

第 35 回生理研コンファレンス・統合脳国際シンポジウム

Recent Advances in Cortical and Hippocampal Microcircuits

大脳皮質・海馬の局所神経回路研究

第 35 回生理研コンファレンス・統合脳国際シンポジウム「大脳皮質・海馬の局所神経回路研究」は、2006 年 7 月 24 日-26 日の 3 日間に、自然科学研究機構・岡崎コンファレンスセンターにおいて開催された。大脳皮質の神経回路構築の解析は、現在、大きな飛躍の時を迎えていると言っても過言ではない。今まで未知であった多くの事実が分子脳科学や多電極記録法等のシンポは目覚ましく、多くの新しい事実が次々と報告されている。その中でも、リーディング的存在の研究者達 (Edward M Callaway 博士 (Salk Institute, USA), Sacha B Nelson 博士 (Brandis Univ., USA), Gabor Tamas 博士 (Szeged Univ., Hungary), Jackie Schiller 博士 (Technion, Israel), Takao K Hensch 博士 (RIKEN-BSI, Harvard Univ. USA)) にご参加頂き、最新の成果を発表していただいた。さらに、日本の大脳皮質神経回路研究の諸先生方にも、秀でた研究を発表していただき、トータルで 18 演題の口頭発表について活発な質疑応答が交わされた。さらに、ポスター発表にも 31 演題が集まり、日本の若き神経科学研究者や院生達も、第一線を走っておられる研究者と直接ディスカッションする機会を得た事で、大いに刺激を受けた事であろう。総数 124 名 (うち、外国人 14 名) の参加者同士の交流も深まり、多くの意味で非常に有意義であった。打ち解けた雰囲気の中で実り多いディスカッションが行われ、非常に楽しい会合となった。



Monday, July 24

Opening Remarks Yumiko Yoshimura

Session 1: Physiological network connectivity in hippocampal microcircuitry

1. Yuji Ikegaya (Univ. of Tokyo, Tokyo)

Spontaneous activity and ongoing plasticity of CA3 recurrent networks

2. Adi Cymerblit and Yitzhak Schiller (Technion, Israel)

Network dynamics during the development and maintenance of seizures in pilocarpine and picrotoxin treated rats

Session 2: Anatomical network connectivity in hippocampal microcircuitry

3. Ryuichi Shigemoto (NIPS, Okazaki)

Asymmetrical organization of glutamate receptors in left and right hippocampal synapses

4. Shozo Jinno, Thomas Klausberger, Laszlo F. Marton, Yannis Dalezios, Pablo Fuentealba, Wai Yee Suen, Eric A. Bushong, Darrell Henze, György Buzsáki and Peter Somogyi (Oxford Univ., UK; Hungarian University of Transylvania, Hungary; University of Crete, Greece; Institute of Applied and Computational Mathematics, Greece; The State University of New Jersey, USA)

Novel long-range GABAergic projections in the hippocampal formation and beyond

Session 3: Network connectivity in cortical microcircuitry

5. Gábor Tamás, János Szabadics, Szabolcs Oláh, Gergely Komlósi, Pál Barzó, Gábor Molnár (Univ. of Seged, Hungary)

Single spike triggered event sequences in networks of the human cerebral cortex in vitro

6. Yasuo Kawaguchi (NIPS, Okazaki)

Layer V pyramidal cell diversity and their synaptic connections

Tuesday, July 25

Session 4: Plasticity in the visual cortex

7. Yumiko Yoshimura (Nagoya Univ., Nagoya)

Functional roles of T-type Ca^{2+} channels in visual cortical plasticity

8. Takao K Hensch (RIKEN-BSI, Wako)

GABA circuit control of critical period plasticity in visual cortex

Session 5: Microcircuitry in vivo

9. Victoria M Puig, Mika Ushimaru, Yoshiyuki Kubota, Akiya Watakabe, Tetsuo Yamamori, Yuchio Yanagawa, Yasuo Kawaguchi (NIPS & NIBB, Okazaki, Gunma Univ., MIT, USA)

Cortico-striatal, cortico-raphé and fast-spiking cell activity in the rat frontal cortex during cortical oscillations in vivo: modulation by serotonin

10. Ichiro Fujita (Osaka Univ., Osaka)

Functional and Anatomical Architecture of the Inferior Temporal Cortex

Session 6: Microcircuitry of inhibitory neurons

11. Edward Callaway, Takuma Mori, Xiangmin Xu, Ian Wickersham, and David Lyon (Salk Inst, USA)

Unraveling cell type and fine-scale specificity of cortical connections

12. Yukio Komatsu (Nagoya Univ., Nagoya)

A new form of inhibitory synaptic actions between nearby pyramidal neurons in visual cortex

13. Fumitaka Kimura (Osaka Univ., Osaka)

Cholinergic control of cortical network and thalamocortical transmission

Wednesday, July 26**Session 7: Anatomical aspects of cortical microcircuitry**

14. Kathleen Rockland (RIKEN-BSI, Wako)

Cortical projection neurons: phenotypes and input maps

15. Takaichi Fukuda (Kyushu Univ, Fukuoka)

Dendritic network of cortical interneurons linked by gap junctions

Session 8: Synaptic integration along dendrite

16. Jackie Schiller (Technion, israel)

Synaptic integration and plasticity within non-linear dendritic subunits

Session 9: New aspects in cortical microcircuitry analysis

17. Yoshiyuki Kubota, Fuyuki Karube, Yasuo Kawaguchi (NIPS, Okazaki)

Dendritic dimensions of cortical GABAergic nonpyramidal cells

18. Sacha B Nelson (Brandeis Univ., USA)

Physiological Genomics of Cortical Circuits in Health and Disease

Closing Remarks Yoshiyuki Kubota

Poster**Poster I Anatomical and Physiological Analysis of Local Circuits in Neocortex**

P-1. Quantification of excitatory and inhibitory synapses onto parvalbumin- and calretinin-positive GABAergic neurons in the rat cerebral cortex.

Akio Sekigawa, Yoshiyuki Kubota, Yasuo Kawaguchi

Div. Cerebral Circuitry, NIPS, Okazaki, Dept. Physiol. Sci. Grad. Univ. Advanced Studies, Okazaki

P-2. Cortical interneuron organization analysis by in vivo Venus labeling of GABAergic cells in BAC transgenic rats

Yasuharu Hirai^{1,2}, Masakazu Uematsu^{2,3}, Satoe Ebihara², Kuniya Abe⁴, Sachiko Yosida³, Megumi Kato², Masumi Hirabayashi², Yuchio Yanagawa^{5,6} and Yasuo Kawaguchi^{1,2}

¹Grad. Univ. Advanced Studies, Okazaki, Japan, ²NIPS, Okazaki, Japan, ³Toyohashi Univ. Tech., Toyohashi, Japan,

⁴RIKEN, Tsukuba, Japan, ⁵Gunma Univ., Gunma, Japan, ⁶SORST

P-3. Regional, cell type, and layer-specific differences in cholinergic inhibition of neocortical neurons

Allan T. Gullledge^{1,2}, Susannah Park², Greg J. Stuart² & Yasuo Kawaguchi¹,

¹Division of Cerebral Circuitry, National Institute for Physiological Sciences, Okazaki, Japan, ²Division of Neuroscience, JCSMR, Australian National University, Canberra, Australia

P-4. Laminar sources of synaptic input to layer 1 neurons in rat visual cortex

Takuma Mori, Edward M. Callaway

Systems Neurobiology Laboratories, Salk Inst., La Jolla, CA, USA

P-5. Fluorescence activated cell sorting and expression-profiling of parvalbumin-positive GABAergic neocortical interneurons from mouse barrel cortex.

Ethan M. Goldberg, Hyo-Young Jeong, and Bernardo Rudy.

NYU School of Medicine, Department of Physiology & Neuroscience, New York, U.S.A.

- P-6. How is γ frequency rhythmic firing of neocortical regular spiking neurons shaped by recurrent inputs?
Kenji Morita¹, Rita Kalra², Kazuyuki Aihara³, and Hugh P. C. Robinson²
¹RIKEN Brain Science Institute, ²Department of Physiology, Development, and Neuroscience, University of Cambridge,
³Institute of Industrial Science, University of Tokyo, and ERATO, JST
- P-7. Multisite recordings on the signal propagation pattern in local circuit of the visual cortex
Makoto Osanai, Yusuke Takeno, Ryousuke Hasui, Tetsuya Yagi
Graduate School of Engineering, Osaka University
- P-8. Synaptic connection patterns between pyramidal cell subtypes in layer V of rat frontal cortex
Mieko Morishima, Yasuo Kawaguchi
Division of Cerebral Circuitry, National Institute for Physiological Sciences
- P-9. Target-dependent diversity of intrinsic membrane properties in rat frontal Layer 5 pyramidal cells
Takeshi Otsuka, Mieko Morishima, and Yasuo Kawaguchi
Div. Cerebral Circuitry & Structure, NIPS, Okazaki
- P-10. A distinctive layer 5 pyramidal neuron in monkey association cortex, morphologically identified by EGFP – adenovirus infection
Marie Wintzer, Kathleen S. Rockland
Lab for Cortical Organization and Systematics, RIKEN BSI, Wako, Japan
- P-11. Classification of layer 6 neurons by in situ hybridization
Akiya Watakabe¹, Noritaka Ichinohe², Sonoko Ohsawa¹, Tsutomu Hashikawa³, Kathleen S. Rockland², and Tetsuo Yamamori¹
¹Div of Brain Biol., National Institute for Basic Biology, ²Lab for Cortical Organization and Systematics, RIKEN BSI,
³Lab for Neural Architecture, RIKEN BSI

Poster II Physiological Analysis *in vivo*

- P-12. Burst spikes encode multiple quantities in a time-compressive manner
Toshiyuki Ishii^{1,2}, Tomonori Manabe¹ and Toshihiko Hosoya¹
¹RIKEN Brain Science Institute, ²Toho University
- P-13. Direction selectivity and arrangement of neurons in single barrel columns in the rat somatosensory cortex examined with *in vivo* two-photon calcium imaging
¹Koji Ikezoe, ²Yoshiya Mori, ^{3,4}Kazuo Kitamura, ^{2,4}Hiroshi Tamura, ^{2,4}Ichiro Fujita
¹Grad. Sch. Engineering Science, ²Grad. Sch. Frontier Biosciences, ³Grad. Sch. Medicine, Osaka University, Osaka, Japan,
⁴CREST, JST, Saitama, Japan
- P-14. Spatiotemporal dynamics of surround suppression in cat V1: spatial-frequency dependency
Ayako Ishikawa, Satoshi Shimegi, Hiroyuki Kida, Hiroshi Sakamoto, Hiromichi Sato
Grad. Sch. Front. Biosci. & Grad. Sch. Med., Osaka Univ., Japan
- P-15. Spatiotemporal dynamics of surround suppression in cat V1: stimulus-size and orientation-contrast
Satoshi Shimegi, Hiroyuki Kida, Ayako Ishikawa, Hiroshi Sakamoto, Hiromichi Sato
Grad. Sch. Med., & Grad. Sch. Front. Biosci., Osaka Univ., Japan
- P-16. Clustering of color-selective cells in macaque area V4: analysis with multiple single-unit recordings
Yasuyo Kotake, Hiroshi Morimoto, Hiroshi Tamura, Ichiro Fujita
Grad. Sch. Frontier Biosciences, Grad. Sch. Engineering Science, Osaka Univ., CREST, JST, Japan

P-17. Inter-spike interval statistics and visual stimulus discrimination capability of neurons in the monkey inferior temporal cortex

Shunta Tate, Hiroshi Tamura, Ichiro Fujita

Lab Cognitive Neurosci., Grad Sch Frontier Biosciences, Osaka University, Osaka, Japan, Japan Society for the Promotion of Science, Tokyo, Japan

Poster III Development and Plasticity in Neocortex

P-18. Postnatal changes in the colocalization of VGluT1 and VGluT2 immunoreactivities at single axon terminals of the mouse neocortex

Kouichi Nakamura^{1,2}, Akiya Watakabe³, Hiroyuki Hioki¹, Fumino Fujiyama¹, Yasuyo Tanaka¹, Tetsuo Yamamori³, Takeshi Kaneko^{1,2}

¹Department of Morphological Brain Science, Graduate School of Medicine, Kyoto University, ²CREST, JST, ³Division of Brain Biology, National Institute for Basic Biology

P-19. Activity-dependent development of interhemispheric connections in mouse visual cortex

Hidenobu Mizuno, Tomoo Hirano, Yoshiaki Tagawa

Dept. Biophys., Kyoto Univ. Grad. Sch. Sci., Kyoto, Japan; CREST, JST, Kawaguchi, Japan

P-20. Transient layer-specific zinc-positive neurons in the developing rat somatosensory cortical system

Noritaka Ichinohe, Daniel Potapov, Kathleen S Rockland

Laboratory for Cortical Organization and Systematics, Brain Science Institute, RIKEN, Wako, Japan

P-21. Layer and area specific gene expression profiling in developing rat cerebral cortex

Toshio Miyashita, Marie Wintzer, *Tomokazu Konishi, Noritaka Ichinohe, Kathleen S. Rockland.

Lab. for Cortical Organization and Systematics, Brain Science Institute, RIKEN. *Faculty of Bioresource Sciences, Akita Prefectural University

P-22. Truncated TrkB-T1 regulates the morphology of neocortical layer I astrocytes in adult rat brain slices

Koji Ohira^{1,2}, Nobuo Funatsu¹, Koichi J Homma³, Yoshinori Sahara¹, Motoharu Hayashi⁴, and Shun Nakamura^{1,2}

¹Department of Biochemistry and Cellular Biology, National Institute of Neuroscience, National Center of Neurology and Psychiatry, Tokyo, Japan. ²Core Research for Evolutional Science and Technology (CREST), Japan Science and Technology Agency, Saitama, Japan. ³Department of Molecular Pathology, Faculty of Pharmaceutical Sciences, Teikyo University, Kanagawa, Japan. ⁴Department of Cellular and Molecular Biology, Primate Research Institute, Kyoto University, Aichi, Japan.

P-23. Dynamic role of inhibitory circuits in visual cortical plasticity.

Y. Yazaki-Sugiyama, K. Siu*, T. Fukai*, T. K. Hensch;

Lab for Neuronal Circuit Development, *Neural Circuit Theory, RIKEN BSI, Wako, JAPAN

Poster IV New Techniques in Cortical Microcircuitry Analysis

P-24. Efficient Gene Transduction in Neurons with Lentivirus by Improved Neuron-Specific Promoters

Hiroyuki Hioki¹, Hiroshi Kameda¹, Hisashi Nakamura¹, Taro Okunomiya¹, Kohei Ohira¹, Kouichi Nakamura^{1,2}, Masako Kuroda¹, Takahiro Furuta¹, Takeshi Kaneko^{1,2}

¹Department of Morphological Brain Science, Graduate School of Medicine, Kyoto University, Kyoto, Japan. ²Core Research for Evolutional Science and Technology, Japan Science and Technology Agency (CREST), Kawaguchi, Japan

P-25. Development of dendrite-targeting signals using lentivirus vectors with neuron-specific promoter

Hiroshi Kameda¹, Hiroyuki Hioki¹, Takahiro Furuta¹, Koji Ohira¹, Wakoto Matsuda¹, Kouichi Nakamura^{1,2}, Takeshi Kaneko^{1,2}

¹Department of Morphological Brain Science, Graduate School of Medicine, Kyoto University, Kyoto, Japan, ²CREST, JST

P-26. Golgi-like Visualization of cortical neurons by virus vectors.

Ryohei Tomioka and Kathleen S. Rockland

Lab for Cortical Organization and Systematics, RIKEN BSI

P-27. A Novel Genetic Method for Reversibly Inactivating Mammalian Neurons In Vivo

Yoshiaki Yamaguchi¹, Elaine M. Tan^{1,3}, Gregory D. Horwitz², Thomas D. Albright² and Edward M. Callaway¹

¹Systems Neurobiology Laboratories, ²Vision Center Laboratory, The Salk Institute, La Jolla, USA, ³Neurosciences Graduate Program, UCSD, La Jolla, USA,

Poster V Physiological Analysis in Hippocampus

P-28. The effects of body temperature on hippocampal neural activity: control of membrane potential through TRPV4 activation

Koji Shibasaki^{1,2}, Makoto Suzuki³, Atsuko Mizuno³, Makoto Tominaga^{1,2}

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Poster VI Anatomical Analysis in Basal Ganglia

P-29. Difference in Organization of Corticostriatal and Thalamostriatal Synapses between Patch and Matrix Compartments of Rat Neostriatum.

Fumino Fujiyama¹, Tomo Unzai¹, Kouichi Nakamura^{1,3}, Sakashi Nomura², and Takeshi Kaneko^{1,3}

¹Department of Morphological Brain Science, Graduate School of Medicine, Kyoto University, ²Department of Physical Therapy, School of Health Sciences, Faculty of Medicine, Kyoto University, Kyoto, JAPAN and ³CREST, JST.

P-30. Axonal arborization of midbrain dopaminergic neurons: single-cell study

Wakoto Matsuda¹, Takahiro Furuta¹, Koichi Nakamura^{1,2}, Takeshi Kaneko^{1,2}

¹Department of Morphological Brain Science, Graduate School of Medicine, Kyoto University²CREST

P-31. Single cell tracing of thalamostriatal projection neurons with reference to patch and matrix compartments of rat striatum

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