

# この先に こころがある。

若手研究者向け

トラベルグラント提供！

包括型脳科学研究推進支援ネットワーク  
研究集会支援



## 技術

### Tools & Technologies Frontiers of Brain Science Tohoku Forum for Creativity

HARUO MIZUTANI (HARVARD)  
VALENTIN NÄGERL (UNIV BORDEAUX)  
SHU KONDO (NIG, JAPAN)  
KATRIN VOGT (MAX PLANCK)  
KOICHI HASHIMOTO (TOHOKU UNIV)  
MASAO TACHIBANA (UNIV TOKYO)  
OLIVER GRIESBECK (MAX PLANCK)  
KEN BERGLUND (EMORY UNIV)  
TOMOMI TSUNEMATSU (UNIV STRATHCLYDE)  
KO MATSUI (TOHOKU UNIV)  
C JUSTIN LEE (KIST, KOREA)  
AMIT AGARWAL (JOHNS HOPKINS)  
JASON M. CHRISTIE (MPFI, USA)  
RYUICHI SHIGEMOTO (IST AUSTRIA)  
SABINA HRABETOVA (SUNY DOWNSTATE MED CNTR)  
JEFF LICHTMAN (HARVARD)  
GÁSPÁR JÉKELY (MAX PLANCK)  
MICHAEL HÄUSSER (UCL, UK)  
HIROMU TANIMOTO (TOHOKU UNIV)

脳の全配線図を描きだし、細胞活動と遺伝子発現を自在に操作できる時代がやってきました。最新技術を活かして、脳といった物質になぜ心が宿るのか、脳科学究極の問いに挑戦します。

当番幹事：谷本拓（生命）  
松井広（医学）

ワークショップ  
2015.7.21-24  
東北大学星陵キャンパス

JEOL, Leica, Nikon, Olympus, ZEISS  
各社の最新型顕微鏡を用意。超解像イメージングや光シート顕微鏡を使って、透明化標本や生細胞のライブイメージングの限界に迫ります。

シンポジウム  
2015.7.25-27  
東北大学片平キャンパス

超解像イメージングや電顕コネクトミクスの形態学的アプローチと、オプトジェネティクスや電気生理学の機能的アプローチ。さらにそれを橋渡しする情報科学理論。あらゆる手段で人類最後のブラックボックスに挑みます。

続きはウェブで！事前登録はお早目に。

<http://www.tfc.tohoku.ac.jp/program/2441.html>

## 東北大学 知のフォーラム 脳科学最前線

世話人代表：飯島敏夫（生命）、大隅典子（医学）

7月：技術  
8月：発達  
9月：記憶

3つのイベントを開催します。  
他のイベントもお楽しみに。



TOHOKU FORUM  
for CREATIVITY



# Tohoku Forum for Creativity

## FRONTIERS OF BRAIN SCIENCE TOOLS & TECHNOLOGIES WORKSHOPS: JULY 21 (TUE) – 24 (FRI), 2015

### Workshop Onsite Registration

Tue. July 21 12:00 - 13:30

1st Floor Lecture Room (Med Sch Bldg #6)

Tohoku Medical Megabank Building

Department of Medicine at Seiry Campus, Tohoku University

### Workshop Banquet

Attendees will make detailed arrangements with organizers, staffs, and lecturers about their workshop projects over dinner. Organizers will lead group discussion sessions to facilitate information exchange among the attendees. As day time schedule is occupied with lectures and workshop projects, these discussions need to be made over dinner time.

Attendance of the banquet is recommended but optional. Please register online to attend the banquet.

Faculty members and corporate attendees' banquet drink fee is 3,000 yen.

Students' banquet drink fee is 1,000 yen. Academic speakers are free of charge.

The fee will be collected at the onsite registration on July 21.

Banquet will be held at 1st Floor Atrium of Med Sch Bldg #6 from 18:00 – 20:30 on July 21.

### Workshop Items

The following workshop stations will be distributed in Med Sch Bldg #6, #5, and #1

- |                                        |                            |
|----------------------------------------|----------------------------|
| 1. JEOL, Remote EM                     | Bldg #6, GDRoom #15        |
| 2-1. Leica, STED microscopy            | Bldg #6 GDRoom #11-#14     |
| 2-2. Leica, DLS microscopy             | Bldg #6 GDRoom #11-#14     |
| 3. Nikon Instech, N-SIM microscopy     | Bldg #1 2F Common Facility |
| 4. Nikon Instech, Neurolucida software | Bldg #6 GDRoom #16         |
| 5. Olympus, SD-OSR microscopy          | Bldg #5 2F Room 201        |
| 6. ZEISS, Light-sheet microscopy       | Bldg #5 2F Room 211        |
| 7. ZEISS, Airyscan confocal microscopy | Bldg #5 2F Room 211        |
| 8. ZEISS, IMARIS software              | Bldg #5 4F Refresh Room    |

### Workshop Overview

1. Pre-registration using the form on our website is required to attend the workshop. Unregistered, walk-in attendance is strictly prohibited.
2. Only those who can attend the entire workshop will be allowed to participate.
3. Maximum of ~28 participants. The pre-registration list will be evaluated by the organizers, and the results of the selection will be announced.

4. A variety of the latest microscopes (light-sheet, next generation confocal, super-resolution, etc.) will be demonstrated, with technical support provided by the manufacturers.
5. The timetable of the workshop will be as follows: one day of lectures, one day of rotations, two days of individual projects. Several of the participants will be expected to give short presentations at the end of the workshop.
6. It will be preferable if the workshop attendees bring their own samples for use during the microscopy sessions. Transparentation techniques such as ScaleA2, CUBIC, SeeDB, and CLARITY may be useful, but they require sample processing before the workshop. Those who wish to apply these techniques to their samples should discuss this beforehand with the organizers, who in turn will consult with the specialists at the microscopy companies.
7. Please contact Dr. Tatsuya Sato (tatsuyasato1118@gmail.com, Graduate School of Medicine, Tohoku University) to inquire about the details of the workshop, after the online registration.

## Workshop Time Schedule

### Workshop Day 1

July 21 (Tue)

12:00 - 13:30      Registration  
                          **Med Sch Bldg #6 Lecture Room**  
                          Workshop Banquet drink fee (participation optional):  
                          Faculty & corporate attendee ¥3,000, students ¥1,000

13:30 - 13:40      Opening remarks  
                          Noriko Osumi (Tohoku University)

#### Part 1. Chair Person: Noriko Osumi (Tohoku University)

13:40 - 14:20      Haruo Mizutani  
                          Harvard University, USA  
                          "The suite of connectomic technologies"

14:20 - 14:50      Coffee break

#### Part 2. Chair Person: Tatsuya Sato (Tohoku University)

14:50 - 15:20      JEOL Presentation  
 15:20 - 15:50      Leica Presentation

15:50 - 16:20      Coffee break

16:20 - 16:50      Nikon Instech Presentation  
 16:50 - 17:20      Olympus Presentation  
 17:20 - 17:50      ZEISS Presentation

- 17:50 - 18:00      Announcements
- 18:00 - 20:30      Workshop Banquet @ Med Sch Bldg #6 Atrium  
Greetings by Noriko Osumi (Tohoku University)  
Group discussions and information exchange

### Workshop Day 2

July 22 (Wed)

5 Groups (Group L, N, O, Z-L, Z-A)

8 Stations (Station 1. JEOL, 2. Leica, 3. N-SIM, 4. Neurolucida, 5. SD-OSR, 6. ZEISS-LS, 7. ZEISS-AS, 8. ZEISS-IM)

- 09:00 - 09:40      Group L @ station 1, N @ 2, O @ 3, Z-L @ 4, Z-A @ 5
- 09:50 - 10:30      Group L @ station 2, N @ 3, O @ 4, Z-L @ 5, Z-A @ 6
- 10:40 - 11:20      Group L @ station 3, N @ 4, O @ 5, Z-L @ 6, Z-A @ 7
- 11:30 - 13:00      Lunch break (on your own)
- 13:00 - 13:40      Group L @ station 4, N @ 5, O @ 6, Z-L @ 7, Z-A @ 8
- 13:50 - 14:30      Group L @ station 5, N @ 6, O @ 7, Z-L @ 8, Z-A @ 1
- 14:40 - 15:20      Group L @ station 6, N @ 7, O @ 8, Z-L @ 1, Z-A @ 2
- 15:30 - 16:30      Break
- 16:30 - 17:10      Group L @ station 7, N @ 8, O @ 1, Z-L @ 2, Z-A @ 3
- 17:20 - 18:00      Group L @ station 8, N @ 1, O @ 2, Z-L @ 3, Z-A @ 4

### Med Sch Bldg #6 Atrium

- 18:20 - 19:00      All participants discussions  
Next 2 days planning

### Workshop Day 3

July 23 (Thu)

- 09:00 - 19:00      Original projects

### Workshop Day 4

July 24 (Fri)

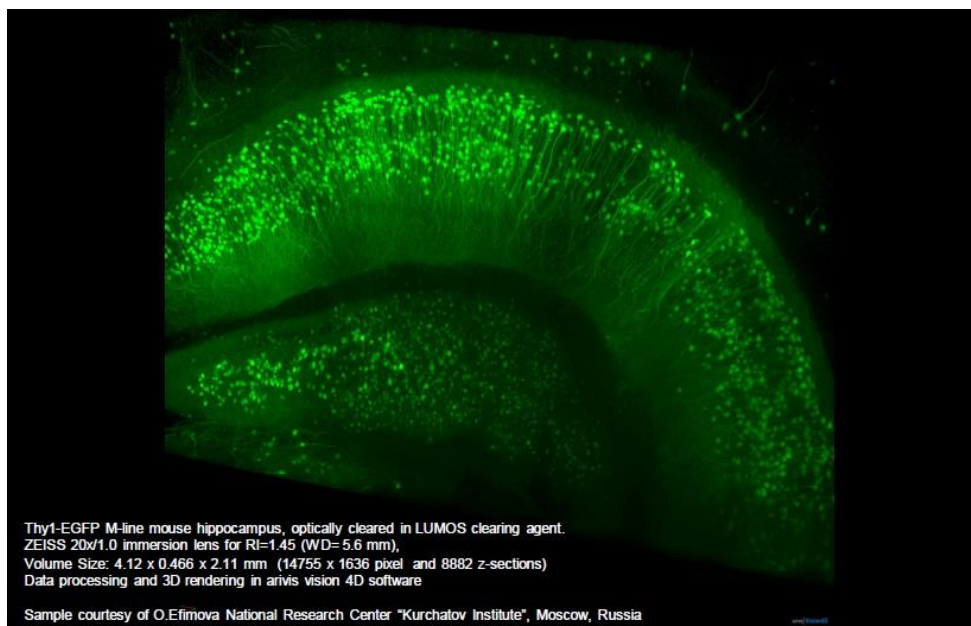
- 09:00 - 15:00      Original projects



## **Med Sch Bldg #6 Lecture Room**

### **Part 3. Chair Person: Hiromu Tanimoto (Tohoku University)**

15:00 - 15:40	Valentin Nägerl University of Bordeaux, France "Imaging neurons and synapses at the nanoscale by STED microscopy"
15:40 - 16:00	Break
16:00 - 16:10	Summary comments, Leica
16:10 - 16:20	Summary comments, Nikon Instech
16:30 - 16:40	Summary comments, Olympus
16:40 - 16:50	Summary comments, ZEISS
16:50 - 17:10	Break
17:10 - 17:25	Selected participant presentation #1
17:25 - 17:40	Selected participant presentation #2
17:40 - 17:55	Selected participant presentation #3
17:55 - 18:05	Closing remarks by Hiromu Tanimoto



## **Optogenetics Workshop**

Optogenetics workshop will be held in Dr. Ko Matsui's laboratory during the same time as the above microscopy workshop. Dr. Tomomi Tsunematsu from Univ. Strathclyde (UK) will lead the workshop as an external adviser. Due to limitation of lab space, only 5 attendees will be permitted. Using a variety of optogenetic transgenic mice and rats that we maintain in Tohoku University, we will attempt *in vivo* optical control of brain cells and examine the effects with EEG and behavior.



# Tohoku Forum for Creativity

## FRONTIERS OF BRAIN SCIENCE

### TOOLS & TECHNOLOGIES

**SYMPOSIUM: JULY 25 (SAT) – 27 (MON), 2015**

We are living in a very fortunate time in which we have the tools to unravel the complexity of the brain and reveal its simple underlying structure. Such revelations may lead us to an understanding of the brain in which its activities can be described by the rules of physics alone. These cutting edge technologies include: optogenetics, connectomics, superresolution microscopy, genetics in model systems, and neuroinformatics. We believe that the combined use of these complementary techniques will provide an excellent future direction for brain science research, thus, we will gather scientists with diverse expertise to discuss this concept at our first symposium of Frontiers of Brain Science.

#### Symposium Onsite Registration

Sat. July 25 12:00 - 13:30

#### Symposium Location

TOKYO ELECTRON House of Creativity at Katahira Campus, Tohoku University

Lectures @ 3F Lecture Room

Posters @ 1F Lounge

#### Symposium Banquet

Attendees of the symposium will have a chance of interacting with the invited speakers over dinner. Organizers will make arrangements so that group discussions can be made. Establishing personal interactions between young researchers and prominent scientists matches with the concept of the TFC program. As day time schedule is occupied with oral presentations, these discussions need to be made over dinner time.

Attendance of banquet is optional. Please register online to attend the banquet.

Faculty members and corporate attendees' banquet drink fee is 6,000 yen.

Students' banquet drink fee is 1,000 yen. Academic speakers are free of charge.

The fee will be collected at the onsite registration on July 25.

Banquet will be held at Westin Hotel Sendai from 18:30 – 20:30 on July 25.

#### Symposium Luncheon

A luncheon seminar will be given by Dr. Ko Matsui while the attendees have lunch. Due to lack of presentation time, this oral presentation needs to be made over lunch time.

Lunch will be provided to the registered attendees free of charge.

The luncheon seminar will be held from 11:50 – 12:30 on July 26.

## Speakers' Reception

Organizers will arrange a small discussion group with Workshop and Symposium speakers. Future directions of brain science will be discussed and possible collaborations with Tohoku University will be proposed. Due to requirement of having such discussion in a small group, this meeting will be made over dinner at a nearby restaurant.

The speakers' reception will be held from 19:00 – 21:00 on July 26.

## Symposium Excursion and Discussion Hours

Symposium excursion and discussion hours will be organized by the Tohoku Area Division of the Society for Young researchers on Neuroscience (SYN). Most of the invited speakers will attend this excursion and approximately one SYN member will accompany one invited speaker. This arrangement will allow intense discussion between novice researchers (graduate students and postdoctoral researchers) and the leading figures in brain science that TFC has invited.

After several oral presentations at the House of Creativity in Katahira Campus on the last day of the Symposium (July 27), a chartered bus will take the invited speakers and attendees to the outskirts of the downtown Sendai area. Those attending from the Workshop would have already spent more than 7 days in Tohoku University and slightly offsetting the environment will have a facilitatory effect on the scientific discussions. As many of the speakers and attendees will participate in the Japan Neuroscience Meeting at Kobe starting from the next day (July 28), the excursion needs to end in time for the last flight to Kobe. To make use of the limited time, lunch will be provided during the excursion. Group discussions will be arranged by SYN over lunch.

This excursion and discussions is necessary to fulfill the purpose of the TFC programs and could actually be considered as one of the core of the July event. Another aim of the TFC programs is to allow foreign guests to get accustomed to the Tohoku area. The foreign guests will certainly be appalled by the richness of the Tohoku area natural resources. Such acquired familiarity will also definitely facilitate smooth future collaborations.

## Symposium Overview

1. Pre-registration using the form on our website is required to attend the symposium.
2. 10 - 20 poster presentations can be made. Please register online if you would like to present a poster.
3. 17 domestic and international invited speakers each provide a 40 - 60 minute presentation with discussion time.
4. The abstracts of the presentations will only be distributed in paper format, and uploading the content of the abstract to the internet is strictly prohibited.

## Symposium Time Schedule

### Symposium Day 1

#### July 25 (Sat)

12:00 - 13:30	Registration Symposium Banquet participation fee: Faculty & corporate attendee ¥6,000, students ¥1,000
	Poster preparations

13:30 - 13:40      Opening remarks by Susumu Satomi  
President of Tohoku University

Part 1. Chair Person: Noriko Osumi (Tohoku University)  
+ Ryuji Nakamura (Dep Dev Neurosci, Med, TU)

13:40 - 14:20      Shu Kondo  
National Institute of Genetics, Japan  
"Frontiers of genome engineering in animal genetics:  
how CRISPR/Cas9 is changing Drosophila research"

14:20 - 15:00      Katrin Vogt  
Max Planck Institute of Neurobiology, Germany  
"Dissecting a visual learning circuit in the Drosophila mushroom body"

15:00 - 15:40      Koichi Hashimoto  
Tohoku University, Japan  
"Machine vision and robotics in biology"

15:40 - 16:40      Coffee break  
Poster presentations

Part 2. Chair Person: Ko Matsui (Tohoku University)  
+ Yuki Suhara (Div Interdisciplinary Med Sci, Med, TU)

16:40 - 17:40      Masao Tachibana  
University of Tokyo, Japan  
"Processing of dynamic visual images in the retina"

17:40 - 17:50      Welcome message by Atsushi Higashitani  
Dean, Graduate School of Life Sciences, Tohoku University

17:50 - 18:00      Announcements

18:30 - 20:30      Symposium Banquet @ Westin Hotel Sendai  
Greetings by Noriko Osumi (Tohoku University)  
Group discussions and information exchange



## Symposium Day 2

July 26 (Sun)

Part 3. Chair Person: Hiromu Tanimoto (Tohoku University)

+ Kyo Koizumi (Mol Cellular Neurosci, Life Sci, TU)

- 09:30 - 10:10      Oliver Griesbeck  
Max Planck Institute of Neurobiology, Germany  
"Ratiometric *in vivo* imaging with "Twitch" calcium sensors"
- 10:10 - 10:50      Ken Berglund  
Emory University, USA  
"Luminopsins: Novel optogenetic tools for controlling neuronal activity by bioluminescence"
- 10:50 - 11:30      Tomomi Tsunematsu  
University of Strathclyde, UK  
"Optogenetic perturbation of cell-type specific and depth specific neural activity *in vivo*"
- 11:30 - 11:50      Luncheon preparation

### **Luncheon Seminar**

- 11:50 - 12:30      Ko Matsui  
Tohoku University, Japan  
"Glia optogenetics"
- 12:30 - 13:00      Poster presentations

Part 4. Chair Person: Tomomi Tsunematsu (University of Strathclyde)

+ Soojin Kwon (Div Interdisciplinary Med Sci, Med, TU)

- 13:00 - 13:40      C Justin Lee  
Korea Institute of Science and Technology, Korea  
"Detection of channel-mediated gliotransmitter release"
- 13:40 - 14:20      Amit Agarwal  
Johns Hopkins University, USA  
"Molecular mechanisms of spontaneous Ca<sup>2+</sup> oscillations in astrocytes"

14:20 - 14:50      Coffee break  
Poster presentations

Part 5. Chair Person: Ken Berglund (Emory University)  
+ Satomi Kikuta (Radiology Imaging Informatics, Med, TU)

14:50 - 15:30      Jason M. Christie  
Max Planck Florida Institute, USA  
"Local control of spike signaling within axons of cerebellar interneurons"

15:30 - 16:10      Ryuichi Shigemoto  
IST Austria, Austria  
"Quantitative, high-resolution localization of synaptic molecules  
by freeze-fracture replica labeling and electron tomography"

16:10 - 16:50      Sabina Hrabetova  
SUNY Downstate Medical Center, USA  
"Distinct diffusion regimes in brain extracellular space"

16:50 - 17:20      Coffee break  
Poster presentations

Part 6. Chair Person: Noriko Osumi (Tohoku University)  
+ Ryuichi Kimura (Dep Dev Neurosci, Med, TU)

17:20 - 18:20      Jeff Lichtman  
Harvard University, USA  
"The promises and perils of connectomics"

18:30 - 18:40      Symposium 2nd day concluding remarks by  
Tooru Simosegawa  
Dean, Graduate School of Medicine, Tohoku University

19:00 - 21:00      Speakers' Receptions @ Restaurant  
Speakers and organizers only (~25 participants)  
Discussion about possible future collaborations will be made.

### Symposium Day 3

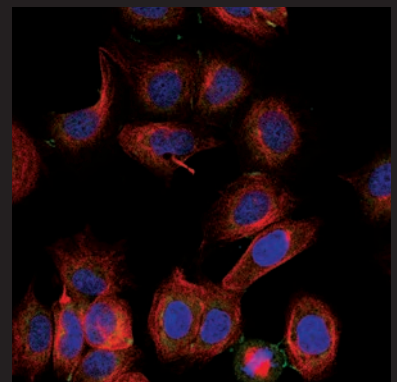
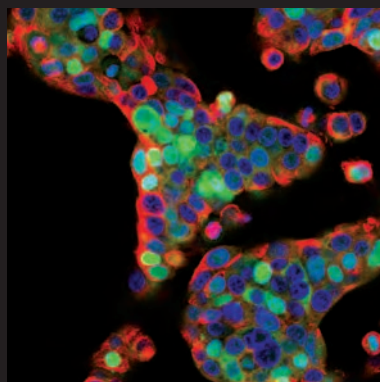
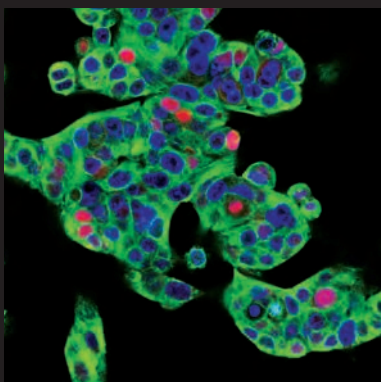
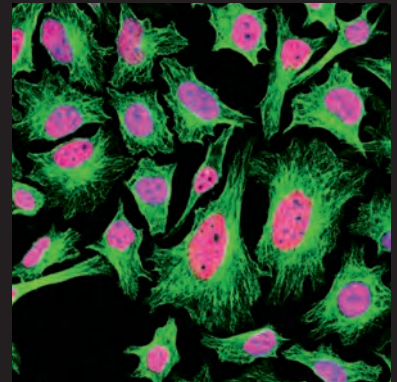
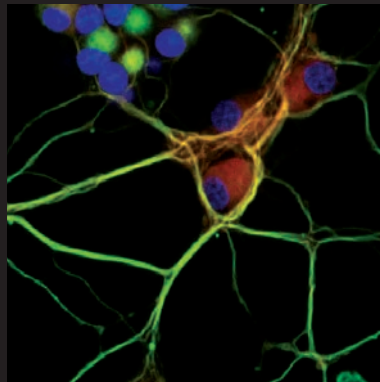
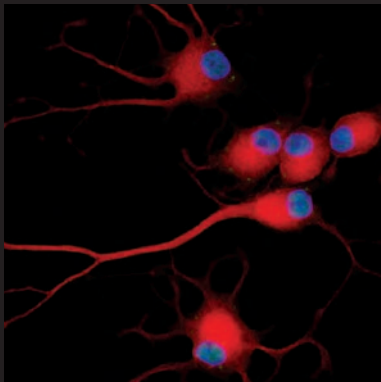
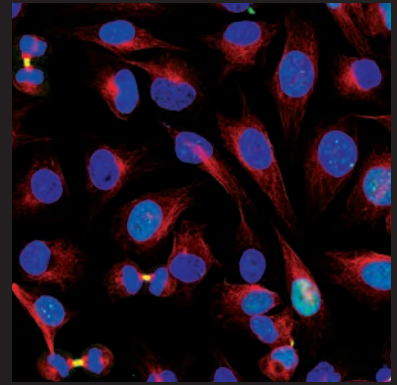
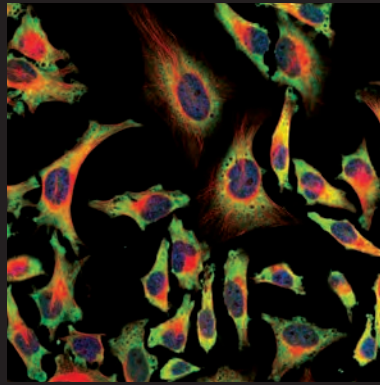
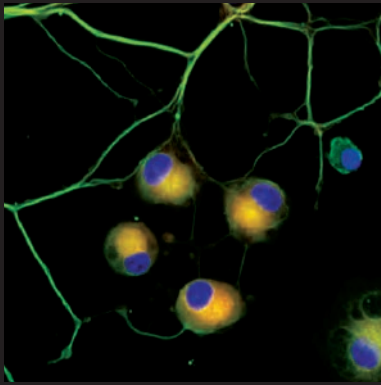
July 27 (Mon)

Part 7. Chair Person: Ko Matsui (Tohoku University)  
+ Hiroyuki Igarashi (Mol Cellular Neurosci, Med, TU)

- 09:00 - 09:40 Gáspár Jékely  
Max Planck Institute for Developmental Biology, Germany  
"Systems neurobiology of the Platynereis larva"
- 09:40 - 10:20 Michael Häusser  
University College London, UK  
"All-optical interrogation of neural circuits"
- 10:20 - 11:00 Hiromu Tanimoto  
Tohoku University, Japan  
"Mapping circuits for memory formation"
- 11:00 - 11:10 Symposium remarks  
Noriko Osumi (Tohoku University)
- 11:10 - 13:00 Final lunch discussions
- 13:00 - 17:00 Excursion and Discussion Hours at the outskirts of the  
downtown Sendai area.

TOKYO ELECTRON House of Creativity at Katahira Campus, Tohoku University





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# マイクロからナノスケール領域の観察・分析に!



## JCM-6000 NeoScope

卓上走査電子顕微鏡

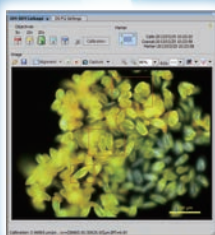
新感覚の操作画面とタッチパネルで直感的な操作を実現。高真空/低真空が標準装備、EDSを装着可能など、機能豊富な卓上走査電子顕微鏡です。



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## miXcroscopy

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光学顕微鏡(OM)と走査電子顕微鏡(SEM)の試料ホルダを共通化し、ステージ情報を専用のソフトウェアで管理。光学顕微鏡で観察した箇所をシステムに記憶させ、同一視野を走査電子顕微鏡でさらに拡大して微細構造を観察できます。



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取得した画像を3D再構築することにより3Dでの微細構造解析が可能になります。

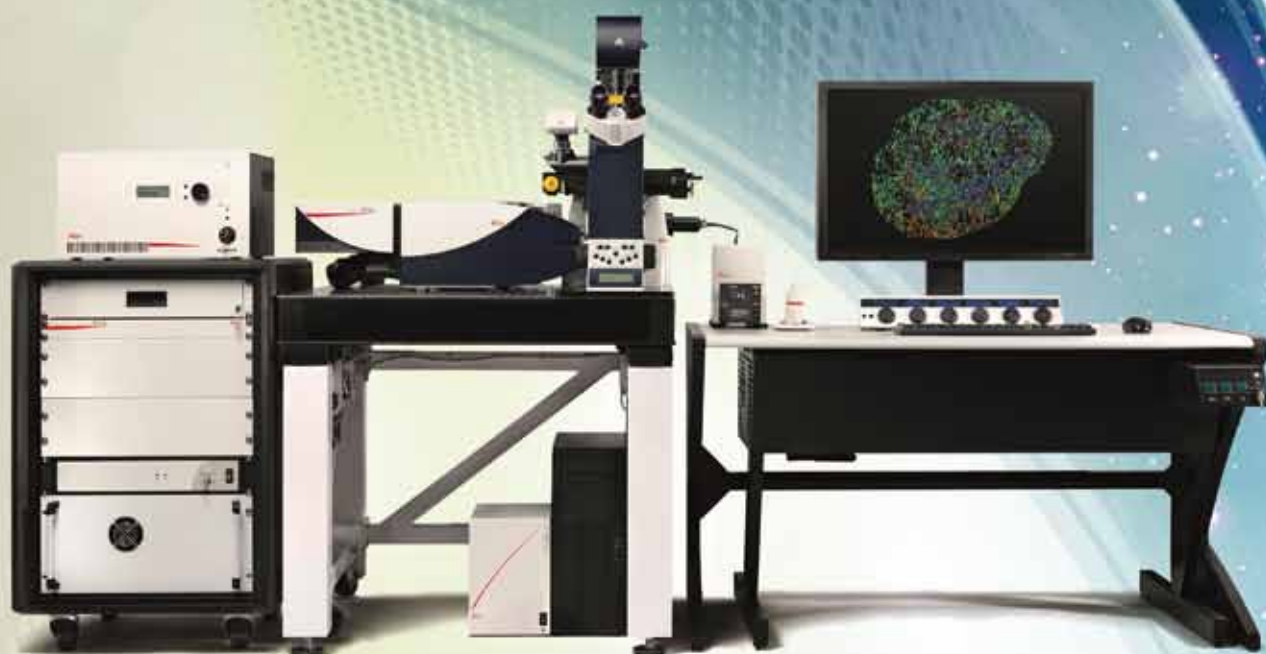
**JEOL**  **日本電子株式会社**

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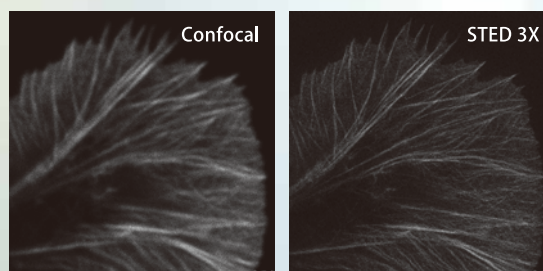
ライカの超解像テクノロジーにより実現した  
かつてない超解像モンスターシステム



# ライカ TCS SP8 STED 3X

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- 共焦点撮影速度で超解像ライブセルイメージング
- 光学的に超解像を実現した唯一の超解像イメージングシステム
- オートアライメント機構搭載により常にパーフェクトパフォーマンス



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常に頂点を目指して挑戦し続けるニコンの高度な顕微鏡技術が、生命科学の明日を揺り動かします。



**A1R<sup>+</sup>**

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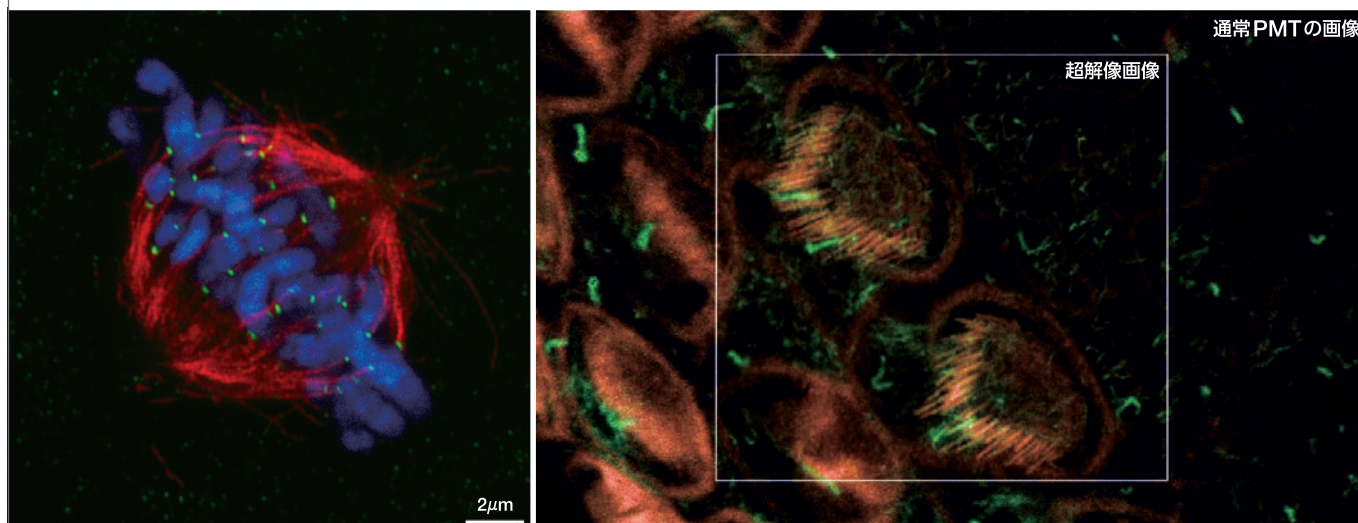
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