

CURRICULUM VITAE  
**Kei M IGARASHI, PhD**

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## EDUCATION

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Institution	Date	Degree	Subject	Supervisor
University of Tokyo	2003 – 2007	Ph.D	Neuroscience	Kensaku Mori
University of Tokyo	2001 – 2003	M.Sc	Medical Science	Kensaku Mori
University of Tokyo	1996 – 2001	B.Sc	Molecular Biology	Hitoshi Sakano

## PROFESSIONAL EXPERIENCES

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- 2016 –Pres      **Assistant Professor**, Department of Anatomy & Neurobiology  
**Fellow**, Center for the Neurobiology of Learning and Memory  
**Faculty Member**, Institute for Memory Impairments and Neurological Disorders  
University of California, Irvine
- 2009 –2015      **Postdoctoral Fellow and Research Associate**, Kavli Institute for Systems Neuroscience,  
Norwegian University of Science and Technology  
*Supervisor: Dr. Edvard I Moser and Dr. May-Britt Moser*
- 2008 –2008      **Visiting Scientist**, Department of Neurobiology, Yale University School of Medicine  
*Supervisor: Dr. Gordon M. Shepherd and Dr. Wei R. Chen*
- 2007 –2009      **Postdoctoral Fellow**, RIKEN Brain Science Institute, Japan  
*Supervisor: Dr. Kensaku Mori and Dr. Manabu Tanifuji*

## HONORS AND AWARDS

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- 2018              Ando Momofuku Prize, Ando Foundation
- 2018              Early Career Investigator, Finalist, Charleston Conference on Alzheimer's Disease
- 2017              Research Grant Award, Whitehall Foundation
- 2017              Fay-Frank Award, Brain Research Foundation
- 2017              Mishima Kaiun Prize, Mishima Kaiun Memorial Foundation
- 2016              PRESTO Career Development Award, Japan Science and Technology Agency
- 2015              Excellence in Teaching Award, Norwegian University of Science and Technology
- 2014              Young Investigator Award, Japan Neuroscience Society
- 2013              Research Grant, Mishima Kaiun Memorial Foundation
- 2012              Norwegian Research Council Postdoctoral Fellowship
- 2007 – 2009      Postdoctoral Fellowship, Japan Society for the Promotion of Science
- 2004 – 2007      Graduate Fellowship, Japan Society for the Promotion of Science

## PERSONAL STATEMENT

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Throughout my career, a central direction of my research has been to understand how interactions between multiple brain regions give rise to behavior. To this end, I have been pursuing research using olfactory perception and memory as model behaviors, and investigating cellular and circuit mechanisms that support such behaviors. I have a broad background in functional optical imaging, high-density electrophysiology from rodents under different behaviors, and single-cell neuroanatomy, with extensive training in spike and local field potential (LFP) analyses. My PhD work in the Kensaku Mori lab at the University of Tokyo and postdoc research in the laboratory of Edvard Moser and May-Britt Moser at the Norwegian University of Science and Technology revealed fundamental circuit mechanisms and architectures that underlie olfactory perception and memory (see selected publication list below). In my own laboratory at the University of California, Irvine, I am extending these approaches to study (i) cellular and circuit mechanisms for sensory perception and memory in healthy subjects and (ii) how impairment of such mechanisms causes memory deficit using Alzheimer's disease models. For these topics, I published three original papers and three review papers as a corresponding author. From my own lab at UCI, I published one original paper and one review paper.

## MEMBERSHIPS

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2001-pres	<b>Japan Neuroscience Society</b>
2005-pres	<b>Society for Neuroscience</b>
2010-pres	<b>Federation of European Neuroscience Societies</b>
2010-pres	<b>Norwegian Neuroscience Society</b>

## PUBLICATIONS

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### *Original Research Articles*

12. Cavarretta F, Burton SD, [Igarashi KM](#), Shepherd GM, Hines ML, Migliore M (2018)  
Parallel odor processing by mitral and middle tufted cells in the olfactory bulb  
**Scientific Reports**. 8:7625
  11. Nakazono T, Lam TN, Patel AY, Kitazawa M, Saito T, Saido TC, [Igarashi KM](#) (2017)  
Impaired In Vivo Gamma Oscillations in the Medial Entorhinal Cortex of Knock-in Alzheimer Model  
**Frontiers in Systems Neuroscience**, 11:48
  10. Watanabe H, Rajagopalan UM, Nakamichi Y, [Igarashi KM](#), Kadono H, Tanifuji M. (2016)  
Functional optical coherence tomography of rat olfactory bulb with periodic odor stimulation.  
**Biomedical Optics Express**. 7:841-5
  9. Lu L, [Igarashi KM](#), Witter MP, Moser EI, Moser MB (2015)  
Topography of Place Maps along the CA3-to-CA2 Axis of the Hippocampus.  
**Neuron**. 87:1078-92
  8. [Igarashi KM\\*](#), Lu L, Colgin LL, Moser MB, Moser EI\* (2014)  
Coordination of entorhinal-hippocampal ensemble activity during associative learning.  
**Nature**. 510: 143-7 (\*Co-corresponding authors)
- Featured by: Rangel LM, Eichenbaum H (2014)  
Brain Rhythms: Towards a Coherent Picture of Ensemble Development in Learning.  
**Curr Biol**. 24:R620-1

7. Igarashi KM\*, Ieki N, An M, Yamaguchi Y, Nagayama S, Kobayakawa K, Kobayakawa R, Tanifuji M, Sakano H, Chen WR, Mori K\* (2012)  
Parallel mitral and tufted cell pathways route distinct odor information to different targets in the olfactory cortex.  
**Journal of Neuroscience**. 32:7970-85 (\*Co-corresponding authors)
6. Mitsui S, Igarashi KM, Mori K and Yoshihara Y (2011)  
Genetic visualization of the secondary olfactory pathway in Tbx21 transgenic mice.  
**Neural Systems & Circuits**. 1:5
5. Watanabe H, Rajagopalan UM, Nakamichi Y, Igarashi KM, Kadono H, Tanifuji M (2011)  
Swept source optical coherence tomography as a tool for real time visualization and localization of electrodes used in electrophysiological studies of brain in vivo.  
**Biomedical Optics Express**. 2:3129-3134
4. Watanabe H, Rajagopalan UM, Nakamichi Y, Igarashi KM, Madjarova VD, Kadono H, Tanifuji M (2011)  
In vivo layer visualization of rat olfactory bulb by a swept source optical coherence tomography and its confirmation through electrocoagulation and anatomy.  
**Biomedical Optics Express**. 2:2279-2287
3. Tsuboi A, Imai T, Kato HK, Matsumoto H, Igarashi KM, Suzuki M, Mori K, Sakano H (2011)  
Two highly homologous mouse odorant receptors encoded by tandemly-linked MOR29A and MOR29B genes respond differently to phenyl ethers.  
**European Journal of Neuroscience**. 33:205-13
2. Nagayama S, Enerva A, Fletcher ML, Masurkar AV, Igarashi KM, Mori K, Chen WR (2010)  
Differential axonal projection of mitral and tufted cells in the mouse main olfactory system.  
**Frontiers in Neural Circuits**. 4. Pii120
1. Igarashi KM, Mori K (2005)  
Spatial representation of hydrocarbon odorants in the ventrolateral zones of the rat olfactory bulb.  
**Journal of Neurophysiology**. 93:1007-1019

## Review articles

7. Nakazono T, Jun H, Blurton-Jones, M, Green KN, Igarashi KM (2018)  
Gamma oscillations in the entorhinal-hippocampal circuit underlying memory and dementia  
**Neurosci Res**, 129:40-46
6. Igarashi KM (2016)  
Entorhinal map of space  
**Brain Research**, 1637:177-87
5. Igarashi KM (2015)  
Plasticity in oscillatory coupling between hippocampus and cortex  
**Curr Opin Neurobiol**. 35:163-168
4. Igarashi KM\*, Ito HT, Moser EI, Moser, M-B (2014)  
Functional diversity along the transverse axis of hippocampal area CA1.  
**FEBS Lett**. 588:2470-2476 (\*Corresponding author)
3. Mori K, Matsumoto H, Tsuno Y, Igarashi KM (2009)  
Dendrodendritic synapses and functional compartmentalization in the olfactory bulb.  
**Ann N Y Acad Sci**. 1070:255-258

2. Mori K, Takahashi YK, Igarashi KM, Yamaguchi M (2006)  
Maps of odorant molecular features in the Mammalian olfactory bulb.  
*Physiol Rev.*86:409-433
1. Mori K, Takahashi YK, Igarashi K, and Nagayama S (2005)  
Odor Maps in the Dorsal and Lateral Surfaces of the Rat Olfactory Bulb.  
*Chemical Senses.* 30:i103-i104

### **Book Chapters**

1. Nagayama S, Igarashi KM, Manabe H, Mori K (2014)  
Parallel tufted cell and mitral cell pathways from the olfactory bulb to the olfactory cortex.  
In: *Olfactory System: From Odor Molecules to Motivational Behaviors*. Springer

### **Abstracts (after joining UCI)**

4. Nakazono T, Lam TN, Patel AY, Kitazawa M, Saito T, Saido TC, Igarashi KM\*  
Impaired In Vivo Gamma Oscillations in the Medial Entorhinal Cortex of Knock-in Alzheimer Model  
Society for Neuroscience Abstract, Nov 2017
3. Nakazono T, Lam TN, Patel AY, Kitazawa M, Saito T, Saido TC, Igarashi KM\*  
Impaired In Vivo Gamma Oscillations in the Medial Entorhinal Cortex of Knock-in Alzheimer Model  
Japan Neuroscience Annual Meeting Abstract, Jul 2017
2. Lam TN, Patel AY, Igarashi KM\*  
Establishing a Go/No-Go Odor Association Task for Head-Fixed Mice  
UC Irvine Undergraduate Research Opportunity Program Symposium, May 2017
1. Nakazono T, Lam TN, Patel AY, Kitazawa M, Saito T, Saido TC, Igarashi KM\*  
Impaired In Vivo Gamma Oscillations in the Medial Entorhinal Cortex of Knock-in Alzheimer Model  
UC Irvine Epilepsy Center Annual Meeting, Mar 2017

## **INVITED LECTURES AND PRESENTATIONS**

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### **Plenary Lecture**

Feb 2017                      Tamagawa University Brain Science Institute Retreat, Yugawara, Japan.

### **Award Lecture**

Jul 2017                      Mishima Kaiun Prize Award Lecture, Tokyo, Japan.

### **Conference Talks**

July 2019                      **Chair, Organizer and Speaker**  
Symposium "Brain network dysfunction in Alzheimer's disease: a new potential target for future therapy" Speakers invited: Drs. Abid Hussaini (Columbia Univ), Jorge Palop (UCSF),

- Annabella Singer (Georgia Tech)  
2019 Japan Neuroscience Society Annual Meeting, Niigata, Japan
- June 2019 Sicily Memory Meeting, Italy
- July 2018 Japan Neuroscience Society Annual Meeting, Kobe, Japan
- June 2018 Southern California Alzheimer's Disease Research Center Symposium, Irvine
- April 2018 UC Irvine International Conference on Learning and Memory, Irvine
- Jan 2018 Park City Winter Memory Conference, Utah
- Aug 2017 Japan Science and Technology Agency Joint Meeting, Hamanako, Japan
- Jun 2017 UCI SOM-Ayala Joint Retreat
- Mar 2017 UCI CNLM Spring Meeting
- Feb 2017 Japan Science and Technology Agency Joint Meeting, Shiga, Japan
- Dec 2016 International Memory Workshop  
'Towards elucidation of memory engram'  
National Institute for Physiological Science, Okazaki, Japan.
- Jun 2016 Southern California Computational Neuroscience Symposium, UCLA
- Nov 2015 International Neuroscience Workshop, Tohoku University, Sendai, Japan.
- Sep 2014 **Co-chair, Organizer and Speaker**  
for the Symposium 'Temporal coding and oscillations: Emerging views for neuronal assemblies in microcircuits and inter-regional networks'  
Speakers invited: Drs. David J Foster, Laura L Colgin, Toshiyuki Hirabayashi and Shigeyoshi Fujisawa  
2014 Japan Neuroscience Society Annual Meeting, Yokohama, Japan
- Jul 2014 **Chair, Organizer and Speaker**  
for the Symposium 'Lateral entorhinal cortex: interface for hippocampal episodic memory',  
Speakers invited: Drs. James J Knierim, Mayank Mehta, Kaori Takehara-Nishiuchi  
Federation for European Neurosciences (FENS) Meeting, Milan, Italy
- Aug 2013 Kavli Institutes Neuroscience Meeting, Trondheim, Norway.
- May 2012 Nansen Neuroscience Meeting, Trondheim, Norway.
- Seminars**
- Aug 2018 Kavli Institute for Systems Neuroscience, Norwegian University of Science and Technology

Mar 2018	UCI MIND, University of California Irvine, USA.
Feb 2017	Osaka City University, Osaka, Japan
Apr 2016	Center for the Neurobiology of Learning and Memory, UC Irvine, USA
Jan 2015	University of California Irvine, USA.
Nov 2014	Picower Institute for Learning and Memory, Massachusetts Institute of Technology, USA.
Nov 2014	Sainsbury Wellcome Centre, University College London, UK.
Apr 2014	Kyoto University, Japan.
Mar 2014	University of Tokyo, Japan.
Mar 2014	RIKEN Brain Science Institute, Wako, Japan.
Nov 2013	University of Texas at Houston, Houston, USA.
Apr 2012	RIKEN Brain Science Institute, Wako, Japan.
Jan 2008	Kavli Institute for Systems Neuroscience, Trondheim, Norway.
Nov 2006	RIKEN Brain Science Institute, Wako, Japan.

## RESEARCH SUPPORT

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### **ACTIVE**

#### **PRESTO Career Development Award (JPMJPR1681)**

10/1/16 – 3/31/20

#### ***Japan Science and Technology Agency***

“Reverse-engineering brain oscillations in the entorhinal cortex”

Role on project: PI

Objective: This project will investigate the mechanism underlying olfactory memory in entorhinal cortex.

#### **Research Grant (2017-08-01)**

9/1/17 – 8/31/20

#### ***Whitehall Foundation***

“Mechanisms for entorhinal-hippocampal circuit interactions”

Role on project: PI

Objective: This project will investigate the role of gamma synchronization in associative memory.

#### **Alzheimer’s Association Research Grant (AARG-17-532932)**

10/1/17 – 9/30/20

#### ***Alzheimer’s Association***

“In vivo entorhinal-hippocampal synchronization in APP knock-in mice”

Role on project: PI

Objective: This project will develop methods for neurophysiological recording from entorhinal cortex and hippocampus of APP knock-in mice.

#### **Fay-Frank Grant (BRFSG-2017-04)**

6/1/17 – 5/31/19

#### ***Brain Research Foundation***

“Neural circuit mechanisms in the early stage of Alzheimer’s disease”

Role on project: PI

Objective: This project will investigate the role of gamma synchronization in the early stage of Alzheimer's disease.

**Office of Naval Research Grant**

09/01/17-08/31/20

"Hippocampal Networks and Episodic Memory"

Role on project: Co-I (PI: Gary Lynch)

Objective: My role in this project is record spiking activities in CA3 and DG from task performing rats.

**Completed Research Support****Research Grant**

7/1/13 – 6/30/14

***Mishima Kaiun Memorial Foundation***

"Circuit mechanisms in entorhinal cortex"

Role on project: PI

Direct cost: \$10,000 (1 year)

Objective: This project investigated the mechanism underlying spatial representation in entorhinal cortex.

**JSPS Postdoctoral Fellowship**

4/1/07 – 3/31/10

***Japan Society for the Promotion of Science***

"Circuit mechanisms underlying odor memory in the olfactory cortex"

Role on project: PI

Direct cost: \$170,000 (3 years)

Objective: This project investigated the functional architecture of olfactory cortex.

**JSPS Graduate Fellowship**

4/1/04 – 3/31/07

***Japan Society for the Promotion of Science***

"Anatomical analysis from olfactory bulb to olfactory cortex"

Role on project: PI

Direct cost: \$110,000 (3 years)

Objective: This project investigated the anatomical architecture from olfactory bulb to olfactory cortex.

**TEACHING ACTIVITIES**

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**UC Irvine**

Fall 2017

**Medical Histology course**

100 students, 2 hrs (special senses)

Fall 2017

**Neuroscience Foundation course,**

Interdepartmental Neuroscience Program, 12 students, 1hr

Spring 2017

**Neurophysiology lab course**

BioSci199, 2 students, 4hr/day, 5days/week

Winter 2017

**Neurophysiology lab course**

BioSci199, 2 students, 4hr/day, 5days/week

Fall 2016

**Organizer, Career development workshop**

UC Irvine Japanese postdoc association

Fall 2016      **Neuroscience Foundation course,**  
Interdepartmental Neuroscience Program, 12 students, 1hr

Fall 2016      **Neurophysiology lab course**  
BioSci199, 2 students, 4hr/day, 5days/week

Spring 2016    **Neurophysiology lab course**  
BioSci199, 2 students, 4hr/day, 5days/week

### **Other Institutions**

Fall 2017      **Colloquium in Neuroscience**  
Neuroscience Graduate Program, University of California Riverside  
30 students, 1hr

### **Previous Institutions**

2015            **Systems Neuroscience course**  
Norwegian Univ. of Science and Technology

2012            **Teaching Assistant, Behavioral and Cognitive Neuroscience course**  
Norwegian Univ. of Science and Technology

2001 – 2006    **Teaching Fellow, Medical Physiology**  
University of Tokyo School of Medicine

## **TRAINING & SUPERVISION**

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### **Current**

#### **Postdoctoral Fellows**

2016 – 2018    Tomoaki Nakazono, Ph.D      Published 2 first author paper (Nakazono et al., 2017; 2018)  
Now an assistant professor at the Fukushima Medical  
College, Japan

2018 – present    Ananya Dasgupta, PhD

2018 – present    Shogo Soma, PhD

#### **Graduate Students**

2017 – present    Heechul Jun      Medical Scientist Training Program student, UCI SOM

#### **Undergraduate Student**

2018 – present    Seiya Bamba      Medical School Student, Kyoto University, International Internship

2018 – present    Karolyn Tran      Biological Science, UCI; Bio Sci 199 Program

2018 – 2018      Zichen Wang      Biological Science, UCI; Bio Sci 199 Program

2018 – 2018      Sunwoo Oh      Biological Science, UCI; Bio Sci 199 Program

2016 – 2018      Ayushi Patel      Biological Science, UCI; Bio Sci 199 Program



Undergraduate Research Opportunities Program (UROP) Fellowship

2016 – 2018      Travis Lam      Pharmaceutical Science, UCI; Bio Sci 199 Program  
Undergraduate Research Opportunities Program (UROP) Fellowship

### PhD Advancement Committees

2017 – present      Jan Frankowski      Anatomy & Neurobiology, Robert Hunt lab  
2018 – present      Dhruva Banerjee      MSTP student, Sunil Gandhi lab

### Completed

Co-supervision

2009 – 2015      Li Lu      PhD Student, Norwegian University of Science and Technology  
*Current position: Postdoc with Dr. Angelaki Lab*  
2007 – 2013      Nao Ieki      PhD Student, University of Tokyo School of Medicine  
*Current Position: Researcher at Astellas Pharma*  
2008 – 2009      Myungho An      Master Student, University of Tokyo School of Medicine  
2007 – 2009      Yukie Yamaguchi      Master Student, University of Tokyo School of Medicine

## SERVICE

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### Professional Service

#### Manuscript Review

2014-pres      **The Journal of Neuroscience**  
2015-pres      **Nature**  
2015-pres      **Frontiers Journals**  
2016-pres      **Nature Neuroscience**  
2016-pres      **Scientific Reports**  
2018-pres      **PLoS Biology**

#### Grant Review

2016-pres      **Alzheimer's Association Research Fellowship**  
2018      **University of Strasbourg USIAS programme**

### Department Service

2016 -      Member, Website Committee, Dept of Anatomy & Neurobiology, UC Irvine  
2016      Member, Personnel advancement committee, Dept of Anatomy & Neurobiology, UC Irvine  
2017      Member, Personnel advancement committee, Dept of Anatomy & Neurobiology, UC Irvine

### University Service

**Interdepartmental Neuroscience Program**

- 2017 - Member, INP Executive Committee, UC Irvine  
2017 - Interviewer, INP Recruitment, UC Irvine

### **Center for the Neurobiology of Learning and Memory**

2017 - 2018 Program Committee Member, UCI Learning and Memory International Conference 2018

### **Undergraduate**

2017 Poster evaluator, UCI Bio Sci 199 Excellence in Research

### **Public Outreach**

2017 Mishima Kaiun Award Ceremony Lecture, 25 min talk, ~100 people

### **Media Appearances and Interviews**

2017 Featured article "Navigating brain oscillations and Alzheimer's disease"  
UCI Center for the Neurobiology of Learning and Memory. Online.

<http://www.cnlm.uci.edu/2017/07/28/brain-waves-space-and-alzheimers-disease/>

## **REFERENCES**

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### **Dr. Edvard I. Moser**

Director and Professor

Kavli Institute for Systems Neuroscience, Norwegian University of Science and Technology

E-mail: edvard.moser@ntnu.no

### **Dr. May-Britt Moser**

Director and Professor

Centre for Neural Computation, Norwegian University of Science and Technology

E-mail: may-britt.moser@ntnu.no

### **Dr. Naoshige Uchida**

Professor

Center for Brain Science, Department of Molecular and Cellular Biology, Harvard University

E-mail: uchida@mcb.harvard.edu

### **Dr. Kensaku Mori**

Professor Emeritus

Department of Physiology, Graduate School of Medicine, University of Tokyo

E-mail: moriken@m.u-tokyo.ac.jp

### **Dr. Laura L. Colgin**

Associate Professor

Center for Learning and Memory, The University of Texas at Austin

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### **Dr. Christine M. Gall**

Professor and Chair,

Department of Anatomy and Neurobiology, University of California, Irvine  
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**Dr. Michael A. Yassa**

Professor and Director  
Center for the Neurobiology of Learning and Memory, University of California, Irvine  
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