VISION
MEMORY
THOUGHT

2014 International Symposium

Organized by Yasushi Miyashita The University of Tokyo

Vision, Memory, Thought:

How Cognition Emerges from Neural Network

December 6-7, 2014

Ito International Research Center, The University of Tokyo, Tokyo.

Contents

Preface

For more than 2000 years, human beings have sought to find the most appropriate way to live up to the famous maxim “Know thyself,” which is engraved at the Temple of Apollo at Delphi. Today, we believe that science—especially the domain of neuroscience—is at the frontier of human endeavors related to this challenge. Indeed, molecular biology has made significant progress in elucidating the impact of single genes upon behaviors, and neuroimaging has identified the brain areas that are active while we perform various cognitive tasks. There is, however, an even greater challenge: understanding how mind ultimately emerges from the molecular machinery through interactions among neural signals occurring in neural circuits/networks.

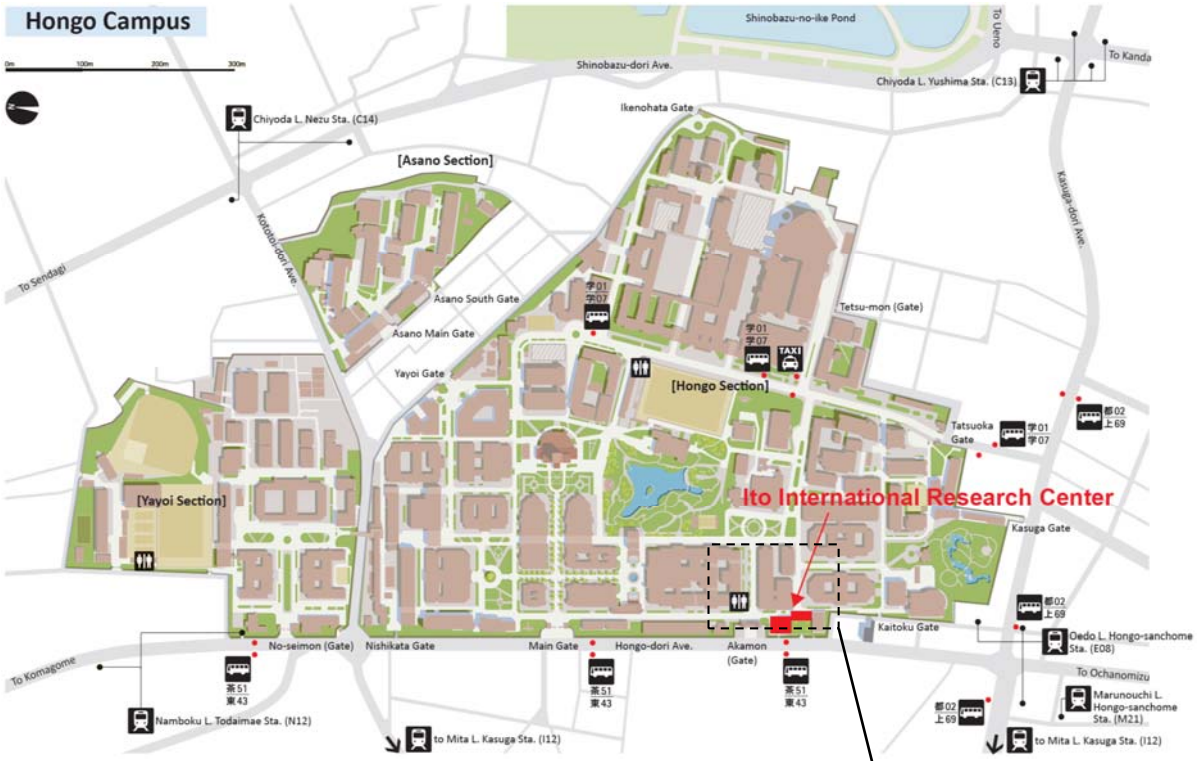
I am convening the symposium entitled “Vision, Memory, Thought: how cognition emerges from neural network,” held on December 6 and 7, 2014 in Tokyo. This symposium aims to tackle basic questions arising from the old maxim “Know thyself,” but with a sharply refined scope. The recent development of multimodal methodologies has enabled us to define neural circuits at several different spatial levels: microscopic (single-axon wiring), mesoscopic (cortical interlaminar connections), and macroscopic (inter-area functional connectivity). The functions of neural circuits at each level should be intensively investigated. However, the focus of this symposium is to discuss how we might link these different levels in order to attain an understanding of mind. To this end, the symposium has brought together the world’s leading scientists who are grappling with this challenge through quite different approaches. Their experimental paradigms are mostly based on the visual and memory systems, not simply because these are crucial subsystems of our cognition, but also because studies on these topics are at the cutting edge of current neural-circuit analyses. In addition to oral presentations by these leading researchers, young scientists will also present their new research findings at the poster session, where discussions will hopefully stimulate new ideas that inspire the next breakthroughs.

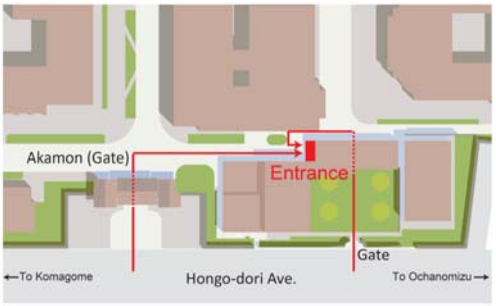
I am confident that this symposium will contribute to our understanding of how cognition emerges from neural networks, and ultimately to human beings’ longstanding effort to know ourselves.

Yasushi Miyashita, Ph.D.

December 6, 2014
Tokyo, Japan

Access to Ito International Research Center, The University of Tokyo





Ito International Research Center (IIRC)
The University of Tokyo

7-3-1, Hongo, Bunkyou-ku, Tokyo 113-0033 JAPAN

TEL: +81-3-5841-0779

http://www.u-tokyo.ac.jp/ext01/iirc/en/index.html

[Access to Tokyo Station]

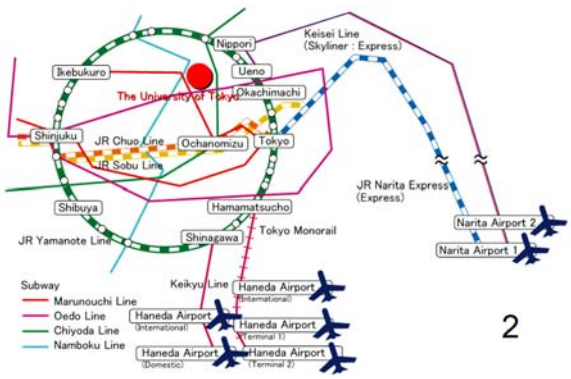
- **From Narita International Airport**

Narita Terminal 1, 2 Sta. —Narita Express (JR)→ **Tokyo Sta.** [55-59 mins.]

- **From Haneda International Airport**

Haneda International Terminal Sta. —Tokyo Monorail→ **Hamamatsucho Sta.** [13-19 mins.]

Hamamatsucho Sta. —Yamanote line (JR)→ **Tokyo Sta.** [6mins.]



[Access to IIRC, Univ. Tokyo]

Tokyo Sta. —Marunouchi Line (Tokyo Metro)→

Hongo-sanchome Sta. (M21) [7 mins.]

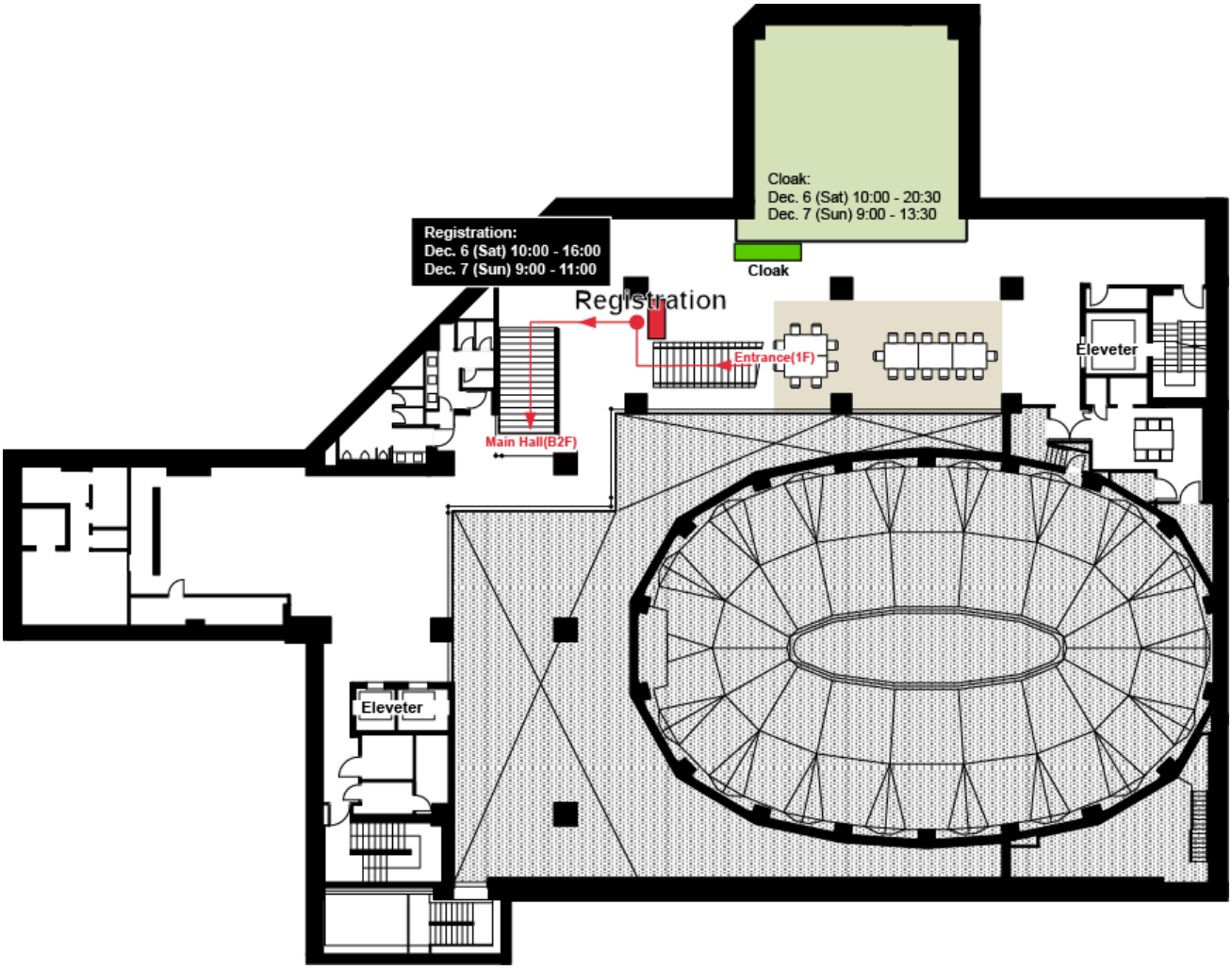
Hongo-sanchome Sta. (M21) → **IIRC** [8 min. walk]

Floor Plans of Ito International Research Center

Building façade

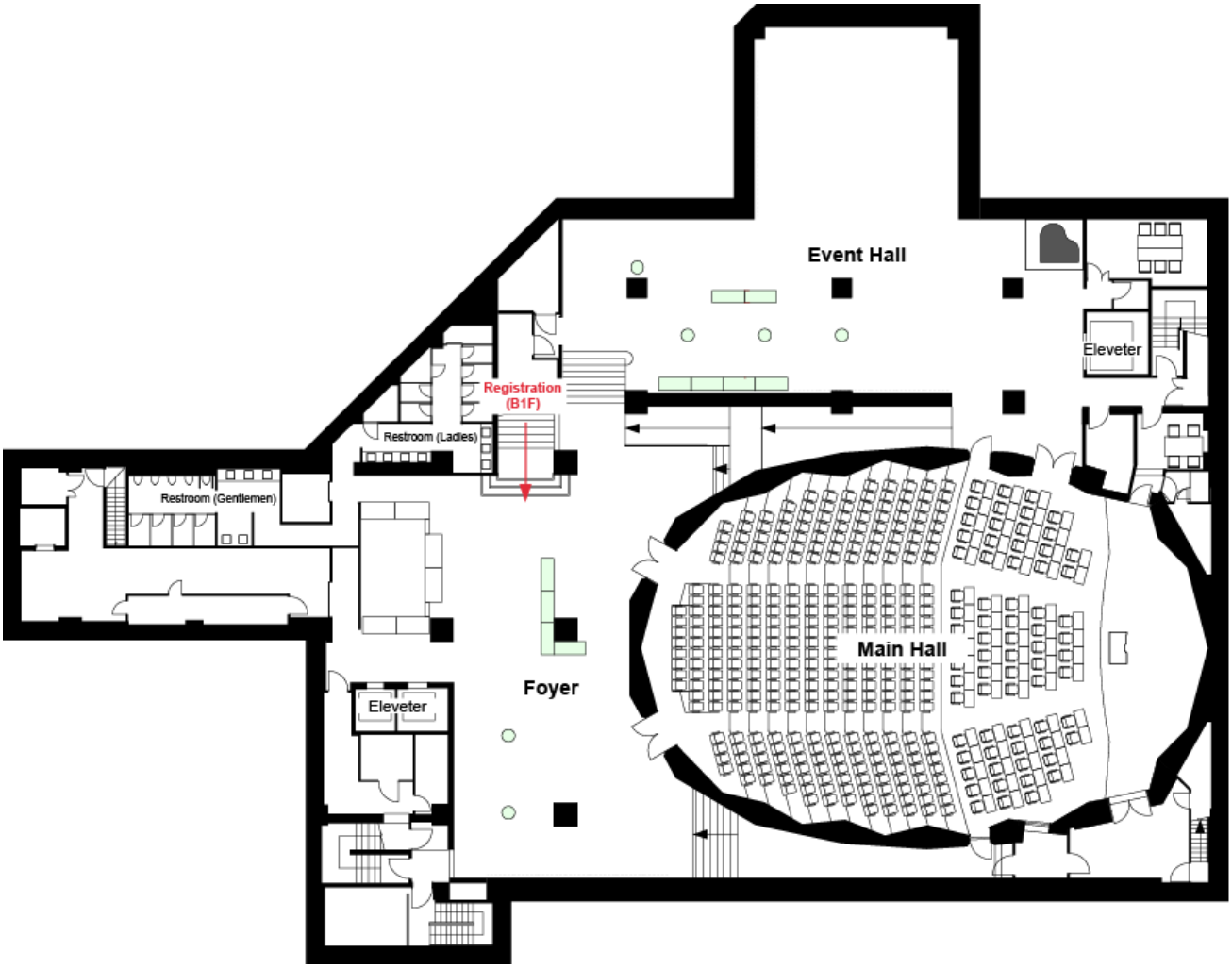
Main hall

B1F



Floor Plans of Ito International Research Center

B2F



Program at a Glance

- Saturday, December 6 (10:30 – 20:00)

[Main Hall]

10:30‐10:40 Opening remark
Dr. Yasushi Miyashita (The University of Tokyo School of Medicine)

Session 1. Cognition Dynamics and Frontal Cortex (Chair: Dr. Nikos K. Logothetis)

10:40 - 11:40 Keynote lecture 1
Dr. William T Newsome (Stanford University School of Medicine)
"A new look at gating: selective integration of sensory signals through network dynamics"

11:40 - 12:40 Keynote lecture 2
Dr. Keiji Tanaka (RIKEN Brain Science Institute)
"Functional division among prefrontal areas"

[Foyer/Event Space]

12:40 – 14:00 Poster Lunch Session [Light refreshments will be served]

[Main Hall]

Session 2. System and Network (Chair: Dr. Bill Newsome)

14:00 – 14:10 Video talk
Dr. Edward Moser (Norwegian University of Science and Technology)
"Grid cells and the cortical map for space"

14:10 – 15:10 Keynote lecture 3
Dr. Stanislas Dehaene (Collège de France)
"How do monkeys and humans represent the abstract structure of sequences"

15:10 – 16:10 Keynote lecture 4
Dr. Doris Tsao (California Institute of Technology)
"Mechanisms for object perception"

Program at a Glance

16:10 – 16:20 Coffee Break

16:20 – 17:20 Keynote lecture 5
Dr. Yasushi Miyashita (The University of Tokyo School of Medicine)
"Cognitive memory in the primate cortex: global network and local circuit"

[Foyer/Event Space]
17:20 – 18:00 Poster Session

[Foyer/Event Space]
18:00 – 20:00 Reception [Fee: JPY 1,000]

- Sunday, December 7 (9:30 – 12:50)

[Main Hall]
Session 3. Multimodal Approaches (Chair: Dr. Stanislas Dehaene)

9:30 – 10:30 Keynote lecture 6
Dr. Karl Deisseroth (Stanford University)
"Optical deconstruction of fully-assembled biological systems"

10:30 – 11:30 Keynote lecture 7
Dr. Takao Hensch (Harvard University)
"Balancing plasticity / stability in brain function"

11:30 – 11:40 Coffee Break

11:40 – 12:40 Keynote lecture 8
Dr. Nikos K. Logothetis (Max-Planck-Institute for Biological Cybernetics)
"The neural orchestration of memory consolidation"

12:40 – 12:50 Closing remark
Dr. Yasushi Miyashita (The University of Tokyo School of Medicine)

Information for Participants

1. Registration

Registration desk is located at Gallery 1 on B1 Floor in Ito International Research Center.

- Registration Desk Opening Hours:
  - Saturday, December 6. 10:00 – 16:00.
  - Sunday, December 7. 9:00 – 11:00.
- On-site registration is available at registration desk.

- Please pick up a name card, receipt for reception party, and program book (including presentation abstract) at registration disk. **[Caution] The abstracts are NOT citable for any works.**

2. Reception Party

This reception offers the opportunity for promising undergraduate, postgraduate students and post docs to meet with leading researchers in a friendly atmosphere. Participants may have the opportunity to speak with the symposium speakers. We encourage all participants to take advantage of this opportunity.

Date & Time: Saturday, December 6th 18:00 – 20:00.
Venue: Event Space & Foyer on B2 floor
Fee: 1,000JPY. (All non-registered participants for the reception party should pay at the registered disk. Only cash payment (JPY) is accepted.)

3. Cloak

Our cloak is located on the B1 floor in the Ito International Center. Valuables and umbrellas cannot be accepted.
Hours:

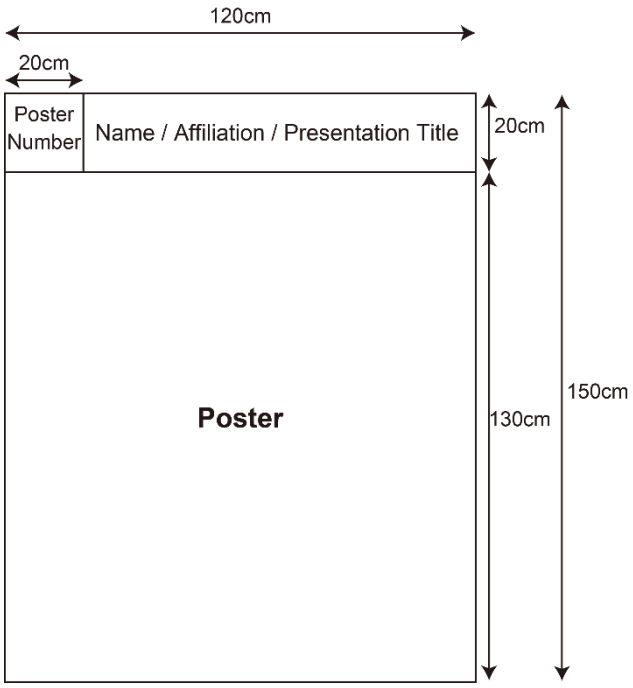
- Saturday, December 6. 10:00 – 20:30.
- Sunday, December 7. 9:00 – 13:30.

4. Drink and Refreshment Service

Drink service will be available for all participants in the Event Space and Foyer during Coffee Break. Light refreshments will be served during Poster Lunch Session on December 6.

Information for Poster Presenters

Poster will be displayed in the Poster Hall.



Poster Preparation

- The panel size is shown in the figure on the right.
  Height: 150cm
  Width: 120cm
- Please print out the title of your presentation as well as the presenter's name/s and affiliation in English and affix this information at the top of the poster display space.
- Poster must be prepared in English.

Presentation Schedule

Saturday, December 6

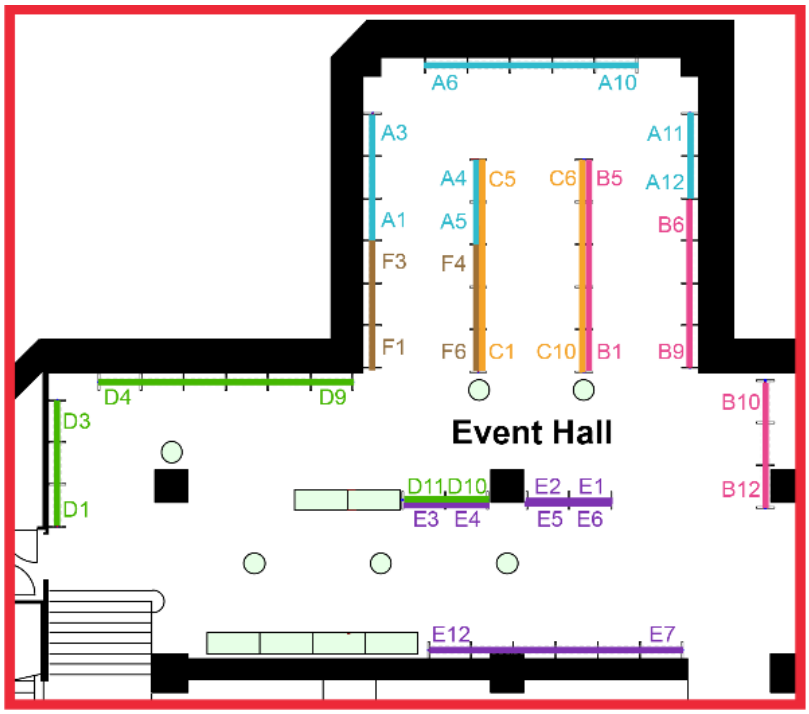
10:00 – 10:30	Poster mounting
12:40 – 14:00	**Presentation / Discussion** (Lunch and Poster Session)
17:20 – 18:00	**Presentation / Discussion** (Poster Session)

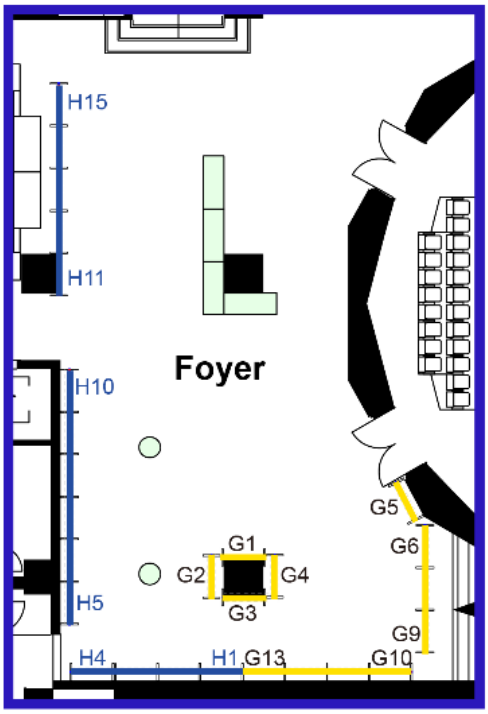
Sunday, December 7

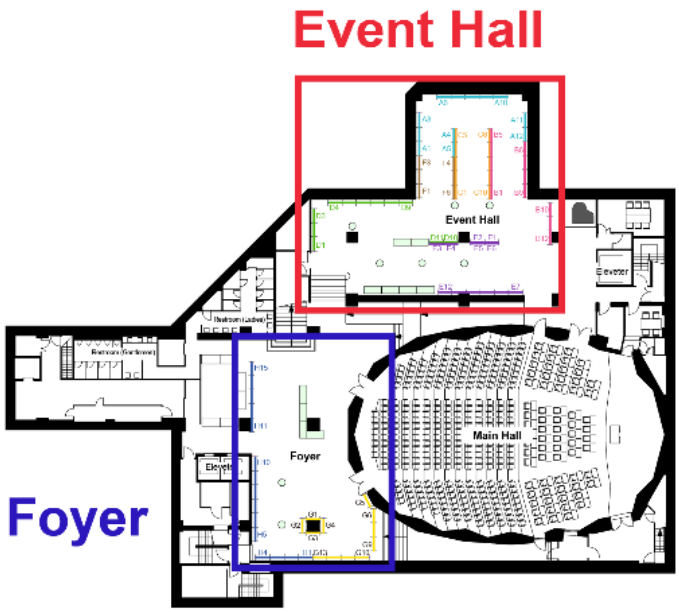
12:50 – 13:20	Poster removal

- All posters are expected to be displayed for two days (December 6 and 7).
- Please mount your poster in the position indicated on the "Poster Hall Layout" in the next page. Poster numbers are already indicated on display panels.
- Tacks for putting up posters will be placed in a paper cup attached to each poster panel. Please do not use glue or scotch tape.
- Please stand in front of your poster panel during the presentation and discussion period listed above, and respond to participants' Questions.
- Posters remaining after the removal period will be removed by the Secretariat.
- The Organizer and Secretariat will accept no responsibility for any theft, loss or damage of posters.

Poster Hall Layout







Program

Keynote Lectures

(Saturday, Dec. 6, Morning)

Session 1. Cognition Dynamics and Frontal Cortex. (Chair: Dr. Nikos K. Logothetis)

■ Lecture 1

A new look at gating: selective integration of sensory signals through network dynamics

Sunday, December 6. 10:40 – 11:40 am.

Dr. William T Newsome

Investigator, Howard Hughes Medical Institute and Professor, Department of Neurobiology, Stanford University School of Medicine, USA

■ Lecture 2

Functional division among prefrontal areas

Sunday, December 6. 11:40 - 12:40 am.

Dr. Keiji Tanaka

Duputy Director, Head, Cognitive Brain Mapping Laboratory, RIKEN Brain Science Institute, Japan

Keynote Lectures

(Saturday, Dec. 6, Afternoon)

Session 2. System and Network (Chair: Dr. Bill Newsome)

■ Lecture 3

How do monkeys and humans represent the abstract structure of Sequences?

Saturday, December 6. 2:10 - 3:10 pm.

Dr. Stanislas Dehaene
Professor, Collège de France and Director, INSERM-CEA Cognitive Neuroimaging unit, NeuroSpin, France

■ Lecture 4

Mechanisms for object perception

Sunday, December 6. 3:10 - 4:10 pm.

Dr. Doris Tsao
Assistant Professor of Biology, California Institute of Technology, USA

■ Lecture 5

Cognitive memory in the primate cortex: global network and local circuit

Saturday, December 6. 4:20 - 5:20 pm.

Dr. Yasushi Miyashita
Professor, Department of Physiology, The University of Tokyo School of Medicine, Japan

Keynote Lectures

(Sunday, Dec. 7, Morning)

Session 3. Multimodal Approaches (Chair: Dr. Stanislas Dehaene)

■ Lecture 6

Optical deconstruction of fully-assembled biological systems

Saturday, December 7. 9:30 - 10:30 am.

Dr. Karl Deisseroth

D.H. Chen Professor of Bioengineering and of Psychiatry and Behavioral Sciences, Stanford University,and Howard Hughes Medical Institute, USA

■ Lecture 7

Balancing plasticity / stability in brain function

Saturday, December 7. 10:30 - 11:30 am.

Dr. Takao Hensch

Professor, Molecular & Cellular Biology, and Neurology (Children's Hospital), Center for Brain Science, Harvard University

■ Lecture 8

The neural orchestration of memory consolidation

Saturday, December 7. 11:40 - 12:40 am.

Dr. Nikos K. Logothetis

Director, Max-Planck-Institute for Biological Cybernetics, Tübingen, Germany

Video Talk

(Saturday, Dec. 6, Afternoon)

Grid cells and the cortical map for space

Saturday, December 6. 2:00 - 2:10 pm.

Dr. Edward Moser
Director of Kavli Institute for Systems Neuroscience and Co-Director of Centre for Neural Computation, Norwegian University of Science and Technology (NTNU), Norway

Poster Presentations

A. Non-invasive functional imaging

A.1 **The left frontal activation selectively modulated by syntactic processing: An fMRI study with a special VOS language**

Shinri Ohta[1, 2], Masatoshi Koizumi[3], Kuniyoshi L. Sakai[1, 2]

[1]Dept. of Basic Sci., Univ. of Tokyo; [2]CREST, JST, [3]Dept. of Ling., Tohoku Univ.

A.2 **Syntactic abilities in a second language assessed by structural properties of the syntax-related pathways**

Kayako Yamamoto[1, 2], Kuniyoshi L. Sakai[1, 2]

[1]Dept. of Basic Sci., Grad. Sch. of Arts and Sci., Univ. of Tokyo, Tokyo, Japan; [2]CREST, Japan Science and Technology Agency, Tokyo, Japan

A.3 **Searching for the brain region related to the relative pitch recognition**

Yuichiro Shimizu[1, 2], Hiroyuki Miyashita[1, 2], Kuniyoshi L. Sakai[1, 2]

[1]Department of Basic Science, Graduate school of Arts and Science, The University of Tokyo; [2]CREST, Japan Science and Technology Agency

A.4 **Dynamics of visual attention in generation process of emergent interpretations for novel metaphors**

Asuka Terai[1], Masanori Nakagawa[1], Takashi Kusumi[2], Yasuharu Koike[3], Koji Jimura[3]

[1]Graduate School of Decision Science and Technology, Tokyo Institute of Technology; [2]Graduate School of Education, Kyoto University; [3]Precision & Intelligence Laboratory, Tokyo

Institute of Technology

A.5 Maturational cerebral hemodynamic changes in the prefronto-parietal regions used in relational reasoning among participants from late childhood to young adulthood

Kiyomi Yatabe[1], Ei-ichi Hoshino[2], Yasuyo Minagawa[3]

[1]Global Centre for Advanced Research on Logic and Sensibility, Keio University, Japan; [2]Department of Computational Intelligence and Systems Science, Tokyo Institute of Technology, Japan; [3]Department of Psychology, Keio University, Japan

A.6 Online decoded neurofeedback of confidence

Aurelio Cortese[1, 2, 3], Ai Koizumi[4], Hakwan Lau[4, 5], Kaoru Amano[3], Mitsuo Kawato[1, 2]

[1]Nara Institute of Science and Technology; [2]ATR Brain Information Communication laboratory Group, Computational Neuroscience Laboratories, DecNef; [3]Center for Information and Neural Networks (CiNet), National Institute of Information and Communications Technology; [4]Columbia University, Department of Psychology. [5]UCLA, Department of Psychology

A.7 How is reward of others integrated to make one's own decisions in neural mechanisms?

H. Fukuda[1, 2], S. Suzuki1[3, 4], N. Ma[1], N. Harasawa[1], K. Ueno[5], J. L. Gardner[6], N. Ichinohe[7], M. Haruno[8], K. Cheng[5, 9], H. Nakahara[1]

[1]Lab For Int Theor Neurosci, RIKEN BSI; [2]Dept of Gen Syst Studies, Univ of Tokyo; [3]Div of Humanities & Social Sci, Caltech, CA, USA; [4]JSPS fellow, Grad School of Letters, Hokkaido Univ; [5]fMRI Support Unit, RIKEN BSI; [6]Gardner Res Unit, RIKEN BSI; [7]Dept of Ultrastructural Res, Natl Inst of Neurosci, NCNP; [8]Center for Info and Neural Networks, NICT; [9]Lab for Cognitive Brain Mapping, RIKEN BSI

A.8 The Neural Basis of Changing Social Norms through Persuasion

Yukihito Yomogida[1], Madoka Matsumoto[1], Ryuta Aoki[1, 2], Ayaka Sugiurab[2, 3], Adam N. Phillips[1], Kenji Matsumoto[1]

[1]Brain Science Institute, Tamagawa University, Tokyo, 194-8610, Japan; [2]Japan Society for the Promotion of Science, Tokyo, 102-0083, Japan; [3]Dept Life Sci, GSAS, Univ of Tokyo, Tokyo, 153-8902, Japan

A.9 Differential functional connectivity networks between subdivisions of the hypothalamus and the orbitofrontal cortex as revealed by high-resolution functional MRI

Satoshi Hirose[1, 2], Hiroyuki Wada[3], Yoshio Imai[3], Toru Machida[3], Masaaki Akahane[3], Ichiro Shirouzu[3], Seiki Konishi[1, 2]

[1]Department of Physiology, The University of Tokyo School of Medicine, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan; [2]Department of Physiology, Juntendo University School of Medicine, 2-1-1 Hongo, Bunkyo-ku, Tokyo 113-8421, Japan; [3]Department of Radiology, NTT Medical Center Tokyo, 5-9-22 Higashigotanda, Shinagawa-ku, Tokyo 141-8625, Japan

A.10 What are emotions? A comparison of categorical and dimensional models of emotion using multivariate pattern analysis

Jerome Foo[1], Katsuyuki Sakai[2]

[1]Physical and Health Education, University of Tokyo, Japan; [2]BSI, Tamagawa University, Japan

A.11 Neural correlates of the automatic representation of a visual stimulus in terms of a background coordinate

Motoaki Uchimura[1, 2, 3, 4], Tamami Nakano[1, 2, 5], Yusuke Morito[5], Hiroshi Ando[5, 6], Shigeru Kitazawa[1, 2, 3, 5]

[1]Dynamic Brain Network Laboratory, Graduate School of Frontier Biosciences, Osaka University; [2]Department of Brain Physiology, Graduate School of Medicine, Osaka University; [3]Department of Neurophysiology, Graduate School of Medicine Juntendo University; [4]Japan Society for the Promotion of Science; [5]Center for Information and Neural Networks (CiNet), National Institute of Information and Communications Technology, and Osaka University; [6]Multisensory Cognition and Computation Laboratory, National Institute of Information and Communications Technology

A.12 Over-night consolidation of sequential motor skill in terms of accuracy is related to the striatum

Sho K. Sugawara[1], Takahiko Koike[1], Hiroaki Kawamichi[2], Kai Makita[3], Yuki H. Hamano[1, 4], Haruka K. Takahashi[1, 4], Eri Nakagawa[1], Hideaki Yamazaki-Kindaichi[1, 4], Norihiro Sadato[1, 4]

[1]National Institute for Physiological Sciences; [2]Faculty of Medicine, Gunma University; [3]Graduate School of Biomedical & Health Sciences, Hiroshima University; [4]School of Life Sciences, The Graduate University for Applied Sciences

B. Executive functions

B.1 Fluctuation of spatial representation and the dynamics of decision-making

in prefrontal neuronal network

Kei Mochizuki[1], Shintaro Funahashi[1, 2]

[1]Kokoro Research Center, Kyoto University; [2]Graduate School of Human and Environmental Studies, Kyoto University

B.2 Single unit activity in the monkey orbitofrontal cortex related to reward value processing during decision-making

Tsuyoshi Setogawa[1], Takashi Mizuhiki[1, 2], Fumika Akizawa[2], Ryosuke Kuboki[2], Narihisa Matsumoto[3], Munetaka Shidara[1, 2]

[1]Faculty of Medicine, University of Tsukuba, Tsukuba, Japan; [2]Grad Sch of Comprehensive Human Sci, University of Tsukuba, Tsukuba, Japan; [3]Human Tech. Res. Inst., AIST, Tsukuba, Japan

B.3 Anterior insular and orbitofrontal cortex in risky decision making

Hironori Ishii, Yuta Kaizu, Shinya Ohara, Philippe N. Tobler, Ken-Ichiro Tsutsui, Toshio Iijima

Division of Systems Neuroscience, Tohoku University; Laboratory for Social and Neural Systems Research, University of Zurich

B.4 Emergence of abstract knowledge that guides decision making in PFC of rats

Satoshi Terada, Hiroyuki Nakahara, and Shigeyoshi Fujisawa

Laboratory for Systems Neurophysiology, and Laboratory for Integrated Theoretical Neuroscience, RIKEN Brain Science Institute, Wako-City, Saitama, Japan

B.5 Functional dissociation of the monkey prefrontal, premotor and posterior parietal cortices by disruptive rTMS during the performance of delayed response task

Shinya Nakamura, Takayuki Hosokawa, Toshio Iijima, Ken-Ichiro Tsutsui

Division of Systems Neuroscience, Graduate School of Life Sciences, Tohoku University, Sendai, Japan

B.6 Involvement of frontal cortical areas and basal ganglia in behavior mediated by conditional 'visuo-goal' association

Yoshihisa Nakayama[1], Tomoko Yamagata[1], Nariko Arimura[1], Jun Tanji[3], Eiji Hoshi[1, 2]

[1]Tokyo Metropolitan Inst. of Med. Sci., Tokyo, Japan; [2]CREST, JST, Tokyo, Japan; [3]Tohoku Univ. Brain Sci. Ctr., Sendai, Japan

B.7 **Role of primate dorsomedial prefrontal cells in social reward valuation**

Atsushi Noritake, Masaki Isoda
Dept. of physiol., Kansai Medical Univ.

B.8 **Neuronal correlates of strategy switching between exploration and exploitation in macaque dorsal premotor cortex**

Satoshi Nishida[1]†, Atsushi Fujimoto[2]†, Tadashi Ogawa[3]
[1]Kokoro Research Center, Kyoto University; [2]Department of Psychiatry, Graduate School of Medicine, Kyoto University; [3]Department of Integrative Brain Science, Graduate School of Medicine, Kyoto University; †These authors contributed equally to this work

B.9 **Role of the primate central thalamus in temporal prediction**

Kei Matsuyama, Masaki Tanaka
Department of Physiology, Hokkaido University School of Medicine, Sapporo 060-8638, Japan

B.10 **The cost paid for the reward enhances the value of the reward**

Shingo Tanaka, John P O'Doherty, Masamichi Sakagami
Tamagawa University, California Institute of Technology

B.11 **The ventral cingulate motor area of monkeys is involved in well-timed initiation of action**

T. Yamagata[1], L. Tremblay[2], E. Hoshi[1, 3]
[1]Tokyo Metropolitan Inst. of Med. Sci., Tokyo, Japan; [2]Centre de Neuroscience Cognitive, UMR-5229 CNRS 67 boulevard Pinel 69675, Bron, France; [3]CREST, JST, Tokyo, Japan

B.12 **Releasing dentate nucleus cells from Purkinje cell inhibition generates output from the cerebrocerebellum**

Takahiro Ishikawa[1], Saeka Tomatsu[2], Donna S Hoffman[3, 4], Shinji Kakei[1]
[1]Tokyo Metropolitan Institute of Medical Science, Tokyo, Japan; [2]National Center of Neurology and Psychiatry, Tokyo, Japan; [3]Center for the Neural Basis of Cognition, Univ. of Pittsburgh Sch. of Med., Pittsburgh, PA

C. Primary visual processing

C.1 **V1 disparity detector integrates multiple spatial frequency channels**

Mika Baba, Kota S. Sasaki, Izumi Ohzawa
Grad Sch Frontier Biosciences, Osaka Univ, Osaka, Japan; Center for Information and

Neural Networks

C.2 Degraded Gabor wavelet transformation: a qualitative evaluation of a visual degradation when a fraction of V1 neurons don't function

Daisuke Kato, Kota S. Sasaki, Izumi Ohzawa
Graduate School of Frontier Biosciences, Osaka Univ.; Center of Information and Neural Network(CiNet)

C.3 The singularity string: a revised structure of pinwheel in cat orientation columns revealed by functional optical coherence tomography

Manabu Tanifuji[1], Yu Nakamichi[1], Valery A. Kalatsky[2], Hideyuki Watanabe[3], Takayuki Sato[1], Uma Maheswari Rajagopalan[1]
[1]Laboratory for Integrative Neural Systems, RIKEN Brain Science Institute; [2]Department of Electrical and Computer Engineering, University of Houston; [3]Department of Medical Physics and Engineering, Division of Health Science, Osaka University Graduate School of Medicine

C.4 Texture selectivity of monkey V4 neurons and their relationship with image statistics

Gouki Okazawa[1], Satohiro Tajima[2, 3], Hidehiko Komatsu[1, 4]
[1]National Institute for Physiological Sciences, Japan; [2]RIKEN, BSI; [3]Japan Society for the Promotion of Science; [4]SOKENDAI

C.5 Functional connections from GABAergic to pyramidal neurons in layer 2/3 of the mouse visual cortex, in vivo

Mir-Shahram Safari, Tadaharu Tsumoto
Laboratoty for cortical circuit plasticity, Brain Science Institute, RIKEN, Japan

C.6 Activity is required not for initial formation but for later reorganization of orientation selectivity in visual cortex

K.M. Hagihara[1], Y. Tagawa[2], T. Yoshoda[1], T. Murakami[1], K. Ohki[1]
[1]Graduate school of medical sciences molecular physiology, Kyushu University, Fukuoka, Japan; [2]Department of Biophysics, Kyoto University, Kyoto, Japan

C.7 Subspace mapping in Gabor wavelet domain for Macaque V2 and MT neurons

Kota S. Sasaki[1, 2], Mikio Inagaki[1], Hajime Hashimoto[1], Izumi Ohzawa[1, 2]
[1]Graduate School of Frontier Biosciences, Osaka University; [2]Center for Information and

Neural Networks (CiNet)

C.8 Subspace reverse correlation for 3D spectral receptive field in macaque MT

Mikio Inagaki, Kota S. Sasaki, Hajime Hashimoto, Izumi Ohzawa
Graduate School of Frontier Biosciences, Osaka University, Osaka, Japan; Center for Information and Neural Networks (CiNet), Osaka, Japan

C.9 Two mechanisms for three-dimensional motion selectivity in macaque area MT

Takahisa M. Sanada[1], Gregory C. DeAngelis[2]
[1]Division of Sensory and Cognitive Information, National Institute for Physiological Sciences, Okazaki, Aichi 444-8585, Japan; [2]Department of Brain and Cognitive Sciences, Center for Visual Science, University of Rochester, NY 14627

C.10 Can macaque monkey perceive motion in depth by cast shadow?

Mizutani S[1, 2 3], Katsuyama N[1, 3], Usui N[1,3], Taira M[1, 3]
[1]Dept. Cogn. Neurobiol. , [2]Dept. Neurol., [3]CBIR, Tokyo Med. Dent.Univ.

D. Visual cognition

D.1 Visual area V4 contributes to both fine and coarse stereopsis by solving the correspondence problem at neural population level

Abdolrahmani M, Doi T, Shiozaki HM, Fujita I
Grad. School of Frontier Biosciences, Osaka Univ., & Center for Information and Neural Networks, NICT, Osaka, Japan

D.2 Mechanisms for shaping receptive field in monkey anterior inferior temporal cortex

Keitaro Obara[1, 2], Kazunori O'hashi[1], Manabu Tanifuji[1, 2, 3]
[1]RIKEN Brain Sci. Inst.; [2]Dept. Life Sci. Med. Biosci., Waseda Univ.; [3]Dept. Complexity Sci. and Eng., Grad. School of Frontier Sciences, Univ. of Tokyo

D.3 Mild perceptual categorization deficits after lesions of anterior inferior temporal cortex

Narihisa Matsumoto[1, 2], Mark A. G. Eldridge[2], Richard C. Saunders[2], Barry J. Richmond[2]
[1]AIST; [2]NIMH, NIH

D.4 Information about facial identity and expression decreased after face

inversion in face responsive neurons of monkey area TE

Y. Sugase-Miyamoto[1], N. Matsumoto[1], K. Kawano[2]
[1]AIST, Ibaraki; [2]Kyoto University, Kyoto

D.5 Microcircuit operation for hierarchical coding of object association across inferotemporal areas in macaques

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D.6 Self-assessment of conscious vision in monkeys and humans

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D.7 Acquiring effective behaviors by secondary reinforcer in blindsight monkeys

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D.8 Responses of midbrain dopamine neurons to conditioned stimuli presented in the V1 lesion-affected visual field

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D.9 MST neurons contribute to perceptual constancy of visual motion across saccadic eye movements

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D.10 Rule-dependent integration of sensory evidence in area LIP

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D.11 Effect of visual information on solidness perception by active touch

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E. Learning and memory

E.1 Decoding from ECoG signals reveals the contents of color imagery in macaque inferior temporal and prefrontal cortices

Hisashi Tanigawa[1], Ren Takei[2], Kei Majima[3, 4], Keisuke Kawasaki[5], Hirohito Sawahata[6], Kiyoshi Nakahara[7], Atsuhiko Iijima[2], Takafumi Suzuki[8], Yukiyasu Kamitani[3, 4], Isao Hasegawa[2, 5]

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E.2 Spatial patterns of cortical oscillation represent associative memory in the primate medial temporal lobe

Adachi K[1], Kawasaki K[2], Sawahata H[3], Matsuo T[4], Suzuki T[5], Majima K[6], Tanigawa H[7], Iijima A[1], Kamitani Y[6], Hasegawa I[2, 7], Nakahara K[8]

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E.3 Whole-brain network dynamics of recognition memory processes in macaque monkeys: an fMRI study

Kentaro Miyamoto, Takahiro Osada, Yusuke Adachi, Hiroko M Kimura, Rieko Setsuie, Tomomi Watanabe, Yasushi Miyashita

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E.4 Information processing in the thalamic mediodorsal nucleus during spatial working memory performance

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Human and Environmental Studies, Kyoto University, Kyoto, Japan; [3]Kokoro Research Center, Kyoto University, Kyoto, Japan

E.5 Neural representation of trajectory in the monkey hippocampus

Rafael Bretas Vieira, Hisao Nishijo
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E.6 Past outcome monitoring and subsequent behavioral adjustment in the primate lateral habenula and anterior cingulate cortex during a reversal learning task

Takashi Kawai[1, 2, 3, 5], Hiroshi Yamada[3, 4], Nobuya Sato[2], Masahiko Takada[1], Masayuki Matsumoto [3]
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E.7 Coordinated activity between the hippocampus and the prefrontal cortex related to retrieval of learned sequences in rats

Seiya Ishino[1], Susumu Takahashi[2], Yoshio Sakurai[1]
[1]Department of Psychology, Kyoto University; [2] Laboratory of Neural Circuitry, Doshisha University

E.8 Rule switching affects cross frequency couplings in rat hippocampus

Tomoaki Nakazono[1], Susumu Takahashi[2], Yoshio Sakurai[1]
[1]Department of Psychology, Kyoto University; [2]Laboratory of Neural Circuitry, Doshisha University

E.9 Sites for formation and storage of eyeblink memory revealed by reversible expression of metabotropic glutamate receptor 1

Harumi Nakao[1], Yasushi Kishimoto[2], Kouichi Hashimoto[4], Kazuo Kitamura[3], Miwako Yamasaki[5], Kazuki Nakao[1, 6], Masahiko Watanabe[5], Masanobu Kano[3], Yutaka Kirino[2], Atsu Aiba[1]
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University; [5]Department of Anatomy, Hokkaido University School of Medicine; [6]Laboratory for Animal Resources and Genetic Engineering, RIKEN Center for Developmental Biology

E.10 Stimulus integration during associative learning is supported by PRh-FrA and IC-FrA circuits

Daisuke Nakayama, Hiroshi Nomura, Zohal Baraki, Kousuke Onoue, Norio Matsuki, Yuji Ikegaya

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E.11 Distinct types of hippocampal sharp-wave ripples during reward-expecting behavior

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E.12 Induction of Associative Olfactory Memory by Targeted Activation of the Memory Circuits in Drosophila Larvae

Takato Honda[1, 2], Chi Yu Lee[2], Maki Yoshida Kasikawa[2], Ken Honjo[2], Katsuo Furukubo-Tokunaga[2]

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F. Emotion

F.1 Primate pulvinar neurons are tuned to evolutionary relevant stimuli (snakes)

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F.2 A comparison between the firing activities of rat basolateral amygdala neurons in a socially interactive situation and in a novel environment

Tadahiro Katayama, Eiichi Jodo, Satoshi Eifuku

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F.3 **Htr2a-expressing cells in central amygdala control hierarchy between innate and learned fear**

Reiko Kobayakawa, Tomoko Isosaka, Ko Kobayakawa
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F.4 **Thiazoline-related fear odors induce innate cold-fear state with sleep-like slow oscillation**

Tomoko Isosaka, Reiko Kobayakawa, Ko Kobayakawa
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F.5 **The roles of habenula on aggressive behaviors in zebrafish**

Ming-Yi Chou, Ryunosuke Amo, Sok-Keng Tong, Masae Kinoshita, Hitoshi Okamoto
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F.6 **Habenulo-raphe serotonergic circuit encodes an aversive expectation value essential for adaptive avoidance**

Ryunosuke Amo[1, 2], Felipe Fredes[1], Masae Kinoshita[1], Ryo Aoki[1, 3], Hidenori Aizawa[1], Masakazu Agetsuma[1], Tazu Aoki[1], Toshiyuki Shiraki[1], Hisaya Kakinuma[1], Masaru Matsuda[4], Masako Yamazaki[1], Mikako Takahoko[1], Shin-ichi Higashijima[5], Nobuhiko Miyasaka[6], Tetsuya Koide[6], Yoichi Yabuki[6], Yoshihiro Yoshihara[6], and Hitoshi Okamoto[1,2]
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G. Functional cellular imaging

G.1 **Combination of optogenetics and optical imaging to identify unknown cortico-cortical projection patterns in macaque**

Yu Nakamichi[1], Mitsuhiro Hashimoto[2], Naohito Kitamura[1], Kei hagiya[1], Takayuki Sato[1], Manabu Tanifuji[1]
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G.2 Orientation maps in monkey V1 and V4 visualized at the single-neuron resolution: a 2-photon calcium imaging study

Koji Ikezoe[1, 2], Shinji Nishimoto[1, 2], and Ichiro Fujita[1, 2]

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G.3 Neuronal basis of resting state functional connectivity investigated with simultaneous wide field imaging of intrinsic and calcium signal

Teppei Matsui, Tomonari Murakami, Kenichi Ohki

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G.4 Decoding of visual images from the population activity in mouse primary visual cortex

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G.5 Two distinct layer-specific alterations in motor predictive information carried by neuronal ensembles and single neurons during learning of a motor task

Yasuhiro R Tanaka, Yoshito Masamizu, Yasuyo H Tanaka, Masanori Matsuzaki

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G.6 Reward-timing-dependent bidirectional modulation of cortical microcircuits during optical single-neuron operant conditioning

Riichiro Hira[1, 2], Fuki Ohkubo[1, 2,] Yoshito Masamizu[1, 2], Masamichi Ohkura[3], Junichi Nakai[3], Takashi Okada[4], and Masanori Matsuzaki[1, 2]

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G.7 Subicular activation preceding hippocampal ripples in vitro

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The University of Tokyo, Tokyo, Japan

G.9 A critical time window for dopamine actions on the structural plasticity of dendritic spines

Sho Yagishita[1, 2], Akiko Hayashi-Takagi[1, 2, 3], Graham C.R. Ellis-Davies[4], Hidetoshi Urakubo[5], Shin Ishii[5], and Haruo Kasai[1, 2]

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G.10 Microglia induced filopodia formation in immature barrel cortex

Akiko Miyamoto[1], Hiroaki Wake[1, 3], Hideji Murakoshi[2, 3], Kei Eto1, Junichi Nabekura[1, 2, 3]

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G.11 In Vivo visualization of subtle, transient, and local activity of astrocytes using an ultrasensitive calcium indicator

Hiroshi Sekiya[1], Kazunori Kanemaru[1], Ming Xu[2], Kaname Satoh[1], Nami Kitajima[1], Keitaro Yoshida[2], Yohei Okubo[1], Takuya Sasaki[3], Satoru Moritoh[4], Hidetoshi Hasuwa[5], Masaru Mimura[2], Kazuki Horikawa[6], Ko Matsui[7], Takeharu Nagai[8], Kenji F Tanaka[2], Masamitsu Iino[1]

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G.12 Cal-520: a newly-developed fluorescent calcium indicator with high sensitivity suitable for monitoring neuronal activity in vitro and in vivo

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G.13 Rapid linear decoding of olfactory perception during flight

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H. Optogenetic & genetic approaches

H.1 Light stimuli alter the activity status of CREB and CRTC1 in the primary visual cortex of adult marmosets

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H.2 The top-down circuit for sensory perception in the cerebral cortex of the mouse

Satoshi Manita[1], Takayuki Suzuki[1], Chihiro Homma[1], Takashi Matsumoto[1], Maya Odagawa[1], Kazuyuki Yamada[1], Keisuke Ota [1, 7], Chie Matsubara[1], Ayumu Inutsuka[2], Masaaki Sato[1, 3], Masamichi Ohkura[4], Akihiro Yamanaka[2], Yuchio Yanagawa[5], Junichi Nakai[4], Yasunori Hayashi[1, 4], Matthew E. Larkum[6], Masanori Murayama[1]

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H.3 Neuronal responses in the basal ganglia evoked by optical stimulation of mice motor cortex

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H.4 Systemic delivery of an AAV vector in neonatal macaques results in widespread gene transduction into neurons throughout the brain

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H.5 Expressing designer receptors exclusively activated by designer drags on the frontostriatal projection neurons in the primate brain using double viral vector transfection

Mineki Oguchi[1], Miku Okajima[2], Shingo Tanaka[1], Masashi Koizumi[1], Takefumi Kikusui[3], Nobutsune Ichihara[3], Shigeki Kato[4], Kazuto Kobayashi[4], and Masamichi Sakagami[1]
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H.6 Enhanced functional recovery after spinal cord injury by inhibition of repulsive guidance molecule in macaques

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H.7 Organization of multisynaptic inputs to the hippocampus: Dual transsynaptic tracing with rabies virus vector in the rat

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H.8 Myelin homeostasis dysfunction induces motor learning impairments

Hiroaki WAKE[1], Daisuke KATO$_1$, Yasuyo TANAKA[2], Yasuhiro TANAKA[2], Yoshito MASAMIZU[2], Riichiro, HIRA[2], Junichi NABEKURA[1], Masanori MATSUZAKI[2]
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H.9 Genetic dissection of pheromone processing reveals direct roles of the main olfactory system in mouse social behavior

Tomohiko Matsuo[1], Tatsuya Hattori[2], Akari Asaba[2], Naokazu Inoue[3, 4], Takefumi Kikusui[2], Reiko Kobayakawa[1], Ko Kobayakawa[1, 5]
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H.10 Experience-dependent modulation of mouse empathetic behavior

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H.11 Cortical excitatory/inhibitory imbalance in a mouse model for human 15q11-13 duplication

Nobuhiro Nakai[1, 2, 3], Yasuhito Watanabe[2], Yoshinobu Kawamura[2], Taisuke Miyazaki[4], Masahiko Watanabe[4], Masanobu Kano[5], Kouichi Hashimoto[2], Toru Takumi[1, 2, 6]

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H.12 Enhanced synapse remodeling as a common phenotype in mouse models of autism

Shinji Tanaka[1], Masaaki Isshiki[1], Toshihiko Kuriu[2], Katsuhiko Tabuchi[3], Toru Takumi[4], Shigeo Okabe[1]

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H.13 Three-dimensional reconstruction of ultrathin-sectioned neural tissue by light microscopy and electron microscopy

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H.14 Spaciotemporal gene expression profiling with efficient brain clearing cocktails and computation

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H.15 Suppression of epileptic seizures through the activation of CB1 and CB2 receptors by the endocannabinoid 2-arachidonoyl glycerol

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