



TOHOKU  
UNIVERSITY

Annual Report 2015



TOHOKU FORUM for CREATIVITY

TOKYO ELECTRON House of Creativity



3 **Message from the President**

4 **Message from the Director**

5 **Overview of the Tohoku Forum for Creativity**

Mission

Organization

International Advisory Board

Support for the Tohoku Forum for Creativity

A Message from our Sponsor

8 **Activity Report 2015**

Thematic Programs

- Fundamental Problems in Quantum Physics: Strings, Black Holes and Quantum Information
- Frontiers of Brain Science
- Spintronics: from Mathematics to Devices
- The Effects of Technological Changes on Social Mobility and Income Distribution

Other Activities

- Falling Walls Lab Sendai 2015
- Quattro Seminars

Support for Young Researchers

- Leading Young Researcher Overseas Visit Program

30 **Information 2015**

Thematic Programs

- Invited Researchers List
- Fundamental Problems in Quantum Physics: Strings, Black Holes and Quantum Information
- Frontiers of Brain Science
- Spintronics: from Mathematics to Devices
- The Effects of Technological Changes on Social Mobility and Income Distribution

Other Activities

Leading Young Researcher Overseas Visit Program

50 **Access and Contact**





## Message from the President

### In issuing the Annual Report

For more than a century, Tohoku University's tradition of "Research First", philosophy of "Open Doors", and ethos of "Practice-Oriented Research and Education" have produced excellent graduates, generated numerous research achievements, and contributed to the development of a peaceful and just society.

In August of 2013, I compiled the Satomi Vision which reaffirms the modern significance of the fundamental ideals and mission that Tohoku University has retained through its history. This document outlines the direction that our university will take over the next five years, and the policies and schedule that will lead us there.

This vision aims to develop Tohoku University as a fellowship of knowledge, open to the world, where people can gather, learn, and create. In doing so, this will allow us to achieve our two goals of achieving World-Class Status and Leaping Ahead, and Leading the Post-earthquake Restoration and Regeneration. In order to realize one part of the Satomi Vision, we have established Thematic Programs organized by the Tohoku Forum for Creativity (TFC). These programs will act as an international brain circulation initiative which will allow us to strengthen our research interests, and are being carried out with support from

the program for promoting the enhancement of research universities from the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

The TFC holds Thematic Programs, which are research programs in which world leading scientists, including Nobel Laureates, are invited to Tohoku University for a specified period of time in order to engage in joint research with junior researchers, and to participate in daily debates with students. The aim of these programs is to contribute to the solution of the important problems which humanity faces through the creation of new interdisciplinary research fields. Therefore, the TFC's activities are positioned at the core of the university's strategic international brain circulation initiative.

To promote the Thematic Programs, in October 2013 we established the TFC, which is the first International Visitor Research Institute in Japan, while in February 2015 we completed the construction of the TOKYO ELECTRON House of Creativity. The TFC hosted four outstanding Thematic Programs, and about 1,900 researchers from home and abroad attended those programs, in 2015. As such, the TFC holds an extremely important position within the research activities of Tohoku University, and we have great expectations for what we can achieve in the near future.

This Annual Report has been created to provide all stakeholders in the program with an overview of the activities of the TFC. Accordingly, we ask for your continued understanding and cooperation with the Tohoku Forum for Creativity in the future.

Tohoku University President  
Susumu Satomi

Message from the Director

## For promoting the Thematic Programs

The Tohoku Forum for Creativity's Thematic Programs play a central role in the framework for international brain circulation outlined in the Satomi Vision.

The research focuses of these Thematic Programs were selected based on global trends and the current challenges facing humanity. At each thematic program, world leading researchers, including Nobel Laureates, are invited to the TOKYO ELECTRON House of Creativity for a period of between one and three months to carry out groundbreaking research. As such, the Tohoku Forum for Creativity is Japan's first International Visitor Research Institute. The TFC's activities also aim to develop the next generation of global research leaders by creating a wide array of opportunities for talented junior researchers to interact and discuss their ideas with eminent scholars.

In 2015, the TFC hosted four Thematic Programs, entitled: "Fundamental Problems in Quantum Physics: Strings, Black Holes and Quantum Information," a program covering a wide range of subjects in quantum physics; "Frontiers of Brain Science," a program in which the participants discussed the future directions of neuroscience research; "Spintronics: from Mathematics to Devices", a program for fusion research between spintronics, material science and mathematics, and; "The Effects of Technological Changes on Social Mobility and Income Distribution," a program connecting the issues of income disparity and social inequality.

The TFC also carries out outreach activities with the aim of promoting recent advances in science to the general public. These include hosting, in collaboration with the Falling Walls Foundation of Germany, the Falling Walls Lab Sendai 2015. In addition, we also hosted a public lecture by the Nobel Laureate Susumu Tonegawa, in cooperation with the Yomiuri Shimbun Newspaper, as a part of the "Frontiers of Brain Science" program. The TFC also organizes the Quattro Seminar program, which allows junior researchers to find the seeds for new research by providing a platform for interdisciplinary research discussions across the humanities and social sciences.

I would like to take this opportunity to express my gratitude, not only for the great efforts of those involved in the promotion of these programs, but also for the immeasurable support and cooperation that we have been given since the very beginning of this project by Tokyo Electron Ltd.

In the future, Tohoku University aims to contribute even more to facilitate international research and education. The TFC is expected to play a central role in this endeavor, and we will continue to work towards achieving that goal while receiving the opinions and advice from all of our stakeholders. Accordingly, I ask for your continued cooperation and support.



Tohoku Forum for Creativity Director  
Tohoku University Executive Vice President (for Research)

Sadayoshi Ito

# Overview of the Tohoku Forum for Creativity

## Mission

The Tohoku Forum for Creativity (TFC) is an international visitor research institute which was established in 2013 at Tohoku University to facilitate collaborative research. In order to identify important problems across all of the sciences and humanities, the TFC brings together both junior and senior researchers in a stimulating environment that promotes creative approaches to new and interdisciplinary research areas.

The TFC especially encourages junior researchers, such as graduate students and postdoctoral fellows, to participate in the thematic programs. Through discussions and close contact with distinguished researchers, including Fields Medallists and Nobel Laureates, junior researchers will be stimulated to develop their own original ideas and to eventually become pioneers in new research areas.

### A Fellowship of Knowledge which Contributes to the Solution of the Major Issues Faced by Humanity

The TFC calls for thematic programs from throughout the world covering all academic domains, from the humanities and social sciences to the natural sciences. The TFC then selects themes for concentrated discussions over a three-month period, for which leading international researchers are invited to Tohoku University to develop new areas of research and to contribute to the solution of the major problems facing humanity, through joint research and the hosting of international symposiums. Furthermore, the TFC provides an ideal location for the promotion of interdisciplinary cooperation across a diverse range of research areas in order to tackle the increasingly advanced and complex issues facing society.

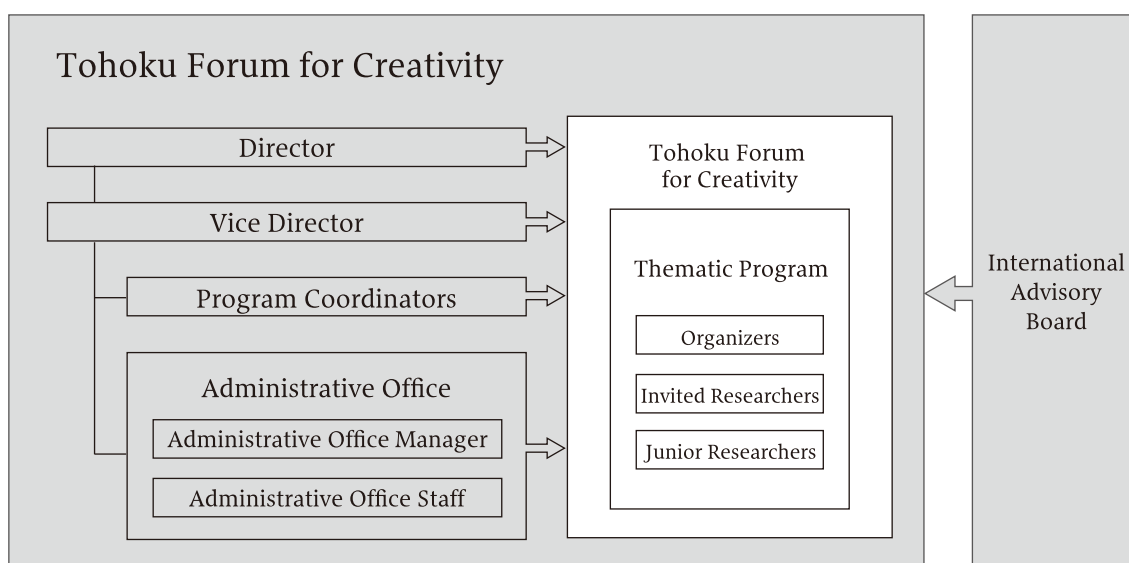
### Educating Global Leaders to Build the Future of Humanity

The TFC will establish itself as a center for the cultivation of international research leaders, by promoting the participation of junior researchers from throughout the world in our thematic programs. In this way, the TFC will foster an environment in which young researchers can interact closely with world class researchers.

### Contributing to Society by Sharing Academic Advances

The TFC provides opportunities for intellectual exchange between participating researchers and the general public, including the children who will lead society in the future, through the planning and hosting of public events. This initiative aims to promote the sharing of knowledge, further internationalization, and the development of a prosperous society, by providing opportunities for the public to interact directly with world-leading researchers.

## Organization



## International Advisory Board

The International Advisory Board was established as an organization to evaluate the proposed thematic programs gathered from throughout the world, and to provide advice on the activities of the TFC.

Reiko Aoki	Executive Vice President, Professor Kyushu University
Jean-Pierre Bourguignon	Former Director and Honorary Professor at IHÉS Institut des Hautes Études Scientifiques
Arjen Doelman	Director of the Lorentz Center Lorentz Center, International Center for workshops in the Sciences
Makoto Kobayashi	Nobel Laureate in Physics 2008 Director of Research Center for Science Systems Research Center for Science Systems, Japan Society for the Promotion of Science
Kiyoshi Kurokawa	Adjunct Professor National Graduate Institute for Policy Studies
Oliver Smithies	Nobel Laureate in Physiology or Medicine 2007 Weatherspoon Eminent Distinguished Professor Department of Pathology and Laboratory Medicine, University of North Carolina at Chapel Hill

### Observer of the Tohoku Forum for Creativity

Yuko Harayama	Executive Member of the Council for Science, Technology and Innovation Council for Science, Technology and Innovation
---------------	--

## Support for the Tohoku Forum for Creativity

This project hosts approximately three thematic programs per year, with support from the program for promoting the enhancement of research universities from the Ministry of Education, Culture, Sports, Science and Technology (MEXT). In order for this program to continue to aggressively tackle the challenges faced by society, we must create opportunities to communicate with society and our supporters in the private sector in order to gain their assistance in promoting our activities.

The TFC will continue to publish information widely throughout the world, and work to gain the understanding and support of numerous individuals and organizations.

Support was provided by the following corporations in FY2015

FY2015

**Comprehensive support for the TFC**

• Tokyo Electron Limited

A Message from our Sponsor

## The continuation of a successful beginning



Since our foundation in 1963, Tokyo Electron Limited has been providing semiconductor production equipment and flat panel display production equipment, and growing together with the times as a leading company in the leading-edge tech industry.

Based upon our corporate philosophy: “We strive to contribute to the development of a dream-inspiring society through our leading-edge technologies and reliable service and support,” we promote various initiatives in support of education for generations of the future.

Tohoku University and our company have been exchanging people and technology by industry-university collaboration in the semiconductor sector. Through this cooperative activity, we became aware of the Satomi Vision, which establishes the future framework for Tohoku University to build a community of wisdom where people gather together, learn, and create, with an open doors to the world, and to achieve the two goals of leaping ahead to become a world class university while taking the lead in recovery and building a new life, and these initiatives have our full support. Further, we feel that the Tohoku Forum for Creativity (TFC), as the first significant international visitor research institute for a Japanese university, is a meaningful endeavor with a long term view to the future. With a desire to contribute to the realization of the initiative, we have supported not only the program itself, beginning with the pilot program of the TFC in 2013, but also the construction of the TOKYO ELECTRON House of Creativity to serve as the center for the program.

Hearing that the students and participating researchers, including the Nobel Laureate Gerard 't Hooft, have already begun their studies at the TOKYO ELECTRON House of Creativity since the official opening in April 2015, it fills me with great pleasure to imagine the motivated and energetic researchers, who hope to change the future of society, gather and debate.

I really hope that the TFC program will serve as a symbol for recovery and a new life for the Tohoku region, and as a leading example as an open world forum with great momentum. Further, relating to educating the next generation promoted by our company, my great expectation is that participants of the Tohoku Forum for Creativity will be some of the front running leaders of the world in the next 20 or 30 years.

I would like to express my hope for the continued development and prosperity for the Tohoku Forum for Creativity at Tohoku University.

Tokyo Electron Limited  
Corporate Director  
Corporate Advisor  
Terry Higashi

---

## TOKYO ELECTRON House of Creativity

Construction was completed on the TOKYO ELECTRON House of Creativity in March 2015 at the Tohoku University Katahira Campus, to serve as the center for the TFC. The TFC aims to use this center as the principle location for the realization of “building a community of wisdom where people gather together, learn, and create, with an open doors to the world.”

\*Tokyo Electron Limited provided immeasurable support for the construction of this facility.





## Thematic Programs

- 9 Fundamental Problems in Quantum Physics:  
Strings, Black Holes and Quantum Information
- 13 Frontiers of Brain Science
- 17 Spintronics: from Mathematics to Devices
- 21 The Effects of Technological Changes on Social Mobility  
and Income Distribution

## Other Activities

- 25 Falling Walls Lab Sendai 2015
- 26 Quattro Seminars

## Support for Young Researchers

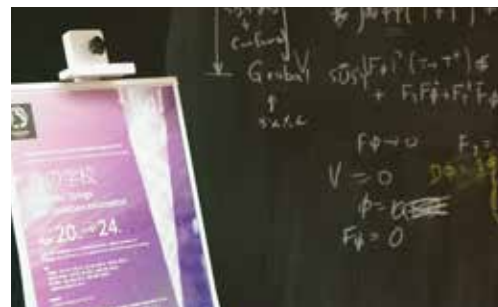
- 27 Leading Young Researcher Overseas Visit Program



Thematic Program | April 2015 – March 2016

# Fundamental Problems in Quantum Physics: Strings, Black Holes and Quantum Information

The discovery of the Higgs particle was a cornerstone in the development of the theory of elementary particle physics and has opened the door to a new era. It is now time to discuss new frontiers of the fundamental problems in quantum physics. With this in mind, we initiated a program focusing on the theories of strings, black holes and quantum information



as well as their interrelation, and future prospects. We also discussed the issues of particle physics and cosmology in light of the discovery of the Higgs particle. A feature of this program was to create an opportunity for the exchange of new ideas, not limited merely to the fields of particle physics and applied mathematics, which are the center of this research area, but also included researchers from the fields of information science, engineering and pure mathematics.

## Important Goals and Degree of Achievement

The aim of our project was the promotion of international exchange, and the building of an international network of institutions abroad to cooperate with Japanese institutions, in addition to the education of young researchers.

As the first event in the program, we organized a spring school to prepare the graduate students and young researchers who wanted to join our academic events. There were several attendants from other universities in Japan, and thus the aim of the project, that is, the preparation for research in our field and the promotion of young researchers to join our field, was achieved.

The two international workshops held in September, which were the main events of this program, were also very successful. During the workshop, we arranged special lectures by the Nobel Laureate Professor François Englert (Free University of Brussels) and the Nobel Laureate Professor Makoto Kobayashi (High Energy Accelerator Research Organization). This stimulated the discussions among the participants coming from various institutions, and made the workshops very fruitful.



## Program Organizers



**Tohru Eguchi** (Professor, Graduate School of Science, Rikkyo University)

Prof. Eguchi completed his doctorate course at the School of Science, University of Tokyo. He took his current position after working as a postdoctoral fellow at Stanford University, and the University of Chicago, and as a professor at the University of Tokyo. Subsequently he served as the director of the Yukawa Institute for Theoretical Physics, Kyoto University. Dr. Eguchi was awarded the Imperial Prize of the Japan Academy in 2009.



**Tadashi Takayanagi** (Professor, Yukawa Institute for Theoretical Physics (YITP), Kyoto University)

Prof. Takayanagi completed his doctorate course at the Department of Physics, University of Tokyo. He took his current position after working as a postdoctoral fellow at the Jefferson Physical Laboratory and Harvard University, at the Department of Physics, Kyoto University, as an assistant professor, and at the Institute for the Physics and Mathematics of the Universe (IPMU), University of Tokyo, as an associate professor. Dr. Takayanagi was awarded the New Horizons in Physics Prize in 2014.



**Masahiro Yamaguchi** (Professor, Graduate School of Science, Tohoku University)

Prof. Yamaguchi completed his doctorate course at the Department of Physics, University of Tokyo. He took his current position after working at the Graduate School of Science, Tohoku University, as an assistant professor and an associate professor. He has also served as a Special Advisor to the President (for International Educational Exchange).



**Satoshi Watamura** (Associate Professor, Graduate School of Science, Tohoku University)

Dr. Watamura completed his doctorate course at the Department of Physics, University of Tokyo. He took his current position after serving at the European Organization for Nuclear Research (CERN) as a postdoctoral fellow, and the Graduate School of Science, Tohoku University, as an assistant professor and an associate professor. His primary publications include "Analytical mechanics and theory of relativity" published by Asakura Publishing Co., Ltd.

## Program Highlights

The highlight of the program was a series of special lectures delivered by the Nobel Laureate Professor Gerard 't Hooft (Utrecht University) in April, and by the Nobel Laureates Professor François Englert and Professor Makoto Kobayashi, in September. These three professors are very famous physicists, and their special lectures were the main events in this program.

Professor Gerard 't Hooft gave three lectures during the period of the spring school. One of the lectures was a public lecture. The other two lectures were mainly for graduate students and young researchers, and thus they were very informative and useful for the aspiring academics. In addition, Professor Gerard 't Hooft's attendance at the spring school discussion time made those sessions very interactive.

The special lectures by Professor François Englert and Professor Makoto Kobayashi were given during the workshop in September. This event was also open to the public, thus the hall with a capacity of 120 seats became full. Professor François Englert, who was awarded the Nobel Prize for the prediction of the existence of the Higgs particle, gave a lecture about the relationship between the Higgs particle and the mass of the elementary particles. Professor Makoto Kobayashi, who was awarded the Nobel Prize for the discovery of a new mechanism of CP violation under the existence of the Higgs particle, gave a lecture on CP violation and flavor mixing. The audience included researchers from foreign institutions, and also many researchers and students working in other research fields, which, coupled with the fact that the event was open to the public, led to exciting discussions.

## Specific Strategies for International Research Exchange

We could successfully invite three Nobel laureate physicists to actively participate in our program. Each professor stayed for approximately one month at Tohoku University, during which we could exchange ideas and had very fruitful discussions. Thus, we can conclude that our aim was achieved. Furthermore, we also invited another researcher for a month with whom we also had very useful discussions. At every workshop there were active discussions and a vivid exchange of ideas from a wide range of research fields.



## Principle Invited Researchers

---



### Gerard 't Hooft

(Utrecht University, Netherlands)

Distinguished Professor at the Institute for Theoretical Physics, Utrecht University. A specialist in quantum field theory and quantum gravity. Recipient of the Nobel Prize in Physics in 1999.



### François Englert

(Free University of Brussels, Belgium)

Professor at the Free University of Brussels and a Special Invited Professor at Chapman University's Institute for Quantum Studies. A specialist in theoretical physics. Recipient of the Nobel Prize in Physics in 2013.



### Makoto Kobayashi

(High Energy Accelerator Research Organization, Japan)

Professor Emeritus at the High Energy Accelerator Research Organization (KEK). A specialist in high energy physics. Recipient of the Nobel Prize in Physics in 2008.



### Viatcheslav Mukhanov

(Ludwig Maximilian University of Munich, Germany)

Professor at the Arnold Sommerfeld Center for Theoretical Physics at the Ludwig Maximilian University of Munich. A specialist in cosmology and theoretical physics. Recipient of the Gruber Prize in Cosmology in 2013.



### Robert Mann

(University of Waterloo, Canada)

Professor at the University of Waterloo, and affiliate at the Perimeter Institute for Theoretical Physics. A specialist in black holes and quantum information. An author of "Black holes : thermodynamics, information, and firewalls" published by Springer.



### Robert Myers

(Perimeter Institute for Theoretical Physics, Canada)

Director of the Perimeter Institute for Theoretical Physics, and lecturer at the University of Waterloo. A specialist in string theory. Recipient of the 2012 Vogt Medal from the Canadian Association of Physicists.



## International Training for Young Personnel

In this program, we organized a spring school so that graduate students and young researchers could attend lectures by famous researchers while at the early stage of their research careers. We also gave young researchers the opportunity to discuss their ideas with specialists. As we saw from the successful discussion time at the spring school, we conclude that this aim was achieved successfully.

## Strategies Following the Completion of the Program

The fields of string theory and black holes together with quantum information is a very new research area which is developing rapidly. Therefore, the researchers in this field have to continuously present their new results to each other and exchange new ideas by gathering together. Our next target is to create additional opportunities for discussions about these cutting edge topics by organizing additional workshops and conferences. We will publish the lecture notes and survey articles based on our program, in order to give substantial materials to the researchers and to construct the organization for the next workshops. Consistent with this idea, we have already held a follow-up workshop, and we are now organizing the next activities to further develop this research field.



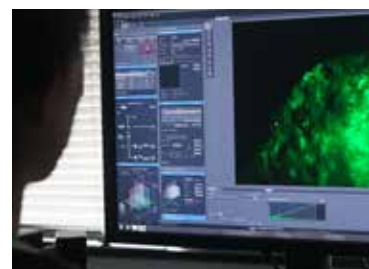
Thematic Program | July 2015 – March 2016

## Frontiers of Brain Science

How can the brain, just an organ, create the mind and thoughts? That is the ultimate question in neuroscience. Cutting-edge techniques and sophisticated technologies enable researchers to draw a comprehensive map of the brain, and manipulate cellular activities and gene expression. By using these advanced technologies, the frontiers of brain science have almost reached a point at which we can unravel how the mind comes to be.

From July to November in 2015, a series of international symposia were held on four different research themes: “Tools and Technologies”, “Development and Disease”, “Memory and Mind” and the “Joy of Brain Science”. At these events world-class researchers gathered and discussed the frontiers of brain science. In total, more than 40 researchers, including two Nobel Prize winners in Physiology or Medicine, Prof. Susumu Tonegawa and Prof. Edvard Moser, were invited to participate in the program.

In the “Tools & Technologies” symposium, we invited manufacturers and/or agents of experimental equipment to show the performance of their latest devices, which enabled the researchers to try the new products and evaluate their capacities by testing their own samples. In addition to this unique activity, we also held seminars on research ethics and scientific writing.



## Important Goals and Degree of Achievement

The program aimed at providing opportunities to facilitate communication between world-class researchers and the young researchers and students of Tohoku University, in order to enhance the University's neuroscience research capability. We invited Dr. Susumu Tonegawa, the 1987 Nobel Laureate for Physiology or Medicine, Dr. Valentin Nägerl, who worked with Dr. Stefan W. Hell (Nobel Laureate for Chemistry in 2014) at Bordeaux University, and Dr. Edvard Moser, Professor at the Norwegian University of Science and Technology, who won Nobel Prize in Physiology or Medicine in 2014 for his discovery of grid cells in a part of the brain. The cutting-edge techniques and technologies such as gene editing, connectomics and optogenetics are expected to contribute to produce high-impact results in neuroscience in the near future. In addition to the big name invitees, we also endeavored to find young and mid-career researchers who are actively engaged in studies, and invited them to the symposia. This was one of the unique aspects of this program. Through practical workshops and an excursion to the suburbs of Sendai, the participants had valuable opportunities to communicate and exchange opinions with world-class researchers. Furthermore, we held a public talk by Dr. Tonegawa, which provided an opportunity for local people and high school and university students in the Tohoku area to meet and communicate with a Nobel Laureate. Through such a rare and precious opportunity, the local community was able to gain a better understanding of advanced science.



## Program Organizers



**Toshio Iijima** (Professor, Graduate School of Life Sciences, Tohoku University)

Graduated from Tohoku University Graduate School of Science, became a Professor at the Tohoku University Graduate School of Life Science after working as an Assistant Professor at the University of California, Los Angeles School of Medicine, the Research Head at the National Institute of Advanced Industrial Science and Technology, and as a Professor at the University of Tsukuba Graduate School of Medicine. He has served as Dean of the Tohoku University Graduate School of Life Sciences, and an Executive Vice-President of Tohoku University.



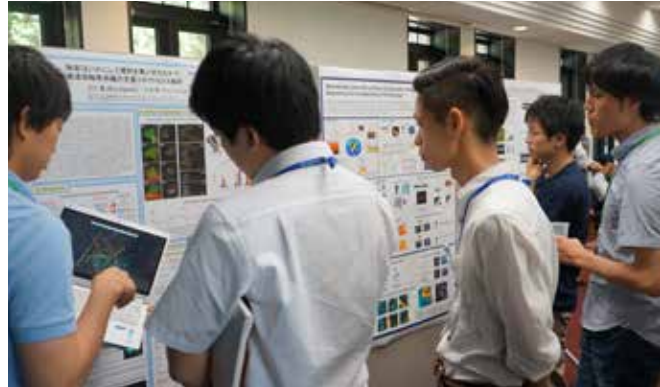
**Noriko Osumi** (Professor, Graduate School of Medicine, Tohoku University)

Graduated from Tokyo Medical & Dental University, and became a Professor at the Tohoku University Graduate School of Medicine, after working as an Associate Professor at the National Institute of Neuroscience, National Center of Neurology & Psychiatry. Served as Special Advisor for Gender Equality at Tohoku University, and chosen as a Distinguished Professor. Now working as Executive Director at the United Centers for Advanced Research and Translational Medicine (ART).

## Program Highlights

In “Tools and Technologies”, we discussed the techniques and technologies at the forefront of neuroscience research. The most noteworthy technologies include:

- 1) Genetic Engineering, with which the genetic makeup of cells is modified,
- 2) Optogenetics, a biological technique which involves the use of light to control activities of living neurons and glial cells,
- 3) Super-resolution microscopy, allowing images to be taken with a higher resolution beyond the diffraction limit,
- 4) Connectomics, drawing a comprehensive map of complicated neural connections using electron microscopy.



We invited 19 outstanding researchers who are engaged in delivering remarkable outcomes using these cutting-edge techniques and technologies. We aimed to discuss how “the mind” is formed in “the brain”.

In “Development and Disease”, researchers working on brain development and evolution, as well as on neurodevelopmental diseases, gathered for deep and interdisciplinary discussions about the molecular and cellular mechanisms of brain development. We also featured research on autism spectrum disorders covering basic science to clinical applications.

In “Memory and Mind”, we discussed the fundamental question of “how does memory affect consciousness?” Excellent researchers were invited from various fields, including neuroscience, cognitive science, psychophysics and comparative psychology, for deep discussion. During these discussions, the difference between memory science and consciousness science turned out to be obvious. It was recognized that proactive communication among researchers in these two fields is necessary to reach an integrated understanding of memory and consciousness.

## Specific Strategies for International Research Exchange

In these symposia, more than half of the researchers came from overseas. Most of them were from the U.S. and Europe, but researchers from Korea and India also participated in our events. All lectures and discussions were conducted in English (except for the public talk). International students and postdoctoral researchers who came from overseas and study/work at Tohoku University attended the workshops and lectures. We are confident that we have successfully achieved the objectives to make this program a bridge connecting young researchers all over Japan with established researchers.

At each symposium, a frontier of study in brain science was presented and discussed. In particular, the presentation by Dr. Susumu Tonegawa, the Nobel Prize winner, was stimulating and gave a strong motivation to young researchers, which hopefully will provide a key to reveal new paths to them in the near future.

Researchers at Tohoku University exchanged opinions with the invited researchers on future collaborations throughout the program. We reached agreements with some Universities and Institutes on researcher exchange programs. One researcher who worked in the Osumi Laboratory was assigned to join the laboratory of Dr. Wieland Huttner at the Max Planck Institute in Dresden. Producing such seeds for future collaborative study was one of objectives of the program, and therefore from this point of view, we can say that one of our goals was achieved.



## Principle Invited Researchers

---



### Valentin Nägerl

(University of Bordeaux, France)

Working on superresolution imaging, and an editor of “Neurophotonics” and the “Biophysical Journal”.



### Jeff Lichtman

(Harvard University, USA)

He studies synaptic competition by visualizing synaptic rearrangements directly in living animals using modern optical imaging techniques such as connectomics.



### Michael Häusser

(University College London, UK)

He develops biological techniques to control cells in living tissue, typically neurons, by the use of light.



### Edvard Moser

(Norwegian University of Science and Technology, Norway)

Director of the Kavli Institute for Systems Neuroscience/Center for Neural Computation. Winner of the Nobel Prize in Physiology or Medicine in 2014 for the discovery of cells that constitute a positioning system in the brain.



### Francois Guillemot

(The Francis Crick Institute, UK)

He studies how the different types of neural cells are generated at appropriate times and locations to form functional neural circuits.



### Susumu Tonegawa

(Massachusetts Institute of Technology, USA)

Winner of the Nobel Prize in Physiology or Medicine in 1987 for his discovery of the genetic mechanism that produces antibody diversity. He now studies neuroscience, examining the molecular, cellular and neuronal basis of memory formation and retrieval.



### Richard Morris

(University of Edinburgh, UK)

He discovered the way synaptic connections in the hippocampus brain region are strengthened by stimulation. The process, known as long-term potentiation (LTP), forms the basis of the ability to learn and to remember.



### Wieland Huttner

(Max Planck Institute of Cell Biology & Genetics, Germany)

He studies neural stem and progenitor cells and neocortex expansion in development and evolution at the molecular and cellular levels.

---

## International Training for Young Personnel

Presentations, discussions and exchanging ideas were all conducted in English, which we believe was a precious opportunity and effective training for the young participants. On an excursion to the suburbs of Sendai, one young researcher accompanied one invited world-class researcher. Under such circumstances, young researchers were provided with a valuable opportunity to discuss and exchange ideas in person with the experts in their fields.

As a result of the collaborations with the world-class universities or institutes which the invited researchers belong to, the Neuro Global Collaborative Graduate School is scheduled to be established as part of the Super Global Graduate School Plan in 2018. The purpose of this graduate school is to provide a high level of education and to improve the study environment for our students in order to foster the next generation of global talent. This approach will include building a stream of regular exchanges of researchers between universities and institutes around the world in a framework of short/medium-term internship programs.

## Strategies Following the Completion of the Program

For more than 100 years, Tohoku University has been leading studies in neuroscience. The TFC program on Brain Science followed this tradition at Tohoku University. In order to enhance Tohoku University's name as a leading player in neuroscience, we will be constantly engaged in organizing multidisciplinary and international symposia as we did during this program. We will endeavor to promote globalization and boost the level of neuroscience study at Tohoku University by strengthening the new network established during this Tohoku Forum for Creativity program, and by making use of the framework of Neuro Global International Collaborative Graduate School, which is scheduled to be launched in 2018.



Thematic Program | September 2015 – December 2015

# Spintronics: from Mathematics to Devices

Since the work by Pauli and Dirac, we know that the electron comes in four flavors, which in the non-relativistic limit reduce to two components of intrinsic angular momentum, the “up” and “down” spin. Although we rarely experience electron spin in everyday life, it governs the very structure of matter and lies at the root of phenomena such as ferromagnetism, the state in which spins are ordered and generate a macroscopic magnetic moment, as well as superconductivity.

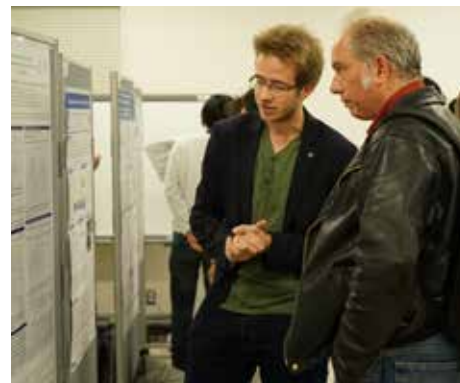
Spintronics is the science and technology aiming to understand and control the electron spin in nanoscale structures and devices, and to apply the newly found functionalities to sensor, information, and communication technologies. The full spectrum of spintronics spans many disciplines, from pure mathematics, theoretical physics, and materials science, to the design of integrated circuits and nanomedical therapies.

This program was designed in such a way that the long-term invited participants could work together, give special lectures, and interact with Tohoku University scientists over a sustained period of time. They also lectured at the Spintronics school which was organized in parallel to the academic program. The international workshops functioned as special events covering the whole program period.

## Important Goals and Degree of Achievement

In this thematic program, we intended to generate new insights in spintronics by providing a forum that stimulates frank discussions between international leading scientists from abroad and Japan with the Tohoku University community. We planned a high level of activities with peaks represented by the special events. Key objectives were (1) to increase the general level of fundamental knowledge and application potential of spintronics, (2) to emphasize that spintronics is not a narrowly specialized field but an interdisciplinary endeavor that reaches far into perceived unrelated fields such as mathematics, integrated circuit design and engineering, (3) to promote the leading role of Tohoku University as a major international player in spintronics, and (4) to decrease the threshold for young researchers to enter the field.

In order to achieve these goals, we configured the program into two pillars, consisting of a spintronics school, for the development of young researchers, and several international workshops, to conduct advanced discussions. At the spintronics school, both invited researchers and Tohoku University staff researchers gave lectures about the fundamentals of spintronics. The international workshops were held on a wide range of themes, including device applications and pure mathematics, while the participants included academics from a wide range of research fields, in addition to experts in spintronics. Through these events, and the collaborative research with the long-term stay researchers, we were able to promote new research themes and the development of young researchers in spintronics, and therefore we were able to fully achieve the goals of the program.



## Program Organizers



**Gerrit Bauer** (Professor, Institute for Materials Research, Tohoku University)

Prof. Bauer completed his doctorate course at the Technical University of Berlin. He took his current position after serving at the Hahn Meitner Institute for Nuclear Research as a research assistant, the Philips Natuurkundig Laboratorium as a staff scientist, and Delft University of Technology as a professor. He also serves as a professor at the WPI-AIMR, and a researcher at the Kavli Institute of Nanoscience.



**Yoshiro Hirayama** (Professor, Graduate School of Science, Tohoku University)

Prof. Hirayama completed his doctorate course at the School of Engineering, University of Tokyo. He took his current position after serving at the NTT Basic Research Laboratories as a group leader, distinguished technical member, and executive manager. He also serves as a coordinator of the Graduate Program in Spintronics, and a coordinator of the Interdepartmental Doctoral Degree Program for Multi-dimensional Materials Science Leaders at Tohoku University.

## Program Highlights

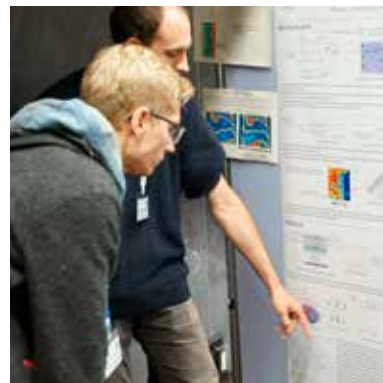
The highlight of this program consisted of the six international workshops and the spintronics school. At the spintronics school, basic lectures were given by invited speakers from outside the university, in addition to lecturers from Tohoku University, which provided a valuable opportunity for students and postdoctoral fellows to learn the fundamental principles of spintronics. The six international workshops had the themes of topology, theoretical physics, anti-ferromagnetic materials, integrated circuits, materials science, and cutting edge spintronics research, respectively. In particular, at October's, "Quantum Nanostructures and Electron-Nuclear Spin Interactions" workshop, the lecture by Nobel Laureate Professor Klaus von Klitzing attracted a lot of attention, and had a packed auditorium. In addition, we anticipated about 40 participants for the workshop on "Spintronics with Antiferromagnets", but finally three times that number attended, stretching the capacity of the TOKYO ELECTRON House of Creativity and the local organizers. This was caused by good timing to have a meeting on a hot topic, as well as the success of the TFC program set-up that allowed coordinating multiple workshops.



## Specific Strategies for International Research Exchange

The field of spintronics is a global activity, which means that any research group has to gauge its work continuously with those abroad. For many years, long term programs like the present one have been the method of choice to meet, discuss, compare, and compete with international colleagues. Traditionally, the Kavli Institute of Theoretical Physics, Santa Barbara, has been leading, with extended programs in 2006 and 2013, in addition to programs being held at the Yukawa Institute in 2008, and the Kavli Institute of Theoretical Physics China in 2010. By creating the TFC, Tohoku University has entered this illustrious stage with a bang, adding new aspects to the program concept. Previous programs were much more focused on theoretical physics. We intentionally expanded the scope to include experimental approaches and practical applications, as well as by emphasizing interdisciplinarity.

The concrete results are difficult to quantify since the seeds that have been sown during the intensive discussions of new results, and the new ideas that followed, will take time to grow and ripen before leading to research papers. We are convinced that the Program will have a direct effect on the research output and citation index of the participating Tohoku University scholars and students.



## Principle Invited Researchers

---



**Klaus von Klitzing**  
(Max Planck Institute for Solid State Research, Germany)  
Director of the Max Planck Institute for Solid State Research since 1985. Discovered the quantum Hall effect. Recipient of the Nobel Prize in Physics in 1985.



**Andrei Slavin**  
(Oakland University, USA)  
Distinguished Professor at the Department of Physics, Oakland University. A specialist in magneto-dynamics. Served as a fellow of the Institute of Electrical and Electronic Engineers (IEEE) and the American Physical Society (APS).



**Burkard Hillebrands**  
(Kaiserslautern University of Technology, Germany)  
Professor at Kaiserslautern University of Technology. A specialist in magnonics. Serves as a fellow of the Institute of Electrical and Electronic Engineers (IEEE), the American Physical Society (APS), and a member of the Academy of Sciences and Literature, Mainz.



**Claudia Felser**  
(Max Planck Institute for Chemical Physics of Solids, Germany)  
Director of the Max Planck Institute for Chemical Physics of Solids. A specialist in spintronics and material science. Serves as the chair of the DFG research group "New Materials with High Spin Polarization".



**David Awschalom**  
(University of Chicago, USA)  
Professor at the Physics Department, University of California. A specialist in spintronics in semiconductors. Recipient of the Oliver E. Buckley Prize, and the Agilent Europhysics Prize in 2005.



**Julie Grollier**  
(French National Center for Scientific Research, France)  
Researcher director of Thales lab, the French National Center for Scientific Research (CNRS). A specialist in spintronics and memristors. Recipient of the Jacques Herbrand prize in 2010. Serves as a fellow of the American Physical Society (APS).



**Stuart Parkin**  
(Max Planck Institute of Microstructure Physics, Germany)  
Director of the Max Planck Institute of Microstructure Physics in Halle, and professor at the Institute of Physics at the Martin Luther University Halle-Wittenberg. A specialist in material science spintronics. Served as an IBM Fellow, IBM's highest technical honor. Recipient of the Millennium Technology Prize in 2014.



**Masashi Kawasaki**  
(University of Tokyo, Japan)  
Professor, "Quantum Phase Engineering Project" at the Quantum-Phase Electronics Center, University of Tokyo, and team leader of the Strong Correlation Interface Research Group, RIKEN Advanced Science Institute. Serves as an international advisory committee member of the Oxide Electronics Workshop since 1995, and a MRS symposium organizer in 1999, 2001, 2007, and 2008.



**Seigo Tarucha**  
(University of Tokyo, Japan)  
Professor at the Graduate School of Engineering, University of Tokyo. A specialist in spin-based quantum computing. Recipient of the Medal with Purple Ribbon in 2004, and the Leo Esaki Prize in 2007.

---

## International Training for Young Personnel

Most spintronics research programs focus on career researchers in their primes, i.e., on the assistant and associate professor level. In contrast, we kept all of the activities of our TFC program open for Masters and Ph.D. students. However, as the high scientific level of the presentations and discussions provide a high threshold for young researchers, we introduced the Elementary Spintronics School which gave students easy access to the important issues in spintronics, as well as a chance to interact closely with the visiting international scholars.

## Strategies Following the Completion of the Program

In our opinion, the main issue for the TFC is to provide continuity and create a tradition to become a world center for programs and focused workshops, such as the KITPs and Aspen Center. In order to create a tradition of the TFC in spintronics, another program should be organized in about 3-5 years. The TFC and Graduate School GP-Spin will organize a joint international school and student-organized workshop on spintronics-related topics in 2016.



Thematic Program | September 2015 – December 2015

## The Effects of Technological Changes on Social Mobility and Income Distribution

This program focused on cutting-edge research on income disparity and inequality. The program facilitated joint research on the effects of technological change on social mobility and income distribution from both theoretical and empirical perspectives, with the aim of establishing a forum for international research in the relevant fields. Traditionally, social mobility research has been the preserve of sociology, and income distribution research the preserve of economics. However, recent research suggests that these two areas are closely linked. Therefore, in this program, sociologists and economists worked synergistically to, first, conduct detailed analyses on the direct effects of technological change on income distribution, and also the indirect effects mediated by changes in social mobility. Second, given that these effects manifest in different ways depending on the particular systems of each society, we focused the theoretical investigation on the concept of path dependence, and focused the empirical investigation on international comparative analysis. Third, given that it is impossible to separate the issue of social inequality from normative judgments, we developed theoretical analysis based on social choice theory. Drawing on this theoretical development, we highlighted specific objectives such as policy proposals for rectifying disparity/inequality in contemporary society.

With a view to achieving these objectives, we invited fourteen researchers (nine of whom were from overseas) to stay in Japan throughout the duration of program to carry out joint research. We also held eight academic events.

## Important Goals and Degree of Achievement

By inviting leading economists and sociologists and engaging in discussions on various topics, we succeeded in gaining a deeper understanding of the effects of technological change on social mobility and income distribution. The greatest outcome of all was the fact that we could incorporate into the project the importance of the effects of the decreasing birthrate and aging population on inequality, a theme that was not initially targeted in the project.

The first goal of this program was to hold a follow-up seminar concerning the path dependent dynamics of technological changes and the structural disparities in wage rates and profit rates. This seminar was a follow-up to the previous year's workshop. The invited researcher lectured on research trends at the cutting edge of the field, and also provided highly intensive instruction to young researchers.

The second goal was to hold a seminar series on social inequality and political economy entitled "Economic Inequalities and Economic Crises – History and Theory" with a view to improving the basic research abilities of young researchers studying the humanities. This seminar series was very popular with students, not only from the Graduate School of Economics and Management, but also from other graduate schools and with undergraduate students. Fifteen seminars (each lasting 90 minutes) were held, and research guidance was provided to 330 participants.

The third goal was to hold a workshop focusing on the effects of technological progress on the accumulation of capital and the evolution of social institutions, in order to facilitate exchanges between Japanese and Western researchers in the relevant research areas. Two-day intensive discussions achieved this goal.



## Program Organizers



**Yoshimichi Sato** (Professor, Graduate School of Arts and Letters, Tohoku University)

Professor at Tohoku University. He received his Ph.D from Tohoku University. He took his present position after working as an associate professor at Yokohama City University, and as a visiting scholar at the University of Chicago and Cornell University. His research topics include social stratification and inequality, rational choice theory, trust, and social change.



**Kenji Mori** (Professor, Graduate School of Economics and Management, Tohoku University)

Professor at Tohoku University. He received his Ph.D from Tohoku University. He took his present position after working as a lecturer and associate professor at Oita University. His research interests are political economy and the history of economic theories.

## Program Highlights

At the “Follow-up Seminar on Technological Change and Income Distribution,” Professor Antonio D’Agata (University of Catania) held a seminar series to expand upon the research themes discussed at the TFC’s pre-program conducted over four days in 2014.

At the “Seminar Series on Economic Inequalities and Economic Crises – History and Theory,” Professor Michael Krätke (Lancaster University) provided fifteen serial seminars and instructed 330 young researchers.

At the “Workshop on Analytical Political Economy,” distinguished researchers, such as Professor Amitava Dutt (University of Notre Dame), Professor Simon Mohun (Queen Mary University of London), Associate Professor Soon Ryoo (Adelphi University), Professor Gill Skillman (Wesleyan University), Professor Peter Skott (University of Massachusetts Amherst), Assistant Professor Soh Kaneko (Keio University), Professor Takashi Ohno (Doshisha University), Professor Hiroaki Sasaki (Kyoto University), Professor Hiroyuki Yoshida (Nihon University), Professor Naoki Yoshihara (Hitotsubashi University), assembled together and discussed the effect of technological change on the accumulation of capital and evolution of social institutions.

At the “Workshop on International Comparison of Gender, Fertility and Happiness,” Professor Hiroshi Yoshida (Tohoku University), one of the project members of this program, held a presentation about the relationship between fertility rate and happiness. Professor Mary Brinton (Harvard University), Associate Professor Hyunjoon Park (University of Pennsylvania), and Professor Michael Krätke made comments in terms of their research expertise.

Moreover, Professor Mary Brinton and Associate Professor Hyunjoon Park gave presentations on issues of gender, youth labor market, and educational inequality at the 10th Quattro Seminar.



## Specific Strategies for International Research Exchange

This program achieved numerous important results as a result of strategic international research collaborations. For example, Professor Antonio D’Agata and Professor Kenji Mori, who was one of the organizers of the program, revealed for the first time how an equilibrium in profit rate discrepancy can be proven using the Knaster-Kuratovski-Marzurkiewicz Lemma, and succeeded in pinpointing the range of the discrepancy. This result was reported at the International Conference on Economic Theory and Policy held at Meiji University in September 2015, and will be published in “Metroeconomica,” a leading journal in this research area.

Professor Michael Krätke discovered unreleased material of Karl Marx, and during his stay at the Tohoku Forum for Creativity he composed the first paper in the world on this material. Drawing on this paper, Professor Kenji Mori engaged in discussions with Dr. Krätke, and planned to publish the paper in Japanese.

Professor Krätke and Professor Mori organized an international research network consisting of eighteen researchers from Japan, the USA, the UK, Germany, France, Austria, Italy, Finland, Brazil, and Korea. This research network will study theories about economic crisis and inequalities. Together they are preparing to publish an English academic book based on their discussions.

In addition, the “Workshop on International Comparison of Gender, Fertility and Happiness” produced valuable findings which were derived not only from particular countries, but also from a crossover of research approaches. For example, European researchers provided insights beyond absolute comparative analysis based on simple statistical values, such as the necessity of interpreting data in the cultural contexts of the countries concerned.



## Principle Invited Researchers

---



**Antonio D'Agata**  
(University of Catania, Italy)

Professor at the University of Catania. His major is mathematical economics. He also participated in the TFC's pre-program held in 2014, and gave a seminar on the relationship between technological change and income distribution.



**Michael Krätke**  
(Lancaster University, UK)

Professor at Lancaster University. He engages in research on the theory and history of economic crisis and Marxism. He provided seminars relating to Thomas Piketty, the author of "Capital in the Twenty-First Century."



**Amitava Dutt**  
(University of Notre Dame, USA)

Professor at the University of Notre Dame. He majors in macroeconomic theories, development economics, international economics, and political economics. He has broad research topics such as globalization and developmental inequality between nations, consumption and happiness, and war and peace.



**Simon Mohun**  
(Queen Mary University of London, UK)

Emeritus Professor at Queen Mary University of London. As a political economist based on Marxism, he researches contemporary capitalist economy in terms of social class, income distribution, and measuring affluence.



**Mary Brinton**  
(Harvard University, USA)

Professor at Harvard University. She is a sociologist researching education, work, and youth employment in Japan and the USA. Her book "Lost in Transition: Youth, Education, and Work in Postindustrial Japan" has a Japanese translated version.



**Hyunjoon Park**  
(University of Pennsylvania, USA)

Associate Professor at the University of Pennsylvania. He is conducting sociological research about the effects of family and school as institutions on educational attainment, with international comparisons considering the social background of each country.

---

### International Training for Young Personnel

The organizers held workshops for graduate students to report their own research. At these workshops, the visiting researchers acted as discussants and provided useful advice. In addition, graduate students could readily meet with these researchers during office hours and obtain advice on how to advance their research, and build their careers.

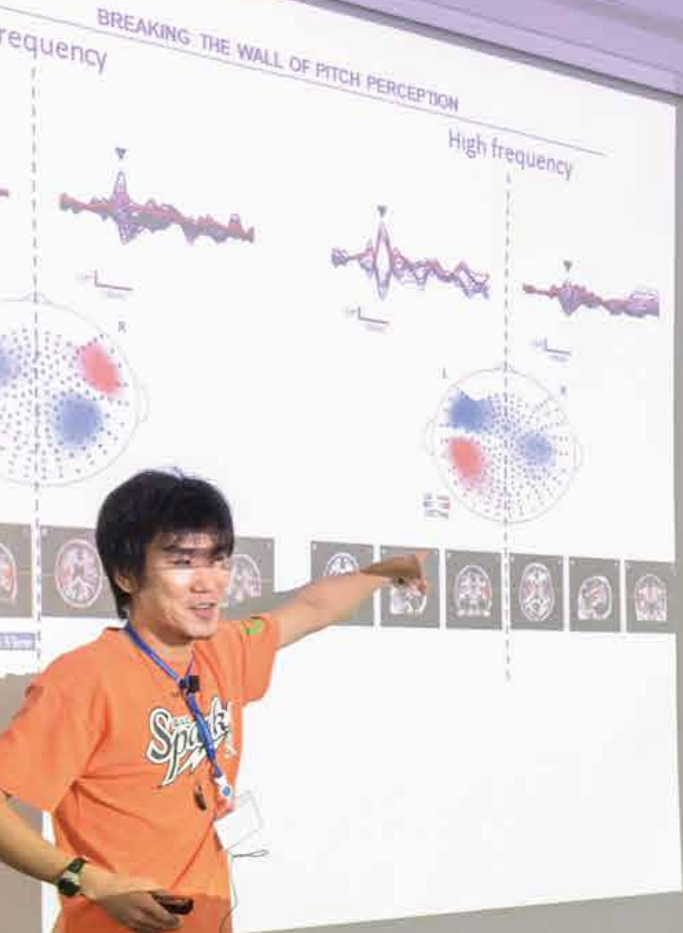
The discussions were all conducted in English, which brought home the importance of English as the common language in research. The participants were also made aware of the important role that empirical data plays in discussions that take place in settings of joint research, not only in their own research fields, but also in the setting shared among researchers from different research areas.

As concrete outcomes, a graduate student who received individual guidance from Professor Krätke got a teaching position at an overseas university, and a post-doctoral student who received guidance from Professor D'Agata was hired as an assistant professor in the economics department of a national university. In addition, a student who received guidance from Professor Brinton has been admitted to graduate school at the Pennsylvania State University.

### Strategies Following the Completion of the Program

We will build a base for synergistic research and education in economics and sociology, so that we may promote research and education using this program as a base, and advance international joint research on an ongoing basis. To achieve these objectives, we must facilitate discussions and joint research by inviting and dispatching academics on an ongoing basis. Therefore, we must proactively raise funds for research in order to enable such visits and dispatches.

In addition, we will build an international network that includes the overseas researchers invited to the TFC, and build a system that enables researchers and graduate students to come and go freely. The relationships between researchers that were forged in the project must be strengthened, broadened, and deepened.



# Falling Walls Lab Sendai 2015

A presentation competition was held jointly with the Falling Walls Foundation of Germany for junior researchers aged 35 or younger on September 4, 2015. It was the first preliminary competition held in the Asian region, and featured participation by 40 individuals from this university and others.

The top three contestants were dispatched to Berlin on November 8 to enter the final round.

The TFC, in cooperation with the URA center, conducted the coaching sessions for the applicants and the training sessions for the three winners in order to improve their presentation skills.



# Quattro Seminars

The TFC has regularly held a series of seminars, commonly known as the “Quattro Seminars,” on the humanities and social sciences as part of the URA and Tohoku Forum for Creativity Collaboration Project, Tohoku University. The Quattro Seminars aim to deepen collaborations between the four schools of the humanities, Graduate School of International Cultural Studies and Center for Northeast Asian Studies at Tohoku University, to explore interdisciplinary research themes, and are opened widely to outsiders. The seminars were held 6 times in 2015. Each seminar saw the participation of 30 researchers who were able to use the seminars as an opportunity to engage in vigorous discussion and strengthen their interpersonal connections.

\*The term Quattro in the common name of the series stands for “4,” representing the four faculties including the Faculty of Arts and Letters, the Faculty of Education, the School of Law, and the Faculty of Economics. The series is hosted through cooperation by the TFC and the URA center.



Support for Young Researchers | September 2013 –

## Leading Young Researcher Overseas Visit Program

This program is one of the central pillars in transforming the research environment at this university, with support from the program for promoting the enhancement of research universities from the Ministry of Education, Culture, Sports, Science and Technology (MEXT) in 2013, implemented by the Tohoku Forum for Creativity in cooperation with the University Research Administration Center, Tohoku University. The program deploys junior researchers (researchers and faculty under the age of 40, as well as graduate students in the second semester of their doctoral programs and postdoctoral fellows at our graduate schools) overseas to cultivate leadership and an international viewpoint. The strategic deployment of highly motivated, outstanding junior researchers to excellent universities and research organizations overseas helps those researchers develop into leaders in the international academic world, and helps create new currents of academic research. Through the program, we expect to strengthen the presence of our junior researchers, and of the university, by taking the opportunity to participate in new elite academic research communities and leveraging the research results and interpersonal networks thereof to achieve future leadership in the relevant domains. For this reason, we prioritize selection of submissions from junior researchers that clearly state the positioning of this program in the formation of their careers and as strategy for improving this university's research capabilities. Normally, we support mid-term overseas studies of periods from six months to one year. The program of 2015 sent 5 junior researchers to overseas research organizations. Furthermore, presentations were held upon their return, and further follow up is provided to help cultivate those individuals as superb global leaders.

---

Visiting institute : Institute for Research in the Social Sciences, Stanford University (USA)  
Research theme : Mathematical sociology on mechanisms generating social inequality  
Visiting period : July 31, 2014 – March 29, 2015

Visitor : Hiroki Takikawa (Assistant Professor, Frontier Research Institute for Interdisciplinary Sciences, Tohoku University)

---

## Project Outcome

I stayed as a visiting researcher at Stanford University in California from July 2014 to March 2015, in order to conduct research on social networks and computational social science. In the social network study conducted with Prof. P. Parigi, we are developing a methodology to extract the network structure of the entire society. I regularly joined Prof. Parigi's laboratory meetings, enabling us to advance the study by obtaining feedback and comments. In addition, I made effort to acquire knowledge about computational social science by taking some academic courses. Computational social science is a discipline to analyze the structure of human behavior and social networks using large-scale data about human behavior on the web (so-called big data). The courses were extremely useful in terms of giving me state-of-the-art knowledge and an opportunity to learn programming techniques.



## Further Development and Networking

After returning to Japan, I kept close contact with Prof. Parigi. In 2015, during a three week stay at Stanford, we further advanced the joint research. These achievements were reported at the European Sociological Association meeting in 2015, International Sociological Association Forum in 2016 and American Sociological Association meeting in 2016. We are now writing the paper and intend to submit it to a prestigious international journal, such as the American Journal of Sociology.

Visiting institute : Dept. Computer Science, University of Calgary (Canada)

Research theme : Dynamic Space Formation for Interpersonal Communication with Productive Humanity

Visiting period : October 7, 2014 – March 28, 2015

Visitor : Kazuma Takashima (Assistant Professor, Research Institute of Electrical Communication, Tohoku University)

## Project Outcome

The main goal of this visit was extending on-going research collaborations with Dr. Ehud Sharlin on designing and forming dynamic workspaces using robotic digital displays. From this collaboration, I achieved two conference full-papers; the first paper is on design and study of MovemenTable, moving robotic digital tables for efficient workspace switching ranging from individual and group activities, which was presented at IFIP INTERACT 2015 conference. The second is on Shape-Shifting Wall Display project where I led all research steps, planning, inviting researchers, prototyping a system and writing a paper in the lab. This paper has been recently published on June 8, 2016 at ACM SIGCHI Conference on Designing Interactive Systems and successfully won a Honourable Mention Award, identified in the top 5% of all submissions. Those two papers are my main outcomes of this visit but also demonstrate my major research interests, activities and future directions.

Besides my own research, I co-supervised several Masters and Ph.D students with Dr. Ehud. This educational challenges provided three conference full-papers and allowed me to experience a examiner for their Ph.D candidacy or Masters thesis defenses via a video conference system.

The lab I visited is a pioneer and one of the most famous research hubs in the domain of Human-computer Interaction in the world, having many powerful students and postdoctoral fellows led by four eminent professors. I met many senior and young researchers, and established academic and friendship networks which will be helpful in my future academic activities, including organizing and managing international conferences and workshops.



## Further Development and Networking

I could continue with many research activities based on my work in Calgary after returning to Japan, including paper writing, conference presentations, supervising and defense examinations. I am still collaborating with Dr. Ehud and his students. The academic network that I established is already quite helpful in my current activities regarding organizing international conferences. I would like to extend the network for further collaborations, joint funding applications and so on.

## 31 Thematic Programs

Invited Researchers List

Fundamental Problems in Quantum Physics:  
Strings, Black Holes and Quantum Information

Frontiers of Brain Science

Spintronics: from Mathematics to Devices

The Effects of Technological Changes on Social Mobility  
and Income Distribution

## 46 Other Activities

## 49 Leading Young Researcher Overseas Visit Program

## Invited Researchers List

Program Code : 2015TPH

### Fundamental Problems in Quantum Physics: Strings, Black Holes and Quantum Information

Chong-Sun Chu (National Tsing Hua University)	Makoto Kobayashi (KEK)
Noriaki Ikeda (Ritsumeikan University)	Viatcheslav Mukhanov (LMU)
Jae-Suk Park (IBS Center for Geometry and Physics)	Jinn-Ouk Gong (APCTP)
Jeehoon Park (Pohang University of Science and Technology)	Kwang Sik Jeong (Pusan National University)
Siye Wu (National Tsing-Hua University)	Yuichiro Kiyo (Juntendo University)
Akifumi Sako (Tokyo University of Science)	Takeo Moroi (University of Tokyo)
Hisayoshi Muraki (Tohoku University)	Ryo Namba (IPMU)
Gerard 't Hooft (Spinoza Institute, Utrecht University)	Marco Peloso (University of Minnesota)
Masahiro Hotta (Tohoku University)	Antonio Pineda (IFAE)
Andreas Karch (Washington University)	Philippe Spindel (Universite de Mons)
Sung-Sik Lee (Perimeter)	Tomo Takahashi (Saga University)
Robert Mann (University of Waterloo)	Masahide Yamaguchi (Tokyo Institute of Technology)
Eduardo Martin-Martinez (Perimeter)	Shuichiro Yokoyama (Rikkyo University)
Hiroaki Matsueda (SNCT)	M. A. Heller (Tohoku University)
Robert Myers (Perimeter)	Yukio Kaneko (Tohoku University)
Yasusada Nambu (Nagoya University)	Yoshiaki Maeda (Tohoku University)
Tatsuma Nishioka (University of Tokyo)	Yutaka Matsuo (University of Tokyo)
Masahiro Nozaki (YITP)	Hisayoshi Muraki (University of Tsukuba)
Kyriakos Papadodimas (CERN)	Patricia Ritter (University of Bologna)
Masaki Shigemori (YITP)	Thomas Strobl (University of Lyon)
Tadashi Takayanagi (YITP)	Guo Chuan Thiang (University of Adelaide)
François Englert (ULB)	

Program Code : 2015FBS

### Frontiers of Brain Science

Haruo Mizutani (Harvard University)	Stephan Sanders (UCSF)
Valentin Nägerl (University of Bordeaux)	Hidenori Yamasue (University of Tokyo)
Shu Kondo (National Institute of Genetics)	Yasuyuki Taki (Tohoku University)
Katrin Vogt (Max Planck Institute of Neurobiology)	Kenji Tsuchiya (Hamamatsu University School of Medicine)
Koichi Hashimoto (Tohoku University)	Atsushi Senju (Birkbeck University of London)
Masao Tachibana (University of Tokyo)	Yoko Kamio (National Center of Neurology and Psychiatry)
Oliver Griesbeck (Max Planck Institute of Neurobiology)	Masahiro Hirai (Jichi Medical University)
Ken Berglund (Emory University)	Paul Matthews (Imperial College London)
Tomomi Tsunematsu (University of Strathclyde)	Susumu Tonegawa (MIT / RIKEN BSI)
Ko Matsui (Tohoku University)	Richard Morris (University of Edinburgh)
C Justin Lee (Korea Institute of Science and Technology)	Shinsuke Shimojo (Caltech)
Amit Agarwal (Johns Hopkins University)	Georg Northoff (University of Ottawa)
Jason M. Christie (Max Planck Florida Institute)	Mitsuo Kawato (ATR)
Ryuichi Shigemoto (IST Austria)	Kazuyuki Aihara (University of Tokyo)
Sabina Hrabetova (SUNY Downstate Medical Center)	Kaoru Inokuchi (University of Toyama)
Jeff Lichtman (Harvard University)	Toshiyuki Hirabayashi (Nat. Inst. Radiol. Sci.)
Gáspár Jékely (Max Planck Institute for Developmental Biology)	Satoshi Kida (Tokyo University of Agriculture)
Michael Häusser (University College London)	Tom McHugh (RIKEN BSI)
Hiromu Tanimoto (Tohoku University)	Joshua Johansen (RIKEN BSI)
Ryuta Kawashima (IDAC, Tohoku University)	Hideaki Takeuchi (Okayama University)
Francois Guillemot (The Francis Crick Institute)	Junjiro Horiuchi (Tokyo Metropol. Inst. Med. Sci.)
Shubha Tole (Tata Institute of Fundamental Research)	Masatoshi Yoshida (Nat. Inst. Physiol. Sci.)
Tomomi Shimogori (RIKEN BSI)	Takanori Uka (Juntendo University)
Goichi Miyoshi (New York University)	Takuya Hayashi (RIKEN Cent. for Life Sci. Tech.)
Yusuke Hirabayashi (Columbia University)	Akira Murata (Kinki University)
Wieland Huttner (Max Planck Institute, Dresden)	Ken-Ichiro Tsutsui (Tohoku University)
Erich Jarvis (Duke University Medical Center)	Steven Laureys (University and University Hospital of Liège)
Noboru Hiroi (Albert Einstein College of Medicine)	Edvard Moser (Norwegian University of Science and Technology, Norway)

Program Code : 2015SPN

### Spintronics: from Mathematics to Devices

Anton Akhmerov (Delft University of Technology)	Alan Carey (Australian National University)
Christopher Bourne (Australian National University)	Rembert Duine (Utrecht University)
Peter Bouwknegt (Australian National University)	Mikio Furuta (University of Tokyo)



Gian-Michele Graf (ETH)  
 Koji Hashimoto (Osaka University)  
 Johannes Kellendonk (Université Lyon I)  
 Liang Kong (University of New Hampshire, Harvard University)  
 Yosuke Kubota (University of Tokyo)  
 Max Lein (Tohoku University)  
 Spyridon Michalakis (Caltech)  
 Graeme Milton (University of Utah)  
 Shuichi Murakami (Tokyo Institute of Technology)  
 Bruno Nachtergaele (University of California Davis)  
 Giuseppe de Nittis (Pontificia Universidad Católica de Chile)  
 Kentaro Nomura (Tohoku University)  
 Franco Nori (RIKEN and University of Michigan)  
 Emil V. Prodan (Yeshiva University)  
 Shinsei Ryu (University of Illinois)  
 Koji Sato (Tohoku University)  
 Akinori Tanaka (RIKEN)  
 Klaus von Klitzing (Max Planck Institute)  
 Masashi Kawasaki (University of Tokyo)  
 Seigo Tarucha (University of Tokyo)  
 Keiichiro Akiba (Tokyo University of Agriculture and Technology)  
 Russell Deacon (RIKEN)  
 Benedikt Friess (Max Planck Institute)  
 Toshimasa Fujisawa (Tokyo Institute of Technology)  
 Makoto Kohda (Tohoku University)  
 Yoji Kunihashi (NTT)  
 Gil-Ho Lee (Harvard University)  
 Tomoki Machida (University of Tokyo)  
 Takashi Nakajima (RIKEN)  
 Yasuhiro Niimi (Osaka University)  
 Benjamin Piot (LNCMI Grenoble)  
 Dominik Zumbuhl (University of Basel)  
 Helen Gomonay (National Technical University, Ukraine and JGU)  
 Axel Hoffmann (Argonne National Laboratory)  
 Tomas Jungwirth (Academy of Sciences, Czech Republic)  
 Mathias Klaeui (University of Mainz)  
 Dazhi Hou (Tohoku University)  
 Allan MacDonald (University of Texas at Austin)  
 Sadamichi Maekawa (JAEA)  
 Takahiro Moriyama (Kyoto University)  
 Naoto Nagaosa (RIKEN and University of Tokyo)  
 Qian Niu (University of Texas at Austin)  
 Stuart Parkin (Max Planck Institute - Halle/Saale)  
 Takuya Satoh (Kyushu University)  
 Jairo Sinova (University of Mainz)  
 Gen Tatara (RIKEN)

Oleg Tchernyshyov (JHU)  
 Yaroslav Tserkovnyak (UCLA)  
 Maxim Tsoi (University of Texas at Austin)  
 Xavier Waintal (CEA Grenoble)  
 Johan Åkerman (University of Gothenburg)  
 David Awschalom (University of Chicago)  
 Geoffrey Beach (Massachusetts Institute of Technology)  
 Tomasz Dietl (Polish Academy of Sciences)  
 Claudia Felser (Max Planck Institute for Chemical Physics of Solids)  
 Shunsuke Fukami (Tohoku University)  
 Julie Grollier (Université Paris-Sud)  
 Masamitsu Hayashi (National Institute for Materials Science)  
 Burkard Hillebrands (TU Kaiserslautern)  
 Masashi Kawasaki (University of Tokyo)  
 Charles Lambert (Université de Lorraine)  
 Aurélien Manchon (King Abdullah University of Science and Technology)  
 Shigemi Mizukami (Tohoku University)  
 Teruo Ono (Kyoto University)  
 Mikihiko Oogane (Tohoku University)  
 Masafumi Shirai (Tohoku University)  
 Andrei Slavin (Oakland University)  
 Kang Wang (UCLA)  
 Dieter Weiss (Universität Regensburg)  
 Masafumi Yamamoto (Hokkaido University)  
 Seung H. Kang (Qualcomm)  
 Sechung Oh (Samsung Electronics)  
 Yiming Huai (Avalanche)  
 Hiroaki Yoda (Toshiba)  
 Ricardo C. Sousa (Spintec)  
 Koji Nii (Renesas Electronics)  
 Takahiro Hanyu (Tohoku University)  
 Hiroki Koike (Tohoku University)  
 Felix Casanova (NanoGUNE)  
 Oliver Klein (CEA-IRAMIS)  
 Roberto Myers (Ohio State University)  
 Ke Xia (Beijing Normal University)  
 Joseph Barker (Tohoku University)  
 Dazhi Hou (Tohoku University)  
 Akihiro Kirihara (NEC)  
 Takashi Kimura (Kyushu University)  
 Hiroshi Kohno (Nagoya University)  
 Akira Oiwa (Osaka University)  
 Rafael Ramos (Tohoku University)  
 Koji Usami (University of Tokyo)  
 Takehito Yokoyama (Tokyo Institute of Technology)

Program Code : 2015INE

**The Effects of Technological Changes on Social Mobility and Income Distribution**

Antonio D'Agata (University of Catania)  
 Jun Matsuyama (University of Toyama)  
 Michael R. Krätke (Lancaster University)  
 Amitava Dutt (University of Notre Dame)  
 Simon Mohun (Queen Mary University of London)  
 Soon Ryoo (Adelphi University)  
 Gilbert Skillman (Wesleyan University)  
 Peter Skott (University of Massachusetts Amherst)

Soh Kaneko (Keio University)  
 Takashi Ohno (Doshisha University)  
 Hiroaki Sasaki (Kyoto University)  
 Hiroyuki Yoshida (Nihon University)  
 Naoki Yoshihara (Hitotsubashi University)  
 Mary Brinton (Harvard University)  
 Hyunjoon Park (University of Pennsylvania)

# Fundamental Problems in Quantum Physics: Strings, Black Holes and Quantum Information

## [Pre-Event] Workshop on Strings, Membranes and Topological Field Theory

- Date: Thursday, March 5, 2015 - Saturday, March 7, 2015
- Venue: Science complex C 2F Room N204, Faculty of Science, Kita-Aobayama Campus, Tohoku University
- Invited Researchers
  - Chong-Sun Chu (National Tsing Hua University)
  - Noriaki Ikeda (Ritsumeikan University)
  - Jae-Suk Park (IBS Center for Geometry and Physics)
  - Jeehoon Park (Pohang University of Science and Technology)
  - Siye Wu (National Tsing-Hua University)
  - Akifumi Sako (Tokyo University of Science)
  - Hisayoshi Muraki (Tohoku University)
- Participants: 35
- Time Schedule
  - Thursday, March 5, 2015
    - 13:30 - 14:30 Noriaki Ikeda (Ritsumeikan University)  
**Supergeometry of Topological Sigma Models, Higher Structures and Physical Applications [1]**
    - 14:45 - 15:45 Chong-Sun Chu (National Tsing Hua University)  
**The theory of non-abelian tensor of multiple 5-branes [1]**
    - 16:00 - 17:00 Hisayoshi Muraki (Tohoku University)  
**A Construction of Gravity Theory based on Poisson Generalized Geometry**
  - Friday, March 6, 2015
    - 10:00 - 11:00 Noriaki Ikeda (Ritsumeikan University)  
**Supergeometry of Topological Sigma Models, Higher Structures and Physical Applications [2]**

- 11:15 - 12:15 Siye Wu (National Tsing-Hua University)  
**Hitchin's equations on a non-orientable space and duality [1]**
- 14:00 - 15:00 Chong-Sun Chu (National Tsing Hua University)  
**The theory of non-abelian tensor of multiple 5-branes [2]**
- 15:15 - 16:15 Jae-Suk Park (IBS Center for Geometry and Physics)  
**Homotopy Theory of Quantum Fields [1]**
- Saturday, March 7, 2015
  - 10:00 - 11:00 Akifumi Sako (Tokyo University of Science)  
**Some physics of noncommutative gauge theories on Kähler manifolds**
  - 11:15 - 12:15 Siye Wu (National Tsing-Hua University)  
**Hitchin's equations on a non-orientable space and duality [2]**
  - 14:00 - 15:00 Jae-Suk Park (IBS Center for Geometry and Physics)  
**Homotopy Theory of Quantum Fields [2]**
  - 15:15 - 16:15 Jeehoon Park (Pohang University of Science and Technology)  
**Period integrals of hypersurfaces and a (0+0)-dimensional Quantum Field theory**

## [Special Event] Public Lecture by Professor Gerard 't Hooft

- Date and time: Friday, April 24, 2015 17:30 - 18:30
- Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University
- Speaker: Gerard 't Hooft (Spinoza Institute, Utrecht University)
- Title: The Higgs Particle, Pivot of the Standard Model of the Subatomic Particles
- Participants: 93

## [Special Event] Conference by Professor François Englert 2013 Nobel Prize Laureate in Physics

- Date and time: Thursday, September 3, 2015 17:30 - 18:30
- Venue: The Embassy of Belgium in Tokyo
- Title: On the origin of elementary particle masses: The history and scope of a discovery
- Hosted by:
  - The Embassy of Belgium
  - The Tohoku Forum for Creativity
  - The BNP Paribas Group
- Support from The Physical Society of Japan

## [Special Event] Special Lectures by Professor François Englert and Professor Makoto Kobayashi

- Date and time: Tuesday, September 15, 2015 14:00 - 16:30
- Venue: Science complex C 2F, Aoba Science Hall (Room C201), Kita-Aobayama Campus, Tohoku University
- Speakers
  - François Englert (ULB)
  - Makoto Kobayashi (KEK)
- Participants: 110
- Time Schedule
  - 14:00 - 15:00 François Englert (ULB)  
**The origin of elementary particle masses**
  - 15:30 - 16:30 Makoto Kobayashi (KEK)  
**CP Violation and Flavor Mixing**

## [Special Event] Public Lectures for the 100th Anniversary of General Relativity

- Date: Saturday, November 14, 2015
- Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University
- Hosted by: The Tohoku Forum for Creativity
- Planned and Coordinated by Celebrating 100 Years of Einstein's General Relativity committee
- Corporate with NPO natural science
- Speakers
  - Kei-ichi Maeda (Waseda University)
  - Toshifumi Futamase (Tohoku University)
- Participants: 110
- Time Schedule
  - 13:30 - 13:35 Opening remarks
  - 13:35 - 14:35 Kei-ichi Maeda (Waseda University)  
**General Relativity and Cosmology**
  - 14:35 - 15:00 Break
  - 15:00 - 16:00 Toshifumi Futamase (Tohoku University)  
**General Relativity and Astrophysics**
  - 16:00 - 16:20 Question and answer session

**[Event] Special Lectures on Fundamental Problems in Quantum Physics by Gerard 't Hooft**

- Date: Monday, April 20, 2015, Wednesday, April 22, 2015
  - Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University
  - Invited Researcher
    - Gerard 't Hooft (Spinoza Institute, Utrecht University)
  - Participants: 93
  - Time Schedule
- Monday, April 20, 2015  
 17:00 - 18:00 **Lecture 1: The role of Black Holes and Conformal Symmetry in Quantum Gravity**
- Wednesday, April 22, 2015  
 17:00 - 18:00 **Lecture 2: The Cellular automaton interpretation of quantum mechanics**

**[Event] Spring School on Particles, Strings and Quantum Information**

- Date: Monday, April 20, 2015 - Friday, April 24, 2015
  - Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University
  - Participants: 57
  - Time Schedule
- Monday, April 20, 2015  
 13:15 - 14:45 Satoshi Watamura (Tohoku University)  
**String and D-brane, I**  
 15:00 - 16:30 Ryuichiro Kitano (KEK Theory Center)  
**Physics beyond Standard Model, I**
- Tuesday, April 21, 2015  
 10:30 - 12:00 Keisuke Fujii (Kyoto University)  
**Basics of Quantum Information/Calculus, I**  
 13:15 - 14:45 Satoshi Watamura (Tohoku University)  
**String and D-brane, II**  
 15:00 - 16:30 Ryuichiro Kitano (KEK Theory Center)  
**Physics beyond Standard Model, II**
- Wednesday, April 22, 2015  
 10:30 - 12:00 Keisuke Fujii (Kyoto University)  
**Basics of Quantum Information/Calculus, II**
- Thursday, April 23, 2015  
 13:15 - 14:45 Yosuke Imamura (Tokyo Institute of Technology)  
**String Theory as connection between Gauge Theory and Gravity, I**  
 15:00 - 16:30 Discussion  
 10:30 - 12:00 Masahiro Hotta (Tohoku University)  
**Quantum Information and spacetime physics, I**  
 13:15 - 14:45 Yosuke Imamura (Tokyo Institute of Technology)  
**String Theory as connection between Gauge Theory and Gravity, II**  
 15:00 - 16:30 Fuminobu Takahashi (Tohoku University)  
**Inflation and Cosmic Microwave Background, I**
- Friday, April 24, 2015  
 10:30 - 12:00 Masahiro Hotta (Tohoku University)  
**Quantum Information and spacetime physics, II**  
 13:15 - 14:45 Fuminobu Takahashi (Tohoku University)  
**Inflation and Cosmic Microwave Background, II**  
 15:00 - 16:30 Tohru Eguchi (Rikkyo University)  
**Problems in String Theory and its future**

**[Event] International Workshop on Strings, Black Holes and Quantum Information**

- Date: Monday, September 7, 2015 - Friday, September 11, 2015
  - Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University
  - Invited Researchers
    - Masahiro Hotta (Tohoku University)
    - Andreas Karch (Washington University)
    - Sung-Sik Lee (Perimeter)
    - Robert Mann (University of Waterloo)
    - Eduardo Martin-Martinez (Perimeter)
    - Hiroaki Matsueda (SNCT)
    - Robert Myers (Perimeter)
    - Yasusada Nambu (Nagoya University)
    - Tatsuma Nishioka (University of Tokyo)
    - Masahiro Nozaki (YITP)
    - Kyriakos Papadodimas (CERN)
    - Masaki Shigemori (YITP)
    - Tadashi Takayanagi (YITP)
  - Participants: 53
  - Time Schedule
- Monday, September 7, 2015  
 12:30 - 13:30 Kyriakos Papadodimas (CERN)  
**The black hole information paradox and the smoothness of the horizon (Review)**  
 14:00 - 15:00 Tadashi Takayanagi (YITP)  
**Tensor Network and Holography (Review)**  
 15:30 - 16:30 Andreas Karch (Washington University)  
**Entanglement Entropies for Probe Branes**  
 17:00 - 17:30 Short talk: Yasuaki Hikida (Rikkyo University)  
**Higgs phenomenon and N=3 higher spin holography**  
 17:30 - 18:00 Short talk: Shotaro Shiba (Kyoto Sangyo University)  
**Thermodynamics of intersecting black branes from interacting elementary branes**
- Tuesday, September 8, 2015  
 09:30 - 10:30 Robert Mann (University of Waterloo)  
**Black Hole Information: From Thermodynamics to Firewalls (Review)**  
 11:00 - 12:00 Kyriakos Papadodimas (CERN)  
**A holographic reconstruction of the black hole interior**  
 14:00 - 15:00 Tadashi Takayanagi (YITP)  
**Gravity Dual of Information Metric**  
 15:30 - 16:30 Eduardo Martin-Martinez (Perimeter)  
**Are firewalls really cataclysmic events?**
- Wednesday, September 9, 2015  
 17:00 - 18:00 Discussion  
 09:30 - 10:30 Robert Mann (University of Waterloo)  
**Super-Entropic Black Holes**  
 11:00 - 12:00 Robert Myers (Perimeter)  
**Entanglement and C-theorems (Review)**  
 14:00 - 15:00 Yasusada Nambu (Nagoya University)  
**Entanglement and correlation of quantum fields in an expanding universe**  
 15:30 - 16:30 Masahiro Nozaki (YITP)  
**Quantum Entanglement of Local Operators in various CFTs**  
 17:00 - 17:30 Short talk: Song He (YITP)  
**Quantum dimension as entanglement entropy in 2D CFT**  
 17:30 - 18:00 Short talk: Yoshiki Sato (Kyoto University)  
**Comments on entanglement entropy in the dS/CFT correspondence**
- Thursday, September 10, 2015  
 09:30 - 10:30 Sung-Sik Lee (Perimeter)  
**Ab Initio Holography**  
 11:00 - 12:00 Robert Myers (Perimeter)  
**Entanglement Holography**  
 14:00 - 15:00 Masaki Shigemori (YITP)  
**The puzzles and microstructures of black holes**  
 15:30 - 16:30 Tatsuma Nishioka (University of Tokyo)  
**Anomalies and Entanglement Entropy**  
 17:00 - 17:30 Short talk: Tokiro Numasawa (YITP)  
**Entanglement Entropy in String Theory**  
 17:30 - 18:00 Short talk: Noburo Shiba (YITP)  
**Entanglement Entropy of Disjoint Regions in Excited States : An Operator Method**
- Friday, September 11, 2015  
 09:30 - 10:30 Hiroaki Matsueda (SNCT)  
**Geometry and Dynamics of Information Spacetime Derived from Entanglement Spectrum**  
 11:00 - 12:00 Masahiro Hotta (Tohoku University)  
**The fall of black hole firewall**

**[Event] International Workshop on Particle Physics and Cosmology**

■ Date: Monday, September 14, 2015 - Friday, September 18, 2015

■ Venue: Science complex C 2F, Aoba Science Hall (Room C201), Kita-Aobayama Campus, Tohoku University

■ Invited Researchers

- François Englert (ULB)
- Makoto Kobayashi (KEK)
- Viatcheslav Mukhanov (LMU)
- Jinn-Ouk Gong (APCTP)
- Kwang Sik Jeong (Pusan National University)
- Yuichiro Kiyo (Juntendo University)
- Takeo Moroi (University of Tokyo)
- Ryo Namba (IPMU)
- Marco Peloso (University of Minnesota)
- Antonio Pineda (IFAE)
- Philippe Spindel (Universite de Mons)
- Tomo Takahashi (Saga University)
- Masahide Yamaguchi (Tokyo Institute of Technology)
- Shuichiro Yokoyama (Rikkyo University)

■ Participants: 48

■ Time Schedule

Monday, September 14, 2015

- 10:00 - 11:00 Viatcheslav Mukhanov (LMU)  
**Quantum Universe**
- 11:30 - 12:30 Ryo Namba (IPMU)  
**Post-inflationary magnetogenesis**
- 14:00 - 15:00 Masahide Yamaguchi (Tokyo Institute of Technology)  
**Beyond Inflation and Beyond Horndeski theory**
- 15:30 - 16:30 Shuichiro Yokoyama (Rikkyo University)  
**Excavating primordial non-Gaussianities in large scale structure**

Tuesday, September 15, 2015

- 10:00 - 11:00 Viatcheslav Mukhanov (LMU)  
**Quantum Universe**
- 11:30 - 12:30 Kwang Sik Jeong (Pusan National University)  
**Cosmological Constraints on Axion Dark Matter**
- 14:00 - 16:30 **Special Lecture by Prof. Englert and Prof. Kobayashi**

Wednesday, September 16, 2015

- 10:00 - 11:00 Marco Peloso (University of Minnesota)  
**Axion inflation beyond the minimal model of Natural Inflation**
- 11:15 - 11:40 Yuki Watanabe (National Institute of Technology, Gunma College)  
**Multi-disformal invariance of non-linear primordial perturbations**
- 11:40 - 12:05 Kazuharu Bamba (Fukushima University)  
**Large-scale magnetic fields, non-Gaussianity, and tensor-to-scalar ratio in the inflationary universe**

12:05 - 12:30 Naoya Kitajima  
**Disappearing Inflaton Potential via Heavy Field Dynamics**

14:00 - 15:00 Jinn-Ouk Gong (APCTP)

**Features in the primordial spectra**

15:30 - 16:30 Tomo Takahashi (Saga University)

**Multi-field models of inflation and isocurvature fluctuations**

Thursday, September 17, 2015

10:00 - 11:00 Yuichiro Kiyo (Juntendo University)  
**top quark mass determination at ILC and NNNLO cross section**

11:15 - 11:40 Kazunari Shima (Saitama Institute of Technology)

**New SUSY paradigm beyond SMs and unity of nature**

11:40 - 12:05 Wen Yin

**A new natural split SUSY mechanism**

14:00 - 15:00 Antonio Pineda (IFAE)

**Renormalons in heavy quark physics and lattice: the pole mass and the gluon condensate**

15:15 - 15:40 Go Mishima (University of Tokyo)

**Bottom quark mass from bottomonium spectrum**

15:40 - 16:05 Takashi Kaneko (KEK)

**Kaon semileptonic decays on the lattice**

16:05 - 16:30 Hiromasa Takaura

**Power dependence on  $\Lambda_{\text{QCD}}$  hidden in perturbative series of Adler function**

Friday, September 18, 2015

10:00 - 11:00 Takeo Moroi (University of Tokyo)

**Looking for New Physics at the ILC**

11:30 - 12:30 Philippe Spindel (Universite de Mons)

**Minisuperspace Quantum Supersymmetric Cosmology and its Hidden Hyperbolic Kac-Moody Structures**

**[Seminar] Special Seminars by Giuseppe Dito**

■ Date and time:

Tuesday, April 14, 2015 14:00 - 15:00

Wednesday, April 15, 2015 10:30 - 11:30

Thursday, April 16, 2015 15:00 - 16:00

■ Venue: Science complex B 10F Room 1023, Faculty of Science, Kita-Aobayama Campus, Tohoku University

■ Speaker: Giuseppe Dito (Universite de Bourgogne)

■ Title: Elementary deformation quantization

■ Participants: 50

**[Seminar] Special Seminar by Daniel Sternheimer**

■ Date and time: Tuesday, April 21, 2015 17:00 - 18:00

■ Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University

■ Speaker: Daniel Sternheimer (Rikkyo University, Universite de Bourgogne)

■ Title: The unreasonable effectiveness of mathematical deformation theory in physics, especially quantum mechanics and maybe elementary particles symmetries

■ Participants: 50

**[Seminar] Special Seminar by Beni Yoshida**

■ Date and time: Thursday, April 23, 2015 17:00 - 18:00

■ Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University

■ Speaker: Beni Yoshida (Institute for Quantum Information and Matter, California Institute of Technology)

■ Title: Holographic quantum error-correcting codes: Toy models for the AdS/CFT correspondence

■ Participants: 50

**[Seminar] Special Seminar by Branislav Jurco**

- Date and time: Thursday, October 29, 2015 13:30 - 14:30
- Venue: Science complex B 10F, Room 1023, Kita-Aobayama Campus, Tohoku University
- Speaker: Branislav Jurco (Charles University of Prague)
- Title: Generalized geometry, Noncommutativity and Dirac-Born-Infeld action
- Participants: 15

**[Seminar] Special Seminar by Yuho Sakatani**

- Date and time: Friday, November 27, 2015 13:00 - 14:00
- Venue: Science complex B 10F, Room 1023, Kita-Aobayama Campus, Tohoku University
- Speaker: Yuho Sakatani (Seoul National University / Institute for Basic Sciences)
- Title: Finite Transformations in Doubled and Exceptional Space
- Participants: 20

**[Follow up Workshop] Higher Structures in String Theory and M-Theory**

- Date: Monday, March 7, 2016 - Friday, March 11, 2016
- Venue: Science complex C 2F Room N204, Faculty of Science, Kita-Aobayama Campus, Tohoku University
- Survey Lectures
  - Mathai Varghese (University of Adelaide)
  - Yuji Okawa (University of Tokyo)
  - Jeong-Hyuck Park (Sogang University)
  - Christian Saemann (Heriot-Watt University)
  - Tamiaki Yoneya (University of Tokyo & Open University of Japan)
  - Maxim Zabzine (Uppsala University)
- Invited Speakerd
  - M. A. Heller (Tohoku University)
  - Noriaki Ikeda (Ritsumeikan University)
  - Yukio Kaneko (Tohoku University)
  - Yoshiaki Maeda (Tohoku University)
  - Yutaka Matsuo (University of Tokyo)
  - Hisayoshi Muraki (University of Tsukuba)
  - Patricia Ritter (University of Bologna)
  - Thomas Strobl (University of Lyon)
  - Guo Chuan Thiang (University of Adelaide)
- Event Organizers
  - Tsuguhiko Asakawa (Maebashi Institute of Technology)
  - Yutaka Matsuo (University of Tokyo)
  - Satoshi Watamura (Tohoku University)
- Participants: 50
- Time Schedule

Monday, March 7, 2016

- 13:00 Maxim Zabzine (Uppsala University)  
**Localization of supersymmetric gauge theory I**
- 14:15 Tamiaki Yoneya (University of Tokyo & Open University of Japan)  
**Covariantized M (atrix) Theory I**
- 15:30 Jeong-Hyuck Park (Sogang University)  
**Introduction to the semi-covariant formulation of bosonic DFT**
- 16:45 Guo Chuan Thiang (University of Adelaide)  
**T-duality and real K-theory: a view from condensed matter physics**

Tuesday, March 8, 2016

- 09:30 Maxim Zabzine (Uppsala University)  
**Localization of supersymmetric gauge theory II**
- 10:45 Christian Saemann (Heriot-Watt University)  
**Higher Structures arising in M-theory**
- 12:00 Hisayoshi Muraki (University of Tsukuba)  
**Gravity on Poisson Manifold**
- 14:15 Tamiaki Yoneya (University of Tokyo & Open University of Japan)  
**Covariantized M (atrix) Theory II**
- 15:30 Jeong-Hyuck Park (Sogang University)  
**Supersymmetric extension including R-R sector**
- 16:45 Patricia Ritter (University of Bologna)  
**Generalized Higher Gauge Theory**

Wednesday, March 9, 2016

- 09:30 Maxim Zabzine (Uppsala University)  
**Localization of supersymmetric gauge theory III**
- 10:45 Christian Saemann (Heriot-Watt University)  
**Categorification: Gerbes, Loop Spaces, Higher Gauge Theory**
- 12:00 M. A. Heller (Tohoku University)  
**Poisson courant algebroid and Double Field Theory**
- 14:15 Yuji Okawa (University of Tokyo)  
**Complete formulation of superstring field theory I**

- 15:30 Jeong-Hyuck Park (Sogang University)  
**Worksheet action with doubled-yet-gauged coordinates; U-gravity for U-duality**
- 16:45 Mathai Varghese (University of Adelaide)  
**Exotic twisted equivariant cohomology of loop spaces, & the twisted Bismut-Chern character**

Thursday, March 10, 2016

- 09:30 Maxim Zabzine (Uppsala University)  
**Localization of supersymmetric gauge theory IV**
- 10:45 Christian Saemann (Heriot-Watt University)  
**The (2,0)-theory and Multiple M5-branes**
- 12:00 Yukio Kaneko (Tohoku University)  
**Off-shell covariantization of higher gauge theories based on QP-manifold**
- 14:15 Yuji Okawa (University of Tokyo)  
**Complete formulation of superstring field theory II**
- 15:30 Noriaki Ikeda (Ritsumeikan University)  
**Higher structure and current algebra**
- 16:45 Yutaka Matsuo (University of Tokyo)  
**Holomorphic field realization of SHC and quantum geometry of quiver gauge theories**

Friday, March 11, 2016

- 09:30 Mathai Varghese (University of Adelaide)  
**Exotic twisted equivariant cohomology of loop spaces, & the twisted Bismut-Chern character**
- 10:45 Christian Saemann (Heriot-Watt University)  
**Higher Geometric (Pre)-Quantization**
- 12:00 Thomas Strobl (University of Lyon)  
**Strings in singular space-times and their universal gauge theory**
- 13:00 Yoshiaki Maeda (Tohoku University)  
**Geometry of loop space**

# Frontiers of Brain Science

## [International Symposium] Tools and Technologies

### ■ Event Organizers

- Hiromu Tanimoto (Tohoku University)
- Ko Matsui (Tohoku University)

### [Workshop]

■ Date: Tuesday, July 21, 2015 - Friday, July 24, 2015

■ Venue: Tohoku Medical Megabank Building  
Department of Medicine at Seiry Campus, Tohoku University

■ Participants: 66

### ■ Workshop Lectures

Tuesday, July 21, 2015

13:40 - 14:20 Haruo Mizutani (Harvard University)  
**The suite of connectomic technologies**

Friday, July 24, 2015

15:00 - 15:40 Valentin Nägerl (University of Bordeaux)  
**Imaging neurons and synapses at the nanoscale by STED microscopy**

### [Symposium]

■ Date: Saturday, July 25, 2015 - Monday, July 27, 2015

■ Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater,  
Katahira Campus, Tohoku University

■ Participants: 120

### ■ Symposium Speakers

- Shu Kondo (National Institute of Genetics)  
**Frontiers of genome engineering in animal genetics: how CRISPR/Cas9 is changing Drosophila research**
- Katrin Vogt (Max Planck Institute of Neurobiology)  
**Dissecting a visual learning circuit in the Drosophila mushroom body**
- Koichi Hashimoto (Tohoku University)  
**Machine vision and robotics in biology**
- Masao Tachibana (University of Tokyo)  
**Processing of dynamic visual images in the retina**

• Oliver Griesbeck (Max Planck Institute of Neurobiology)

**Ratiometric in vivo imaging with "Twitch" calcium sensors**

• Ken Berglund (Emory University)

**Luminopsins: Novel optogenetic tools for controlling neuronal activity by bioluminescence**

• Tomomi Tsunematsu (University of Strathclyde)

**Optogenetic perturbation of cell-type specific and depth specific neural activity in vivo**

• Ko Matsui (Tohoku University)

**Glia optogenetics**

• C Justin Lee (Korea Institute of Science and Technology)

**Detection of channel-mediated gliotransmitter release**

• Amit Agarwal (Johns Hopkins University)

**Molecular mechanisms of spontaneous Ca<sup>2+</sup> oscillations in astrocytes**

• Jason M. Christie (Max Planck Florida Institute)

**Local control of spike signaling within axons of cerebellar interneurons**

• Ryuichi Shigemoto (IST Austria)

**Quantitative, high-resolution localization of synaptic molecules by freeze-fracture replica labeling and electron tomography**

• Sabina Hrabetova (SUNY Downstate Medical Center)

**Distinct diffusion regimes in brain extracellular space**

• Jeff Lichtman (Harvard University)

**The promises and perils of connectomics**

• Gáspár Jékely (Max Planck Institute for Developmental Biology)

**Systems neurobiology of the Platynereis larva**

• Michael Häusser (University College London)

**All-optical interrogation of neural circuits**

• Hiromu Tanimoto (Tohoku University)

**Mapping circuits for memory formation**

## [International Symposium] Development and Disease

■ Date: Monday, August 24, 2015 - Wednesday, August 26, 2015

■ Venue: Auditorium of the International Center for Smart Aging Research,  
Seiry Campus, Tohoku University

### ■ Event Organizers

- Yasuyuki Taki (Tohoku University)
- Tomomi Shimogori (RIKEN BSI)

■ Participants: 100

### ■ Time Schedule

Monday, August 24, 2015

#### [AM: Lab Tour/discussion]

12:00 Registration

13:00 Ryuta Kawashima (Dean, IDAC, Tohoku University)

**Welcome**

#### [Session 1: Brain Development]

13:10 Francois Guillemot (The Francis Crick Institute)

**Signals and factors controlling stem cell activity in the adult brain**

14:10 Shubha Tole (Tata Institute of Fundamental Research)

**Early patterning of the cortical primordium**

14:50 **Short talk 1**

(1) Takako Kikkawa (15 min.)

**Dmrt genes differentially participate in Cajal-Retzius cell development of the cerebral cortex**

(2) Dan Ohtan Wang (15 min.)

**Imaging RNA in Living Neural Circuits with Hybridization-sensitive Fluorescent Probes**

15:20 Break

15:40 Tomomi Shimogori (RIKEN BSI)

**Input from the thalamus creates diversity of the cortical neurons**

16:20 Goichi Miyoshi (@Fishell Lab, New York University)

**Assembly of neocortical circuitry by FoxG1, a gene associated with neurocognitive disorders**

16:50 Yusuke Hirabayashi (@Polleux Lab, Columbia University)

**Exploring the role of the mitochondria/endoplasmic reticulum (ER) interface in axonal development**

18:00 Get together @Lobby of the same building

Tuesday, August 25, 2015

#### [Session 2: Brain Evolution]

09:10 Wieland Huttner (Max Planck Institute, Dresden)

**Neural stem and progenitor cells and neocortex expansion in development and evolution**

10:10 **Short talk 2**

(1) Takuya Imamura (15 min.)

**Gene-activation-associated long non-coding RNAs for species-dependent epigenome formation**

(2) Kouta Kanno (15 min.)

**Individual differences of courtship ultrasonic vocalizations and its neuronal correlates in male mice**

10:40 Break

11:00 Erich Jarvis (Duke University Medical Center)

**Brain evolution of complex behavioral traits: vocal learning and spoken language**

11:40 **Short talk 3**

(1) Asuka Matsui (15 min.)

**Neural activity dependent BTBD3 translocation to the cytoskeleton is essential for proper dendrite development**

(2) Carina Hanashima (15 min.)

**Neuronal subtype specification in establishing the cerebral cortex**

12:10 Lunch & Poster session

#### [Session 3: Models for Neurodevelopmental Disease]

14:00 Noboru Hiroi (Albert Einstein College of Medicine)

**Postnatal neurogenesis and dimensional features of autism in a genetic mouse model of 22q11.2 copy number variants**

14:40 Noriko Osumi (Tohoku University)

**Crosstalk between Pax6 haploinsufficiency and paternal aging in modulating offspring behavior: a possible role for epigenetic modification**

15:20 Break

#### [Session 4: Clinical Studies of Neurodevelopmental Disease]

15:40 **Short talk 4**

Mikio Hoshino (30 min.)

**Analysis of autism susceptibility candidate 2 gene during development**

- 16:10 Stephan Sanders (UCSF)  
**Genomic architecture and gene discovery in autism spectrum disorder**
- 16:50 Hidenori Yamasue (University of Tokyo)  
**Crosstalk between neuroscience and clinical psychiatry with oxytocin in a neurodevelopmental disorder**
- 17:30 Reception @Lobby of the same building
- Wednesday, August 26, 2015
- 09:30 Yasuyuki Taki (Tohoku University)  
**Brain development using magnetic resonance imaging in healthy children**
- 10:10 Kenji Tsuchiya (Hamamatsu University School of Medicine)  
**Neurodevelopmental Trajectories of Children with Autism Spectrum Disorder**
- 10:50 Break

- 11:10 Atsushi Senju (Birkbeck University of London)  
**Development of spontaneous social cognition and autism**
- 12:00 Lunch & Poster session
- 13:10 Yoko Kamio (National Center of Neurology and Psychiatry)  
**Early detection and early intervention for ASD during life course development: Not only for social-communication problems but also for diverse mental health issues**
- 13:50 Masahiro Hirai (Jichi Medical University)  
**Embodied cognition from inside out in atypical development**
- 14:30 Break
- 14:50 Paul Matthews (Imperial College London)  
**Imaging in large populations: better defining later life brain disease risks in terms of development, exposure and aging**
- 15:50 Noriko Osumi (Tohoku University)  
Concluding Remarks

#### [International Symposium] Memory and Mind

##### ■ Event Organizers

- Kaoru Inokuchi (University of Toyama)
- Ken-Ichiro Tsutsui (Tohoku University)

##### [Special Seminar]

- Date: Sunday, September 27, 2015
- Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University
- Speaker: Shinsuke Shimojo (Caltech)

##### [Symposium]

- Date: Monday, September 28, 2015 - Tuesday, September 29, 2015
- Venue: Sakura Hall, Katahira Campus, Tohoku University
- Participants: 200
- Speakers List

Monday, September 28, 2015

- Susumu Tonegawa (MIT / RIKEN BSI) [Plenary Lecture]
- Richard Morris (University of Edinburgh)
- Shinsuke Shimojo (Caltech)
- Georg Northoff (University of Ottawa)
- Mitsuo Kawato (ATR)
- Kazuyuki Aihara (University of Tokyo)
- Kaoru Inokuchi (University of Toyama)

Tuesday, September 29, 2015

- Toshiyuki Hirabayashi (Nat. Inst. Radiol. Sci.)
- Satoshi Kida (Tokyo University of Agriculture)
- Tom McHugh (RIKEN BSI)
- Joshua Johansen (RIKEN BSI)
- Hideaki Takeuchi (Okayama University)
- Junjiro Horiuchi (Tokyo Metropol. Inst. Med. Sci.)
- Masatoshi Yoshida (Nat. Inst. Physiol. Sci.)
- Takanori Uka (Juntendo University)
- Takuya Hayashi (RIKEN Cent. for Life Sci. Tech.)
- Akira Murata (Kinki University)
- Ken-Ichiro Tsutsui (Tohoku University)

##### ■ Time Schedule

Monday, September 28, 2015

- 09:30 - 09:40 Opening Remarks
- 09:40 - 10:30 Richard Morris (University of Edinburgh)  
(Coffee break 10min.)

10:40 - 11:20 Kaoru Inokuchi (University of Toyama)

11:20 - 12:00 Kazuyuki Aihara (University of Tokyo)  
(Lunch break 1h 10min.)

13:10 - 14:10 **Plenary Lecture**  
Susumu Tonegawa (MIT / RIKEN BSI)  
(Coffee break 10min)

14:20 - 15:10 Shinsuke Shimojo (Caltech)

15:10 - 15:50 Mitsuo Kawato (ATR)  
(Coffee break 10min.)

16:00 - 16:50 Georg Northoff (University of Ottawa)

16:50 - 17:00 Closing Remarks

18:00 - Reception at Westin Hotel Sendai  
Celebration Speech by the University President  
Susumu Satomi

Tuesday, September 29, 2015

09:20 - 09:30 Opening Remarks

09:30 - 10:00 Thomas McHugh (RIKEN BSI)

10:00 - 10:30 Satoshi Kida (Tokyo University of Agriculture)  
(Coffee break 15 min.)

10:45 - 11:15 Junjiro Horiuchi (Tokyo Metropol. Inst. Med. Sci.)

11:15 - 11:45 Joshua Johansen (RIKEN BSI)

11:45 - 12:15 Hideaki Takeuchi (Okayama University)

12:15 - 14:00 Luncheon Poster Session

14:00 - 14:30 Toshiyuki Hirabayashi (Nat. Inst. Radiol. Sci.)

14:30 - 15:00 Masatoshi Yoshida (Nat. Inst. Physiol. Sci.)

15:00 - 15:30 Ken-Ichiro Tsutsui (Tohoku University)  
(Coffee break 15 min.)

15:45 - 16:15 Takanori Uka (Juntendo University)

16:15 - 16:45 Akira Murata (Kinki University)

16:45 - 17:15 Takuya Hayashi (RIKEN Cent. for Life Sci. Tech.)

17:15 - 17:25 Closing Remarks

##### [Discussion]

- Date: Wednesday, September 30, 2015
- Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University

#### [Other Related Event] Neuroimaging and its impact on our lives

- Date: Tuesday, July 28, 2015
- Venue: Kobe International Conference Center, Room 501 + Lounge
- Invited Researcher
- Steven Laureys (University and University Hospital of Liège)
- Event Organizer
- Manabu Tashiro (Tohoku University)
- Participants: 80
- Time Schedule
- 18:30 - 21:30 Manabu Tashiro (Tohoku University)  
**Tools and Technologies for Human Functional Neuroimaging: Molecular Imaging of Drug Actions**

Nobuyuki Okamura (Tohoku University)  
**PET Imaging of Misfolded Proteins in Alzheimer's disease**  
Steven Laureys (University and University Hospital of Liège)  
**How Can Science Explain Consciousness? Lessons from Coma and Severe Brain Injury**

#### [Other Related Event] Ethics Seminar by Prof. Shubha Tole

- Date and time: Thursday, August 27, 2015 10:00 - 12:00
- Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University
- Speaker: Shubha Tole (Tata Institute of Fundamental Research)
- Title: Dealing with difficult scientific situations ethically
- Participants: 6

**[Other Related Event] Public Talk by Nobel Laureate Prof. Susumu Tonegawa**

- Date: Sunday, September 27, 2015
- Venue: Kawauchi Hagi Hall, Tohoku University
- Hosted by:
  - Tohoku University
  - The Yomiuri Shimbun
- Participants: 800
- Time Schedule
  - 13:00 - 14:00 Toshio Iijima (Brain Science Center, Tohoku University)  
**Why happy memories remain in our mind/brain through our life?**  
Noriko Osumi (Graduate School of Medicine, Tohoku University)  
**New neurons are generated in the hippocampus for lifetime**  
Hiroaki Tomita (Department of Disaster Psychiatry, International Research Institute of Disaster Science, Tohoku University)  
**How to cope with bitter memories**
  - 14:15 - 15:20 Susumu Tonegawa (MIT / RIKEN BSI)  
**Mechanism of the memory and scheme of the mind**
  - 15:30 - 16:30 Discussion

**[Other Related Event] Research Publications Seminar by Prof. Charles Yokoyama**

- Date and time: Wednesday, September 30, 2015 10:00 - 11:30
- Venue: 2nd Lecture Room, School of Medicine Building 1, Tohoku University Graduate School of Medicine, Seiryō Campus, Tohoku University
- Speaker: Charles Yokoyama (RIKEN Brain Science Institute)
- Title: Essential Skills for Publishing High Impact Research Papers

**[Other Related Event] NTNU – Tohoku Univ. Brain Science Meeting “ Joy of Brain Research ”**

- Date: Wednesday, November 25, 2015 - Friday, November 27, 2015
- Venue: Life Science Project Research Building, Katahira Campus, Tohoku University
- Event Organizers
  - Toshio Iijima (Tohoku University)
  - Menno P Witter (Norwegian University of Science and Technology (NTNU))
- Participants: 100
- Opening Lecture: Wednesday, November 25, 2015 17:45 - 19:00  
Edvard Ingjald Moser (Laureate of 2014 Nobel Prize in Physiology or Medicine)  
**The discovery of grid cells, spatial navigation and cognitive neuroscience**
- Oral and Poster Presentations: Thursday, November 26, 2015 - Friday, November 27, 2015 9:00 - 18:00

**[Other Related Event] Intensive Course: Academic English for Researchers**

- Date and time: Monday, March 7, 2016 - Friday, March 18, 2016 9:30 - 16:00
- Venue: Life Science Project Research Building, Katahira Campus, Tohoku University
- Instructor: Russell Mayne and Dan Jones (English Language Teaching Unit, University of Leicester)

Thematic Program 2015 | Program Code: 2015SPN

## Spintronics: from Mathematics to Devices

**[Event] Elementary Spintronics School**

- Date and time: Monday, September 14, 2015 - Friday, December 11, 2015 16:20 - 17:50
- Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University
- Event Organizers
  - Fumihiro Matsukura (Tohoku University)
  - Kentaro Nomura (Tohoku University)
- Participants: 40
- Time Schedule
  - Tuesday, September 29, 2015  
Gerrit E. W. Bauer (IMR Tohoku University)  
**Introduction to spintronics**
  - Friday, October 2, 2015  
Wolfgang Belzig (University of Konstanz)  
**Circuit methods in spintronics and quantum transport**
  - Tuesday, October 13, 2015  
Yaroslav Blanter (Delft University of Technology)  
**Cavity QED**
  - Friday, October 16, 2015  
Anton Akhmerov (Delft University of Technology)  
**Topological insulators and Majorana fermions**
  - Friday, October 23, 2015  
Ke Xia (Beijing Normal University)  
**Computational spin transport in nanostructure**
  - Friday, October 30, 2015  
So Takei (Queens College of the City University of New York)  
**Spin superfluidity**
  - Friday, November 6, 2015  
Tomasz Dietl (Polish Academy of Sciences)  
**Electric-field effects on magnetism**
  - Tuesday, November 10, 2015  
Oleg Tretiakov (IMR Tohoku University)  
**Magnetization dynamics and motion of topological spin textures**
  - Tuesday, November 24, 2015  
Tomasz Dietl (Polish Academy of Sciences)  
**Electric-current effects on magnetism**
  - Friday, November 27, 2015  
Fumihiro Matsukura (AIMR Tohoku University)  
**Ferromagnetic semiconductors**
  - Monday, December 7, 2015  
Kentaro Nomura (IMR Tohoku University)  
**Topological insulators and Weyl semimetals**
  - Friday, December 11, 2015  
Junsaku Nitta (Tohoku University)  
**Spin-orbitronics**



**[Event] International Workshop : Mathematical Approach to Topological Phases in Spintronics**

■ Date: Monday, October 5, 2015 - Friday, October 9, 2015

■ Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University

■ Event Organizers

- Motoko Kotani (Tohoku University, Chair)
- Jean Bellissard (Georgia Tech.)
- Pavel Exner (Czech Tech. University)
- Peter Kuchment (Texas A&M)
- Graeme Milton (University of Utah)
- Zagrebnov Valentin (Université d'Aix-Marseille)

■ Participants: 60

■ Invited speakers

- Anton Akhmerov (Delft University of Technology)
- Christopher Bourne (Australian National University)
- Peter Bouwknegt (Australian National University)
- Alan Carey (Australian National University)
- Rembert Duine (Utrecht University)
- Mikio Furuta (University of Tokyo)
- Gian-Michele Graf (ETH)
- Koji Hashimoto (Osaka University)
- Johannes Kellendonk (Université Lyon I)
- Liang Kong (University of New Hampshire, Harvard University)
- Yosuke Kubota (University of Tokyo)
- Max Lein (Tohoku University)
- Spyridon Michalakis (Caltech)
- Graeme Milton (University of Utah)
- Shuichi Murakami (Tokyo Institute of Technology)
- Bruno Nachtergaele (University of California Davis)
- Giuseppe de Nittis (Pontificia Universidad Católica de Chile)
- Kentaro Nomura (Tohoku University)
- Franco Nori (RIKEN and University of Michigan)
- Emil V. Prodan (Yeshiva University)
- Shinsei Ryu (University of Illinois)
- Koji Sato (Tohoku University)
- Akinori Tanaka (RIKEN)

■ Time Schedule

Monday, October 5, 2015

- 10:00 - 10:50 Bruno Nachtergaele (University of California Davis)
- 11:00 - 11:50 Gian-Michele Graf (ETH)  
Lunch Break
- 14:00 - 14:50 Mikio Furuta (University of Tokyo)
- 15:00 - 15:40 Yosuke Kubota (University of Tokyo)  
Tea

16:10 - 16:50 Emil V. Prodan (Yeshiva University)

17:00 - 17:50 Graeme Milton (University of Utah)

18:00 Buffet Party

Tuesday, October 6, 2015

10:00 - 10:50 Spyridon Michalakis (California Institute of Technology)

11:00 - 11:50 Johannes Kellendonk (Université Lyon I)

Lunch Break

14:00 - 14:50 Yosuke Kubota (University of Tokyo)

15:00 - 15:40 Max Lein (Tohoku University)

Tea

16:10 - 16:50 Akinori Tanaka (RIKEN)

17:00 - 17:50 Koji Hashimoto (Osaka University)

Wednesday, October 7, 2015

10:00 - 10:50 Spyridon Michalakis (California Institute of Technology)

11:00 - 11:50 Liang Kong (University of New Hampshire, Harvard University)

Lunch Break

14:00 - 14:50 Alan Carey (Australian National University)

15:00 - 15:40 Christopher Bourne (Australian National University)

Tea

16:10 - 16:50 Giuseppe De.Nittis (Pontificia Universidad Católica de Chile)

17:00 - 17:50 Peter Bouwknegt (Australian National University)

Thursday, October 8, 2015

10:00 - 10:50 Bruno Nachtergaele (University of California Davis)

11:00 - 11:50 Shuichi Murakami (Tokyo Institute of Technology)

Lunch Break

14:00 - 14:50 Kentaro Nomura (Tohoku University)

15:00 - 15:40 Anton Akhmerov (Technical University of Delft)

15:50 - 16:30 Koji Sato (Tohoku University)

16:40 - 17:20 Rembert Duine (University of Utrecht)

Friday, October 9, 2015

10:00 - 10:50 Shinsei Ryu (University of Illinois at Urbana-Champaign)

11:00 - 11:50 Franco Nori (RIKEN and University of Michigan)

Close

■ [Tutorial lecture]

13:00 - 13:40 Alan Carey (Australian National University)

**Introduction to K-theory and generalizations I**

13:55 - 14:35 Alan Carey (Australian National University)

**Introduction to K-theory and generalizations II**

15:00 - 15:50 Shinsei Ryu (University of Illinois at Urbana-Champaign)

**Introduction to topological insulators and superconductors**

**[Event] International Workshop : Quantum Nanostructures and Electron-Nuclear Spin Interactions**

■ Date: Monday, October 19, 2015 - Wednesday, October 21, 2015

■ Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University

■ Event Organizers

- Yoshiro Hirayama (Tohoku University)
- Koji Muraki (NTT)

■ Participants: 79

■ Keynote speakers

- Klaus von Klitzing (Max Planck Institute)  
**Electron Spin in GaAs/AlGaAs Heterostructures**
- Masashi Kawasaki (University of Tokyo)  
**Unconventional quantum Hall effect in new materials**
- Seigo Tarucha (University of Tokyo)  
**Coherent control of electron spin in a dynamical nuclear spin bath**

■ Invited speakers

- Keiichiro Akiba (Tokyo University of Agriculture and Technology)  
**Optically induced nuclear spin polarization in the quantum Hall regime**
- Russell Deacon (RIKEN)  
**Non-local spin entangled states in double quantum dot Josephson Junctions**
- Benedikt Friess (Max Planck Institute)  
**NMR probing of the spin and charge ordering in the quantum Hall regime**
- Toshimasa Fujisawa (Tokyo Institute of Technology)  
**Exchange-induced spin blockade in a double quantum dot**
- Makoto Kohda (Tohoku University)  
**Spin-orbit interaction in semiconductor nanostructures**
- Yoji Kunihashi (NTT)  
**Electrical control of drifting spin coherence**
- Gil-Ho Lee (Harvard University)  
**Negative refractive transport of electrons in ballistic graphene**

- Tomoki Machida (University of Tokyo)

**Quantum transport in van der Waals junctions of graphene and 2D materials**

- Takashi Nakajima (RIKEN)

**Generation of locally and non-locally entangled electron spin pairs in a triple quantum dot**

- Yasuhiro Niimi (Osaka University)

**Spin transport in mesoscopic superconductors with strong spin-orbit interactions**

- Benjamin Piot (LNCMI Grenoble)

**Hyperfine coupling and spin polarization in the bulk of the topological insulator Bi<sub>2</sub>Se<sub>3</sub>**

- Dominik Zumbuhl (University of Basel)

**Helical nuclear spin order in GaAs quantum wires**

■ Time Schedule

Monday, October 19, 2015

Opening

■ [Session1: Keynote Session]

10:00 - 10:45 Klaus von Klitzing (Keynote speaker)

10:45 - 11:00 Coffee Break

11:00 - 11:45 Masashi Kawasaki (Keynote speaker)

11:45 - 12:30 Seigo Tarucha (Keynote speaker)

12:30 - 14:00 Lunch (90min)

■ [Session2: Topological Insulator]

14:00 - 14:30 Benjamin Piot (Invited speaker)

14:30 - 14:50 Ngoc Han Tu

14:50 - 15:10 F. Couedo

15:10 - 15:40 Coffee Break

**[Session3: Graphene]**

- 15:40 - 16:10 Tomoki Machida (Invited speaker)
- 16:10 - 16:40 Gil-Ho Lee (Invited speaker)
- 16:40 - 17:00 N. Kumada
- 17:00 - 20:00 Poster Session & Discussions

Tuesday, October 20, 2015

**[Session4: Superconductor and hybrid systems]**

- 09:30 - 10:00 Yasuhiro Niimi (Invited speaker)
- 10:00 - 10:30 Russell Deacon (Invited speaker)
- 10:30 - 10:50 Hiraku Toida
- 10:50 - 11:25 Coffee Break

**[Session5: Quantum wires and point contacts]**

- 11:25 - 11:55 Dominik Zumbuhl (Invited speaker)
- 11:55 - 12:15 Minoru Kawamura
- 12:15 - 13:45 Lunch (90min)

**[Session6: Quantum dots]**

- 13:45 - 14:15 Toshimasa Fujisawa (Invited speaker)
- 14:15 - 14:45 Takashi Nakajima (Invited speaker)
- 14:45 - 15:05 Tomohiro Yamaguchi
- 15:05 - 15:25 Wataru Izumida
- 15:25 - 15:50 Coffee Break

**[Session7: Quantum Hall systems and real space imaging]**

- 15:50 - 16:20 Keiichiro Akiba (Invited speaker)
- 16:20 - 16:40 K. Hashimoto
- 16:40 - 17:00 J. Nicholas Moore
- 17:00 - 17:15 M. H. Fauzi
- 17:15 - 17:30 Y. Hama

Wednesday, October 21, 2015

**[Session8: Spin-orbit interactions]**

- 09:30 - 10:00 Makoto Kohda (Invited speaker)
- 10:00 - 10:30 Yoji Kunihashi (Invited speaker)
- 10:30 - 10:45 T. Masuda
- 10:45 - 11:15 Coffee Break

**[Session9: Resistively detected NMR]**

- 11:15 - 11:45 Benedikt Friess (Invited speaker)
- 11:45 - 12:05 K. Muraki
- 12:05 - 12:25 Y. Hirayama
- Closing

**[Event] International Workshop : Spintronics with Antiferromagnets (32nd Reimei Workshop on Frontiers of Condensed Matter Physics)**

■ Date: Monday, November 16, 2015 - Tuesday, November 17, 2015

■ Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University

■ Event Organizers

- Oleg Tretiakov (Tohoku University)
- Gerrit Bauer (Tohoku University)

■ Participants: 117

■ Invited Researchers

- Helen Gomonay (National Technical University, Ukraine and JGU)
- Axel Hoffmann (Argonne National Laboratory)
- Tomas Jungwirth (Academy of Sciences, Czech Republic)
- Mathias Klauui (University of Mainz)
- Dazhi Hou (Tohoku University)
- Allan MacDonald (University of Texas at Austin)
- Sadamichi Maekawa (JAEA)
- Takahiro Moriyama (Kyoto University)
- Naoto Nagaosa (RIKEN and University of Tokyo)
- Qian Niu (University of Texas at Austin)
- Stuart Parkin (Max Planck Institute - Halle/Saale)
- Takuya Satoh (Kyushu University)
- Jairo Sinova (University of Mainz)
- Gen Tatara (RIKEN)
- Oleg Tchernyshyov (JHU)
- Yaroslav Tserkovnyak (UCLA)
- Maxim Tsoi (University of Texas at Austin)
- Xavier Waintal (CEA Grenoble)

■ Time Schedule

Monday, November 16, 2015: all talks 25 mins + 5 mins for questions

- 09:20 Opening remarks (Oleg Tretiakov)
- 09:30 Axel Hoffmann (Argonne National Laboratory)  
**Spin Currents in Antiferromagnets**
- 10:00 Joseph Barker (IMR, Tohoku University)  
**Antiferromagnetic Skyrmions**
- 10:30 - 11:00 Coffee break
- 11:00 Tomas Jungwirth (Academy of Sciences, Czech Republic)  
**Antiferromagnetic spintronics**
- 11:30 Helen Gomonay (National Technical University, Ukraine and JGU)  
**Spinning of spins: ferro- vs antiferromagnetic spintronics**
- 12:00 Sadamichi Maekawa (JAEA)  
**Spin Hall Effects due to Critical Spin Fluctuations in Spin Glass and Other Magnetic States**
- 12:30 - 14:00 Lunch break
- 14:00 Maxim Tsoi (University of Texas at Austin)  
**Interconnections between magnetic state and transport currents in antiferromagnetic Sr<sub>2</sub>IrO<sub>4</sub>**

14:30 Allan MacDonald (University of Texas at Austin)

**Spin-Transfer and Antiferromagnets**

15:00 - 15:30 Coffee break

15:30 Oleg Tchernyshyov (JHU)

**Propulsion of a domain wall by magnons in an antiferromagnet**

16:00 Qian Niu (University of Texas at Austin)

**Spin pumping and spin-transfer torques in antiferromagnet**

16:30 - 18:30 Poster session

Tuesday, November 17, 2015

09:00 Takuya Satoh (Kyushu University)

**Optical control of antiferromagnetism**

09:30 Jairo Sinova (University of Mainz)

**Relativistic spin-orbit torques in anti-ferromagnets and related effects**

10:00 - 10:30 Coffee break

10:30 Naoto Nagaosa (RIKEN and University of Tokyo)

**Magnetism and transport in topological insulators**

11:00 Gen Tatara (RIKEN)

**Thermal vector potential theory of transport induced by temperature gradient**

11:30 Takahiro Moriyama (Kyoto University)

**Anti-damping spin transfer torque through antiferromagnet**

12:00 - 13:30 Lunch break

13:30 Xavier Waintal (CEA Grenoble)

**Ultrafast pulses, spin torque and artificial antiferromagnets**

14:00 Yaroslav Tserkovnyak (UCLA)

**Collective spin transport through antiferromagnets**

14:30 Stuart Parkin (Max Planck Institute - Halle/Saale)

**Facet-dependent giant spin orbit torque in single crystalline antiferromagnetic Ir-Mn / ferromagnetic permalloy bilayers**

15:00 - 15:30 Coffee break

15:30 Mathias Klauui (University of Mainz)

**Spin Currents in Antiferromagnets and Ferrimagnets**

16:00 Dazhi Hou (Tohoku University)

**Electric probe for spin transition and fluctuation**

16:30 - 16:40 Closing remarks (Allan MacDonald)

19:00 Banquet

**[Event] International Workshop : Spintronics (13th RIEC International Workshop on Spintronics)**

■ Date: Wednesday, November 18, 2015 - Friday, November 20, 2015

■ Venue: Conference Room, Laboratory for Nanoelectronics and Spintronics, Research Institute of Electrical Communication, Katahira Campus, Tohoku University

■ Event Organizer

- Hideo Ohno (Tohoku University)

■ Participants: 185

■ Invited Researchers

- Johan Åkerman (University of Gothenburg)

- David Awschalom (University of Chicago)
- Geoffrey Beach (Massachusetts Institute of Technology)
- Tomasz Dietl (Polish Academy of Sciences)
- Claudia Felser (Max Planck Institute for Chemical Physics of Solids)
- Shunsuke Fukami (Tohoku University)
- Julie Grollier (Université Paris-Sud)
- Masamitsu Hayashi (National Institute for Materials Science)
- Burkard Hillebrands (TU Kaiserslautern)
- Masashi Kawasaki (University of Tokyo)
- Charles Lambert (Université de Lorraine)
- Aurélien Manchon (King Abdullah University of Science and Technology)
- Shigemi Mizukami (Tohoku University)
- Teruo Ono (Kyoto University)
- Mikihiro Oogane (Tohoku University)
- Stuart Parkin (IBM)
- Masafumi Shirai (Tohoku University)
- Andrei Slavin (Oakland University)
- Gen Tatara (RIKEN)
- Kang Wang (University of California, Los Angeles)
- Dieter Weiss (Universität Regensburg)
- Masafumi Yamamoto (Hokkaido University)

#### ■ Time Schedule

Wednesday, November 18, 2015

- 08:15 - 09:00 Registrations  
 09:00 - 09:15 Hideo Ohno (Organizer, Tohoku University)  
**Opening**  
 09:15 - 10:00 Stuart Parkin (Max Planck Institute of Microstructure Physics, Martin Luther University Halle-Wittenberg)  
**Racetrack Memory: ready for take-off!**  
 10:00 - 10:20 Gen Tatara (RIKEN Center for Emergent Matter Science)  
**Spin electromagnetic field induced by Rashba interaction**  
 10:20 - 10:50 Break  
 10:50 - 11:20 Aurelien Manchon (King Abdullah University of Science and Technology)  
**Spin-Orbit Torques in Novel Materials**  
 11:20 - 11:40 Mikihiro Oogane (Tohoku University)  
**Tunnel magneto resistance effect in MTJs with Mn-based ordered alloys**  
 11:40 - 11:50 Photo  
 11:50 - 14:00 Lunch  
 14:00 - 14:30 Burkard Hillebrands (Technische Universität Kaiserslautern)  
**Novel transport phenomena using magnonic Bose-Einstein condensates**  
 14:30 - 14:50 Shigemi Mizukami (Tohoku University)  
**Laser-induced spin-wave propagation in magnetic films**  
 14:50 - 15:20 Johan Åkerman (University of Gothenburg, KTH Royal Institute of Technology)  
**Topological and non-topological dynamical solitons in spin torque and spin hall effect driven nano-oscillators**  
 15:20 - 15:50 Break  
 15:50 - 16:20 Claudia Felser (Max Planck Institute Chemical Physics of Solids)  
**Magnetism in Mn-rich Heusler compounds**

- 16:20 - 16:40 Masafumi Yamamoto (Hokkaido University)  
**Half-metallic Heusler alloys as spin sources of spintronic devices**  
 16:40 - 17:00 Masafumi Shirai (Tohoku University)  
**Electronic Structure at Interfaces between Heusler alloys and MgO**

Thursday, November 19, 2015

- 09:00 - 09:45 David Awschalom (University of Chicago)  
**Quantum Technologies Based on Spins in Semiconductors**  
 09:45 - 10:15 Dieter Weiss (University of Regensburg)  
**Transport and magnetocapacitance in HgTe-based topological insulators**  
 10:15 - 10:45 Break  
 10:45 - 11:15 Kang L. Wang (University of California, Los Angeles)  
**Topological Insulators: Quantum Anomalous Hall and Spintronics**  
 11:15 - 11:35 Shunsuke Fukami (Tohoku University)  
**Spin-orbit torque switching for three-terminal spintronic devices**  
 11:35 - 11:55 Teruo Ono (Kyoto University)  
**Orbital Magnetism on the Dzyaloshinskii-Moriya Interaction**  
 11:55 - 14:00 Lunch  
 14:00 - 14:30 Andrei Slavin (Oakland University)  
**Mechanism of a spin current transformation in an antiferromagnetic insulator**  
 14:30 - 15:00 Tomasz Dietl (Polish Academy of Sciences, University of Warsaw, Tohoku University)  
**Spin-spin interactions in topological materials doped with transition metals**  
 15:00 - 15:30 Masashi Kawasaki (University of Tokyo)  
**Quantum Anomalous Hall Effect in Topological Insulator Heterostructures**  
 15:30 - 17:30 Poster Session  
 17:30 - 18:00 Transfer  
 18:00 - 20:00 Banquet

Friday, November 20, 2015

- 09:00 - 09:30 Geoffrey Beach (Massachusetts Institute of Technology)  
**Spin orbit torques and chiral spin textures in ultrathin magnetic films**  
 09:30 - 09:50 Masamitsu Hayashi (National Institute for Materials Science)  
**Electrically and thermally generated spin current in heavy metals**  
 09:50 - 10:20 Break  
 10:20 - 10:50 Charles Lambert (Université de Lorraine)  
**All-Optical Helicity-Dependent Switching in Spintronic Devices**  
 10:50 - 11:20 Julie Grollier (Université Paris Sud)  
**Nanodevices for bio-inspired computing**  
 11:20 - 11:35 Closing

#### [Event] International Workshop : Spintronics VLSI

- Date: Friday, November 20, 2015 - Saturday, November 21, 2015
- Venue: Conference Room, Laboratory for Nanoelectronics and Spintronics, Katahira Campus, Tohoku University
- Event Organizers
  - Tetsuo Endoh (Tohoku University)
  - Hideo Ohno (Tohoku University)
- Participants: 79
- Invited Researchers
  - Seung H. Kang (Qualcomm)
  - Sechung Oh (Samsung Electronics)
  - Yiming Huai (Avalanche)
  - Kang L Wang (UCLA)
  - Hiroaki Yoda (Toshiba)
  - Ricardo C. Sousa (Spintec)
  - Koji Nii (Renesas Electronics)
  - Takahiro Hanyu (Tohoku University)
  - Hiroki Koike (Tohoku University)
- Time Schedule
 

Friday, November 20, 2015

14:00 - 14:20 Hideo Ohno (Tohoku University)

#### Opening remarks

- Chair: Tetsuo Endoh (Tohoku University)  
 14:20 - 15:00 Kang L Wang (UCLA)  
**Invited talk 1: Low Dissipation Spin-Orbitronics Systems**  
 15:00 - 15:40 Hiroaki Yoda (Toshiba)  
**Invited talk 2: The Progresses of MRAM, the Effect on Energy saving, and The Key to it**  
 15:40 - 16:10 Group Photo & Break  
 Chair: Tetsuo Endoh (Tohoku University)  
 16:10 - 16:50 Yiming Huai (Avalanche)  
**Invited talk 3: Fully Functional 64Mb pMTJ STT-MRAM Chips on 300mm Wafers**  
 16:50 - 17:30 Sechung Oh (Samsung)  
**Invited talk 4: Recent advances of STT-MRAM for emerging memory Devices**

Saturday, November 21, 2015

Chair: Takahiro Hanyu (Tohoku University)

10:30 - 11:10 Koji Nii (Renesas Electronics)

**Invited talk 5: Overview of embedded SRAM/DRAM, and prospect of STT-MRAM technology for advanced SoC solutions**

11:10 - 11:50 Seung H. Kang (Qualcomm)

**Invited talk 6: Emergence of STT-MRAM as a Unified Embedded Memory for Internet-of-Things**

11:50 - 14:00 Lunch

Chair: Takahiro Hanyu (Tohoku University)

14:00 - 14:40 Hiroki Koike (Tohoku University)

**Invited talk 7: High-Density and Low-Power Applications of Spintronics Circuits: High-Density 1T1MTJ-MRAM Array Design, and Low-Power 4T2MTJ-MRAM-based Pattern Recognition Processor**

14:40 - 15:20 Ricardo C. Sousa (Spintec)

**Invited talk 8: MRAM for hybrid CMOS/Magnetic electronics: perpendicular anisotropy and integrated logic concepts**

Chair: Tetsuo Endoh (Tohoku University)

15:20 - 16:00 Takahiro Hanyu (Tohoku University)

**Invited talk 9: Spintronics-Based Logic-in-Memory Architecture Towards Dark Silicon Era**

16:00 - 16:10 Tetsuo Endoh (Tohoku University)

**Closing remarks**

#### [Event] International Workshop: Spin Energy Materials

■ Date: Thursday, December 3, 2015 - Friday, December 4, 2015

■ Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University

■ Event Organizers

- Masaki Mizuguchi (Tohoku University)
- Ryo Iguchi (Tohoku University)
- Gerrit Bauer (Tohoku University)
- Ken-ichi Uchida (Tohoku University)
- Kentaro Nomura (Tohoku University)
- Eiji Saitoh (Tohoku University)
- Koki Takanashi (Tohoku University)
- Shinichi Orimo (Tohoku University)

■ Participants: 49

■ Invited Speakers

- Felix Casanova (NanoGUNE)
- Oliver Klein (CEA-IRAMIS)
- Roberto Myers (Ohio State University)
- Ke Xia (Beijing Normal University)
- Joseph Barker (Tohoku University)
- Dazhi Hou (Tohoku University)
- Akihiro Kirihara (NEC)
- Takashi Kimura (Kyushu University)
- Hiroshi Kohno (Nagoya University)
- Sadamichi Maekawa (JAEA)
- Akira Oiwa (Osaka University)
- Rafael Ramos (Tohoku University)
- Gen Tatara (RIKEN)
- Koji Usami (University of Tokyo)
- Takehito Yokoyama (Tokyo Institute of Technology)

■ Time Schedule

Thursday, December 3, 2015

12:00 Reception open

13:00 Opening remark

13:10 Roberto Myers (Ohio State University)

**Lateral spin diffusion in Yttrium Iron Garnet**

14:00 Oliver Klein (SPINTEC)

**Influence of the inhomogeneous broadening on spin transfer effects**

14:50 Break (30 min.)

15:20 Sadamichi Maekawa (JAEA)

**"Spin and Heat"**

16:00 Koji Usami (University of Tokyo)

**Bidirectional conversion between microwave and light via ferromagnetic magnons**

16:40 Gen Tatara (RIKEN)

**Thermal vector potential theory of magnetization dynamics driven by a temperature gradient**

17:20 Takashi Kimura (Kyushu University)

**Geometry and material optimization for efficient thermal spin injection**

18:00 Transfer to Conference Dinner

19:00 Conference Dinner

Friday, December 4, 2015

08:00 Reception open

08:30 Felix Casanova (NanoGUNE)

**Spin-dependent transport in metallic/ferromagnetic insulator hybrid devices**

09:20 Ke Xia (Beijing Normal University)

**First principles calculations of Spin Seebeck Torques**

10:10 Break (30 min.)

10:40 Joseph Barker (Tohoku University)

**The role of spin wave polarisation in the spin Seebeck effect**

11:20 Akihiro Kirihara (NEC)

**Thermoelectric converter based on the spin Seebeck effect**

12:00 Lunch break

13:30 Rafael Ramos (Tohoku University)

**Unexpected enhancement of the longitudinal spin-Seebeck effect in magnetic multilayers**

14:10 Dazhi Hou (Tohoku University)

**Observation of temperature gradient induced magnetization**

14:50 Break (20 min.)

15:10 Hiroshi Kohno (Nagoya University)

**Microscopic Theory of Thermally-Induced Spin Torques**

15:50 Takehito Yokoyama (Tokyo Institute of Technology)

**Chiral transport and current-induced magnetization in chiral systems**

16:30 Akira Oiwa (Osaka University)

**Conversion from single photons to single electron spins using quantum dots**

■ Supported by:

- Collaborative Research Center on Energy Materials (E-IMR)
- International Collaboration Center of IMR (ICC-IMR)
- ERATO Spin Quantum Rectification (ERATO-SQR)

#### [Seminar] Special Seminars by Prof. Mauro Ferreira and Prof. Wolfgang Belzig

■ Date and time: Thursday, September 24, 2015 14:00 - 16:00

■ Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University

■ The Lectures

Prof. Mauro Ferreira, Trinity College Dublin

**Friedel oscillations in graphene: from flawed DFT calculations to sublattice segregation of dopants**

Prof. Wolfgang Belzig, University of Konstanz

**Cooling a nanomechanical resonator using spin-dependent and superconducting electron transport**

#### [Seminar] Special Seminar by Prof. Bart van Wees

- Date and time: Thursday, October 29, 2015 14:00 - 15:30
- Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University
- The lecture  
Bart van Wees (Groningen University)  
**Spintronics with the ferromagnetic insulator YIG and its sandwich with graphene**

#### [Seminar] Special Seminars by Prof. Axel Hoffmann, Assistant Prof. Mikhail Titov and Prof. Xavier Waintal

- Date and time: Thursday, November 26, 2015 14:00 - 16:30
- Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University
- Speakers
  - Axel Hoffmann (Argonne National Laboratory)
  - Mikhail Titov (Radboud University Nijmegen)
  - Xavier Waintal (CEA Grenoble)
- Time Schedule
  - 14:00 - Thierry Valet (SPICE Center, Johannes Gutenberg University, Mainz)
  - 14:45 - **Manipulating Room Temperature Magnetic Skyrmions**  
Mikhail Titov (Radboud University Nijmegen)
  - Anomalous Hall effect due to skew scattering on rare impurity configurations**
  - 15:30 - Xavier Waintal (CEA Grenoble)
  - Not Russian? Teach your computer how to calculate Feynman diagrams for you**

#### [Seminar] Special Seminars by Prof. Thierry Valet and Prof. Helen Gomonay

- Date and time: Tuesday, December 1, 2015 14:00 - 15:30
- Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University
- Speakers
  - Thierry Valet (SPICE Center, Johannes Gutenberg University, Mainz)
  - Helen Gomonay (SPICE Center, Johannes Gutenberg University, Mainz)
- Time Schedule
  - 14:00 - Thierry Valet (SPICE Center, Johannes Gutenberg University, Mainz)
  - 14:45 - **Spectral Methods for Micro-magnetic Simulations**  
Helen Gomonay (SPICE Center, Johannes Gutenberg University, Mainz)
  - Berry-phase effects in noncollinear antiferromagnets**

Thematic Program 2015 | Program Code: 2015INE

## The Effects of Technological Changes on Social Mobility and Income Distribution

#### [Event] Follow-up Seminars on Technological Change and Income Distribution

- Date: Monday, September 28, 2015
- Venue: The 3rd Lecture Room, 1F, Graduate School of Economics and Management, Kawauchi South Campus, Tohoku University
- Invited Researchers
  - Antonio D'Agata (University of Catania)
  - Jun Matsuyama (University of Toyama)
- Participants: 8
- Time Schedule
  - Monday, September 28, 2015
    - 10:00 - 12:00 Antonio D'Agata (University of Catania)
    - Kenji Mori (Tohoku University)
    - 13:00 - 14:30 **An Analytical Foundation of the Classical View of Long-Period Prices with Differential Profit Rates**  
Jun Matsuyama (University of Toyama)
    - Poverty Measurement from a Multidimensional Perspective**
    - 14:30 - 16:00 Takahiko Kan (Tohoku University)
    - A Game-Theoretic Reinterpretation of the Theory of Moral Sentiments**

#### [Event] Seminar series on Economic Inequalities and Economic Crises – History and Theory

- Date:
  - Every Monday, October 19, 2015 - December 7, 2015, at 14:40 - 17:50
  - October 19, 2015 at 14:40 - 17:50
  - October 26, 2015 at 14:40 - 17:50
  - November 2, 2015 at 14:40 - 17:50
  - November 9, 2015 at 14:40 - 17:50
- Venue: The 3rd Small Lecture Room, Multidisciplinary Research Building, Kawauchi South Campus, Tohoku University
- Instructor: Michael R. Krätke (Lancaster University)

#### [Event] Workshop on Analytical Political Economy

- Date: Tuesday, November 24, 2015 - Wednesday, November 25, 2015
- Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University
- Invited Researchers
  - Amitava Dutt (University of Notre Dame)
  - Simon Mohun (Queen Mary University of London)
  - Soon Ryoo (Adelphi University)
  - Gilbert Skillman (Wesleyan University)
  - Peter Skott (University of Massachusetts Amherst)
  - Soh Kaneko (Keio University)
  - Takashi Ohno (Doshisha University)
  - Hiroaki Sasaki (Kyoto University)
- Event Organizer
  - Kazuhiro Kurose (Tohoku University)
- Participants: 18
- Time Schedule
  - Tuesday, November 24
    - 08:50 - 09:00 Opening Address
    - 09:00 - 10:00 Naoki Yoshihara (Hitotsubashi University)
    - Technical Change, Capital Accumulation, and Distribution**

- 10:10 - 11:10 Simon Mohun (Queen Mary University of London)  
**Social Democracy and Distributive Conflict in the UK, 1950-2012**
- 11:20 - 12:20 Soh Kaneko (Keio University)  
**On the Existence and Characterization of Unequal Exchange in the Dynamic Free Trade Equilibrium with Non-Constant Prices**
- 12:20 - 13:20 Lunch Meeting
- 13:20 - 14:20 Kazuhiro Kurose (Tohoku University)  
**On the Ricardian Invariable Measure of Value in General Convex Economies**
- 14:30 - 15:30 Gilbert Skillman (Wesleyan University)  
**Domination and Exploitation in Economic Relationships: The Contingent Role of Wealth Inequality**
- Wednesday, November 25, 2015
- 10:00 - 11:00 Amitava Dutt (University of Notre Dame)  
**Growth and Distribution with Exogenous Autonomous Demand Growth and Normal Capacity Utilization**

- 11:10 - 12:10 Takashi Ohno (Doshisha University)  
**Capital-Labor Conflict in the Harrodian Model**
- 12:10 - 13:30 Lunch Meeting
- 13:30 - 14:30 Hiroaki Sasaki (Kyoto University)  
**Differences in Wage-Determination Systems between Regular and Non-Regular Employment in a Kaleckian Model**
- 14:40 - 15:40 Soon Ryoo (Adelphi University)  
**The Top Income Share, the Top Wealth Share and the Wealth-Income Ratio in a Two-Class Corporate Economy**
- 15:40 - 16:10 Coffee Break
- 16:10 - 17:10 Peter Skott (University of Massachusetts Amherst)  
**Notes on Wage-Profit Led Growth**
- 17:10 - 17:15 Closing Address

#### [Event] Workshop on Globalization and Youth Labour Market

■ Date: Sunday, December 6, 2015 - Saturday, December 12, 2015

■ Invited Researcher

- Mary Brinton (Harvard University)

■ Event Organizer

- Yoshimichi Sato (Tohoku University)

■ Participants: 15

■ Time Schedule

- **Workshop on Globalization and Youth Labour Market**

Date and time: Tuesday, December 8, 2015 10:30 - 12:00

Venue: Seminar Room 605, Graduate School of Arts and Letters, Kawauchi South Campus, Tohoku University

- **Workshop on International Comparison of Gender, Fertility and Happiness**

Date and time: Thursday, December 10, 2015 10:30 - 12:00

Venue: Main Meeting Room, 4F, Graduate School of Economy and Management, Kawauchi South Campus, Tohoku University

- **Quattro Seminars on Humanities and Social Sciences, URA and Tohoku Forum for Creativity Collaboration Project, Tohoku University — “The Effects of Globalization on Youth Labour Market and Educational Inequality”**

Date and time: Friday, December 11, 2015 16:20 - 17:50

Venue: Middle Conference Room, 11F, New Humanities Building, Kawauchi South Campus, Tohoku University

#### [Event] Workshop on Globalization and Educational Inequality

■ Date: Wednesday, December 9, 2015 - Wednesday, December 16, 2015

■ Invited Researcher

- Hyunjoon Park (University of Pennsylvania)

■ Event Organizer

- Yoshimichi Sato (Tohoku University)

■ Participants: 15

■ Time Schedule

- **Workshop on International Comparison of Gender, Fertility and Happiness**

Date and time: Thursday, December 10, 2015 10:30 - 12:00

Venue: Main Meeting Room, 4F, Graduate School of Economy and Management, Kawauchi South Campus, Tohoku University

- **Quattro Seminars on Humanities and Social Sciences, URA and Tohoku Forum for Creativity Collaboration Project, Tohoku University — “The Effects of Globalization on Youth Labour Market and Educational Inequality”**

Date and time: Friday, December 11, 2015 16:20 - 17:50

Venue: Middle Conference Room, 11F, New Humanities Building, Kawauchi South Campus, Tohoku University

- **Workshop on Globalization and Educational Inequality**

Date and time: Monday, December 14, 2015 13:00 - 14:00

Venue: Seminar Room 807, Graduate School of Arts and Letters, Kawauchi South Campus, Tohoku University

#### [Special Event] Workshop on International Comparison of Gender, Fertility and Happiness

■ Date and time: Thursday, December 10, 2015 10:30 - 12:00

■ Venue: Main Meeting Room, 4F, Graduate School of Economics and Management, Kawauchi South Campus, Tohoku University

■ Speaker

- Hiroshi Yoshida (Director of the Research Center for Aged Economics and Society, Graduate School of Economy and Management, Tohoku University)

■ Commentators

- Mary Brinton (Harvard University)
- Hyunjoon Park (University of Pennsylvania)
- Michael Krätke (Lancaster University)

■ Event Organizer

- Hiroshi Yoshida (Tohoku University)

■ Supported by:

- Graduate School of Economics and Management, Tohoku University
- The Research Center for Aged Economy and Society
- Special Seminar on Society and Economy
- Special Seminar on Health and Welfare Policy

# Other Activities

## TOKYO ELECTRON House of Creativity Inauguration Ceremony

- Date: Tuesday, May 12, 2015  
 Completion ceremony 15:00 - 17:00  
 Private viewing 17:00 - 17:10  
 Exchange meeting 17:20 - 19:00
- Venue: TOKYO ELECTRON House of Creativity, Tohoku University
- Program MC: Prof. Yoshiaki Maeda, Vice Director of Tohoku Forum for Creativity  
 Address from Prof. Susumu Satomi, President of Tohoku University  
 Address from Prof. Sadayoshi Ito, Director of Tohoku Forum for Creativity and Executive Vice President (for Research)
- Addresses from special guests
  - Mr. Tetsuro Higashi, Chairman, President & CEO of TOKYO ELECTRON
  - Mr. Toshiyuki Suzuki, Director of Scientific Research Aid Division, Research Promotion Bureau, MEXT

- Mr. Naoshi Itou, Presiding Director of Miyagi International Association
  - Mr. Akira Watanabe, Chairperson of Sendai Tourism, Convention and International Association
- Presentation of Letter of Appreciation

### Keynote Lectures

- 1) Prof. Nobuhiko Terui, Director of DSSR, Tohoku University  
 "Challenges for Big Data in our Society: Statistical Analysis of Large Scale, High Dimensional Data for Socio-Economic Problems"
- 2) Prof. Fumihiko Imamura, Director of IRIDeS, Tohoku University  
 "Recovery from the Great East Japan Earthquake and Tsunami: Future Strategies for Disaster Risk Reduction"
- 3) Prof. Masayuki Yamamoto, Executive Director of ToMMo, Tohoku University  
 "A Health Informatics Infrastructure for a New Era"

## German-Japanese bilateral research project, 2015: International Conference "Stochastic Analysis and Applications"

- Date: Monday, August 31, 2015 - Friday, September 4, 2015
- Venue: Sakura Hall, Katahira Campus, Tohoku University
- Hosted by: Mathematical Institute, Tohoku University
- Supported by:
  - Japan Society for the Promotion of Science (JSPS Kakenhi)
  - Tohoku Forum for Creativity
- Event Organizers
  - Shigeki Aida (Tohoku University)
  - Hiroshi Kawabi (Okayama University)
  - Seiichiro Kusuoka (Tohoku University)
  - Kazumasa Kuwada (Tokyo Institute of Technology)
  - Yuichi Shiozawa (Okayama University)
  - Masayoshi Takeda (Tohoku University)
- Speakers
  - Sebastian Andres (University of Bonn)
  - Martin Grothaus (TU Kaiserslautern)
  - Martin Hairer (University of Warwick)
  - Fumio Hiroshima (Kyushu University)
  - Walter Hoh (University of Bielefeld)
  - Martin Huesmann (University of Bonn)
  - Yuzuru Inahama (Nagoya University)
  - Naotaka Kajino (Kobe University)
  - Hiroshi Kawabi (Okayama University)
  - Panki Kim (Seoul National University)
  - Seiichiro Kusuoka (Tohoku University)
  - Kazumasa Kuwada (Tokyo Institute of Technology)
  - Kazuhiro Kuwae (Fukuoka University)
  - Xiangdong Li (Chinese Academy of Science)
  - Xue-Mei Li (University of Warwick)
  - Song Liang (University of Tsukuba)
  - Wolfgang Löhner (University of Duisburg-Essen)
  - Jun Masamune (Tohoku University)
  - Yukio Nagahata (Niigata University)
  - Nobuaki Naganuma (Tohoku University)
  - Makoto Nakashima (University of Tsukuba)
  - Stefan Neukamm (TU Dresden)
  - Max von Renesse (University of Leipzig)
  - Michael Röckner (University of Bielefeld)
  - Nikola Sandrić (TU Dresden)
  - Ichiro Shigekawa (Kyoto University)
  - Yuichi Shiozawa (Okayama University)
  - Karl-Theodor Sturm (University of Bonn)
  - Ryokichi Tanaka (Tohoku University)
  - Hideki Tanemura (Chiba University)
  - Gerald Trutnau (Seoul National University)
  - Masaki Wada (Tohoku University)

### Time Schedule

Monday, August 31, 2015

- 09:00 - 10:15 Registration
- 10:15 - 10:50 Michael Röckner (University of Bielefeld)  
**Infinite dimensional continuity and Fokker-Planck-Kolmogorov equations**
- 11:00 - 11:35 Ichiro Shigekawa (Kyoto University)  
**The logarithmic Sobolev inequality and the convergence of a semigroup in the Zygmund space**

- 11:45 - 12:20 Panki Kim (Seoul National University)  
**Minimal thinness for jump processes**
  - 12:20 - 13:40 Lunch break
  - 13:40 - 14:15 Jun Masamune (Tohoku University)  
**Variational convergence on Riemannian manifolds**
  - 14:25 - 15:00 Ryokichi Tanaka (Tohoku University)  
**Random walks on hyperbolic groups: entropy and speed**
  - 15:10 - 15:45 Xiangdong Li (Chinese Academy of Science)  
**W-entropy formulas and rigidity theorems on Wasserstein space over Riemannian manifolds**
  - 16:05 - 16:40 Kazumasa Kuwada (Tokyo Institute of Technology)  
**A dimensional Wasserstein contraction characterizing the curvature-dimension condition**
  - 16:50 - 18:30 Poster session
  - 18:30 - Banquet
- Tuesday, September 1, 2015
- 10:15 - 10:50 Kazuhiro Kuwae (Fukuoka University)  
**Analytic characterization of gaugeability for generalized Feynman-Kac functionals and its applications**
  - 11:00 - 11:35 Nikola Sandrić (Technical University of Dresden and University of Zagreb)  
**Long-time behavior of Lévy-type processes: transience, recurrence and ergodicity**
  - 11:45 - 12:20 Masaki Wada (Tohoku University)  
**Large time asymptotics of Feynman-Kac functionals for symmetric  $\alpha$ -stable processes**
  - 12:20 - 13:40 Lunch break
  - 13:40 - 14:15 Yuichi Shiozawa (Okayama University)  
**Escape rate of symmetric Markov processes**
  - 14:25 - 15:00 Walter Hoh (University of Bielefeld)  
**Markov processes with jumps and nonlocal generators**
  - 15:10 - 15:45 Hideki Tanemura (Chiba University)  
**Systems of infinitely many Brownian motions with long ranged interaction**
  - 16:05 - 16:40 Martin Grothaus (Technical University of Kaiserslautern)  
**On the stochastic heat equation with sticky reflected boundary condition**
  - 16:50 - 17:25 Song Liang (University of Tsukuba)  
**Stochastic Newton equation with absorbing area**
- Wednesday, September 2, 2015
- 09:30 - 10:05 Naotaka Kajino (Kobe University)  
**Localized upper bounds of heat kernels for diffusions via a multiple Dynkin Hunt formula**
  - 10:15 - 10:50 Sebastian Andres (University of Bonn)  
**Heat kernel estimates for random walks with degenerate weights**
  - 11:00 - 11:35 Makoto Nakashima (University of Tsukuba)  
**Phase transitions of random walk pinning model**
  - 11:45 - 12:20 Stefan Neukamm (Technical University of Dresden)  
**A regularity theory for elliptic systems with random coefficients**
  - 12:20 - Lunch break
  - Excursion
  - 18:30 - Conference dinner

Thursday, September 3, 2015

- 10:15 - 10:50 **Free discussion**
- 11:00 - 11:35 Fumio Hiroshima (Kyushu University)  
**Quantum field theory by Gibbs measures on cadlag path space**
- 11:45 - 12:20 Martin Huesmann (University of Bonn)  
**The geometry of multi marginal Skorokhod embedding**
- 12:20 - 13:40 Lunch break
- 13:40 - 14:15 Xue-Mei Li (University of Warwick)  
**Stochastic homogenization in geometry**
- 14:25 - 15:00 Yukio Nagahata (Niigata University)  
**Spectral gap for surface diffusion**
- 15:10 - 15:45 Gerald Trutnau (Seoul National University)  
**Recurrence criteria for diffusion processes generated by divergence free perturbations of non-symmetric energy forms**
- 16:05 - 16:40 Hiroshi Kawabi (Okayama University)  
**Functional CLTs for non-symmetric random walks on crystal lattices**
- 16:50 - 17:25 Wolfgang Löhner (University of Duisburg-Essen)  
**Invariance principle for variable speed random walks on trees**

Friday, September 4, 2015

- 09:30 - 10:05 Max von Renesse (University of Leipzig)  
**Modified Arratia flow and Wasserstein diffusion**
- 10:15 - 10:50 Nobuaki Naganuma (Tohoku University)  
**Error analysis for approximations to one-dimensional SDEs via perturbation method**
- 11:00 - 11:35 Yuzuru Inahama (Nagoya University)  
**Large deviations for rough path lifts of Donsker-Watanabe's delta functions**
- 11:45 - 12:20 Martin Hairer (University of Warwick)  
**Modelling a random rubber band**
- 12:20 - 13:40 Lunch break
- 13:40 - 14:15 Seiichiro Kusuoka (Tohoku University)  
**Continuity and bounds of the density functions of the solutions to pathdependent stochastic differential equations**
- 14:25 - 15:00 Karl-Theodor Sturm (University of Bonn)  
**Optimal transport, Brownian motion, and super-Ricci flow for metric measure spaces**

■ Poster Session

Monday, August 31, 2015 16:50 - 18:30

- Yoshihiro Abe (Kyoto University)  
**Maximum and minimum of local times for two-dimensional random walk**

- Takafumi Amaba (Ritsumeikan University)  
**Convergence implications via dual flow method**
- Syota Esaki (Tokyo Institute Technology)  
**Infinite particle systems of long range jumps with long range interactions**
- Torben Fattler (Technical University of Kaiserslautern)  
**Disease spreading models within the framework of two-component configuration spaces in continuum**
- Julian Hollender (Technical University of Dresden)  
**Unbounded viscosity solutions of non-dominated HJB-equations**
- Masato Hoshino (University of Tokyo)  
**KPZ equation with fractional derivatives of white noise**
- Yu Ito (Osaka University)  
**Integration of controlled rough paths via fractional calculus**
- Yosuke Kawamoto (Kyushu University)  
**Finite particle approximation of interacting Brownian motion**
- Kyung-young Kim (Seoul National University)  
**Heat kernel estimates for symmetric Markov processes in  $C^{1,\alpha}$  open sets and its application**
- Eva Kopfer (University of Bonn)  
**Minimizing movement scheme for time dependent metrics on probability space**
- Franziska Kühn (Technical University of Dresden)  
**Existence and estimates of moments for Lévy-type processes**
- Katharina von der Lühe (University of Bielefeld)  
**Pathwise uniqueness for SDEs with non-regular drift and nonconstant diffusion**
- Yusuke Miura (Tohoku University)  
**The conservativeness of Girsanov transformed symmetric Markov processes**
- Chikara Nakamura (Kyoto University)  
**Lamplighter random walks on fractals**
- Izumi Okada (Tokyo Institute of Technology)  
**Geometry structures of favorite sites of random walk range**
- Kohei Suzuki (Kyoto University)  
**Convergence of Brownian motions on  $RCD^*(K, N)$  spaces**
- Robert Voßhall (Technical University of Kaiserslautern)  
**Interacting particle systems with sticky boundary**
- Melchior Wirth (Friedrich Schiller University Jena)  
**Diffusion determines the recurrent graph**
- Lu Xu (University of Tokyo)  
**Central limit theorem for stochastic heat equations in random environments**

**Falling Walls Lab Sendai 2015**

- Date and time: Friday, September 4, 2015 13:00 -19:20
- Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University
- Hosted by: Tohoku University
- In association with: Tohoku Forum for Creativity
- Supported by: Tokyo Electron Limited
- Participants: about 70
- Time Schedule
  - 13:00 - 13:15 Welcome and introductory remarks
  - 13:15 - 14:00 Presentations (scholar presentations 1-9)
  - 14:00 - 14:15 Networking break

- 14:15 - 15:00 Presentations (scholar presentations 10-18)
- 15:00 - 15:15 Networking break
- 15:15 - 16:00 Presentations (scholar presentations 19-27)
- 16:00 - 16:15 Networking break
- 16:15 - 16:40 Presentations (scholar presentations 28-32)
- 16:40 - 17:20 Networking break (scholars)
- 17:20 - 19:20 Farewell Reception@1st floor, TOKYO ELECTRON House of Creativity (Jury: 16:40 - 17:45 evaluation) (17:45 - 18:05) (Award ceremony / Group picture)

**Special Lecture from the Nobel Laureate Dr. Koichi Tanaka (Lecture at Graduate Schools of Engineering, Tohoku University)**

- Date and time: Thursday, October 22, 2015 14:40 - 16:10
- Venue: 2nd floor, Center Hall, School of Engineering, Aobayama Campus, Tohoku University
- Hosted by: Graduate School of Engineering, Tohoku University

- Speaker: Dr. Koichi Tanaka (Fellow, Shimadzu Corporation, Nobel Laureate in Chemistry in 2002)
- Title: **An environment that enables interdisciplinary fusion research : An example from mass spectrometry**

**Sendai International Conference on Arithmetic Geometry in 2016**

- Date: Thursday, January 28, 2016 - Saturday, January 30, 2016
- Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University
- Hosted by:
  - Graduate School of Science, Tohoku University
  - Graduate School of Information Sciences, Tohoku University
- Supported by:
  - Japan Society for the Promotion of Science, Program for Advancing Strategic International Networks to Accelerate the Circulation of Talented Researchers
  - Tohoku Forum for Creativity, Tohoku University

- Speakers
  - Yoshinosuke Hirakawa (Keio University)
  - Ming-Lun Hsieh (National Taiwan University)
  - Chan-Ho Kim (Korea Institute for Advanced Study)
  - Shinichi Kobayashi (Tohoku University)
  - Tadashi Ochiai (Osaka University)
  - Kazuto Ota (Keio University)
  - Nobuo Tsuzuki (Tohoku University)
  - Shanwen Wang (Shanghai center for mathematical sciences, Fudan University)
  - Zhengyu Xiang (Shanghai center for mathematical sciences, Fudan University)
  - Fuetaro Yobuko (Tohoku University)



- Jeng-Daw Yu (National Taiwan University)
- Time Schedule
- Thursday, January 28, 2016
  - 09:00 - 09:30 Registration/Opening
  - 09:30 - 10:30 Kazuto Ota (Keio University)
    - Kato's Euler system and the Mazur-Tate refined conjecture of BSD type**
  - 11:00 - 12:00 Yoshinosuke Hirakawa (Keio University)
    - On the descent of certain modular Calabi-Yau varieties via the Cynk-Hulek construction**
  - 14:00 - 15:00 Fuetaro Yobuko (Tohoku University)
    - Quasi-Frobenius-splitting and lifting of Calabi-Yau varieties**
  - 15:30 - 16:30 Zhengyu Xiang (Shanghai Center for Mathematical Sciences, Fudan University)
    - On base change of family of  $p$ -adic automorphic forms**
- Friday, January 29, 2016
  - 10:00 - 11:00 Chan-Ho Kim (Korea Institute for Advanced Study)
    - On Gross points at infinite level**

- 11:15 - 12:15 Ming-Lun Hsieh (National Taiwan University)
  - On anticyclotomic  $p$ -adic  $L$ -functions for triple products**
- 14:00 - 15:00 Shinichi Kobayashi (Tohoku University)
  - Anticyclotomic Iwasawa theory for modular forms at non-ordinary primes**
- 15:30 - 16:30 Shanwen Wang (Shanghai Center for Mathematical Sciences, Fudan University)
  - Universal Kato's Euler system**
- 16:45 - 17:45 Tadashi Ochiai (Osaka University)
  - Local Bertini theorem and Euler system bound over Cohen-Macaulay deformation ring**
- Saturday, January 30, 2016
  - 10:00 - 11:00 Jeng-Daw Yu (National Taiwan University)
    - Spectral sequence in the degeneration of irregular Hodge filtrations**
  - 11:15 - 12:15 Nobuo Tsuzuki (Tohoku University)
    - Variation of Newton polygon of  $F$ -isocrystals and  $p$ -rank of a curve**
  - 12:15 - Free discussion

**Symposium: Mathematics can change the World: Report of the Survey on Co-operative Research between Mathematics and Other Research Fields**

- Date: Saturday, February 20, 2016
- Venue: Graduate School of Mathematical Sciences, University of Tokyo
- Hosted by: Tohoku Forum for Creativity, Tohoku University (Commissioned by the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) "Report of the Survey on Co-operative Research between Mathematics and Other Research Fields" )
- In association with: Graduate School of Mathematical Sciences, University of Tokyo
- Assisted by:
  - Research Center of Mathematics for Social Creativity Research Institute for Electronic Science, Hokkaido University
  - Graduate School of Science, Graduate School of Information Sciences, Tohoku University
  - Research Organization of Information and Systems, The Institute of Statistical Mathematics
  - Meiji Institute for Advanced Study of Mathematical Sciences
  - Waseda University Graduate School of Fundamental Science and Engineering
  - Research Institute for Mathematical Science, Kyoto University
  - Institute of Mathematics for Industry, Kyushu University
- Supported by:
  - The Mathematical Society of Japan
  - The Japan Society for Industrial and Applied Mathematics
- Program
- Part 1: **Why we need mathematics**
- MC: Tetsuji Tokihiro (Professor, Graduate School of Mathematical Sciences, University of Tokyo)
- 09:30 - 09:40 Opening Remarks・Guest Speech
  - Opening Remarks: Takashi Tsuboi (Dean, Graduate School of Mathematical Sciences, University of Tokyo)
  - Guest Speech: Guests from MEXT
    - Motoko Kotani (President of MSJ)
    - Shinichi Oishi (President of JSIAM)
- 09:45 - 10:45 Report ( I )
  - Background and purpose:
    - Activities for Mathematical innovation by MEXT**
    - Yasuhiro Awatsuji (Basic Research Promotion Division, Research Promotion Bureau, MEXT/UMI)
  - Survey Report to MEXT:
    - Situations in Japan and overseas countries regarding interdisciplinary fusion research using mathematics**
    - Yoshiaki Maeda (Vice Director of Tohoku Forum for Creativity,

- Tohoku University)
  - Nobuaki Obata (Professor, Graduate School of Information Sciences, Tohoku University)
  - Tamiki Komatsuzaki (Director of Research Center of Mathematics for Social Creativity, Research Institute for Electronic Science, Hokkaido University)
  - Reiko Miyaoka (Professor, Mathematical Institute, Graduate School of Science, Tohoku University)
- 11:00 - 12:30 Keynote Lectures: Needs to mathematics
  - Takeshi Yamada (Research Planning Section, NTT Communication Science Laboratories)
  - Yoh Iwasa (Professor, Faculty of Science, Kyushu University)
- Part 2: **How can we develop mathematical innovation?**
- MC: Masahiro Yamamoto (Professor, Mathematical Sciences, University of Tokyo)
- 14:00 - 14:50 Invited lecture
  - Industrial and applied mathematics in Korea: the present and the future**
  - Hyungju Park (President of NIMS, Director of IMU)
- 15:00 - 15:30 Report (II)
  - Recommendations to MEXT based on the findings of the survey
  - Discussions from the committee for mathematical innovation
- 15:40- 17:40 (Break 10min) Panel Discussion
  - How can mathematics contribute to society for the next ten years?**
  - Moderator: Hisashi Okamoto (Associate director, Research Institute for Mathematical Sciences, Kyoto University)
  - Panelists:
    - [Mathematics] Kazuyuki Aihara (Professor, Institute of Industrial Science, University of Tokyo)
    - Fuyuhiko Tanaka (Associate prof. Graduate School of Engineering Science, Osaka University)
    - Reiko Miyaoka (Professor, Mathematical Institute, Graduate School of Science, Tohoku University)
    - [Company] Akira Takada (Research Center, Asahi Glass Co., Ltd.)
    - [Other fields] Tetsuo Hatsuda (Research Group Director of iTHES)
    - [Media] Tatsuya Tsujimura (Editor, Kyodo News)
    - [Cooperation with the Society] Takashi Ikegawa (Career Adviser, Career Support Office, Graduate School of Mathematical Sciences, University of Tokyo)
- 17:40 - 17:45 Closing Remarks
  - Masayasu Mimura (Vice Director, Meiji Institute for Advanced Study of Mathematical Sciences (MIMS))
- 18:00 - Reception

**Quattro Seminars**

- The Sixth Seminar Thursday, April 30, 2015 16:30 - 18:00
  - Venue: Large Conference Room, 11F, New Humanities Building, Kawauchi South Campus, Tohoku University
  - Title: Recommendations for Qualitative Studies: Single-Case Research and Comparative Small-N Research
  - Speakers: Michi Fukushima (Professor, Graduate School of Economics and Management, Tohoku University)
  - Naoko Ohata (Postdoctoral Research Fellow, Japan Society for The Promotion of Science)
  - Participants: 44
- The Seventh Seminar Tuesday, May 19, 2015 16:30 - 18:30
  - Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University

- Title: Basis of Empire: Human Beings in State Formation Process of West Asia
- Speaker: Yui Arimatsu (Assistant Professor, Frontier Research Institute for Interdisciplinary Sciences, Tohoku University)
- Commentators: Nobuhiro Minaka (Professor, Graduate School of Agricultural and Life Sciences, University of Tokyo)
- Takehiko Matsugi (Professor, National Museum of Japanese History)
- Participants: 21
- The Eighth Seminar Tuesday, June 25, 2015 16:30 - 18:00
  - Venue: Large Conference Room, 11F, New Humanities Building, Kawauchi South Campus, Tohoku University
  - Title: Methodologies of Historical Studies in Humanities and Social Sciences

Speakers: Toshimitsu Kagohashi (Associate Professor, Graduate School of Arts and Letters, Tohoku University) / Taketo Fushimi (Associate Professor, Graduate School of Law, Tohoku University)

Participants: 30

- The Ninth Seminar Friday, September 18, 2015 16:30 - 18:00  
Venue: Large Conference Room, 11F, New Humanities Building, Kawauchi South Campus, Tohoku University  
Title: The Activities and Significance of the Interfaith Chaplain in Contemporary Japan  
Speaker: Yozo Taniyama (Associate Professor, Graduate School of Arts and Letters, Tohoku University)

Participants: 14

- The Tenth Seminar Friday, December 11, 2015 16:20 - 17:50  
Venue: Conference Room, 11F, New Humanities Building, Kawauchi

South Campus, Tohoku University

Title: Social Inequality in Post-industrial Society: Focusing on Gender, Youth Labour Market, Low Fertility, and Educational Inequality

Speakers: Mary Brinton (Harvard University)

Hyunjoon Park (University of Pennsylvania)

Participants: 37

- The Elventh Seminar Tuesday, January 12, 2016 16:30 -18:00  
Venue: Large Conference Room, 11F, New Humanities Building, Kawauchi South Campus, Tohoku University  
Title: Testing the Nuclear Stability-Instability Paradox using Synthetic Control Method  
Speaker: Benjamin E. Goldsmith (Associate Professor, Department of Government and International Relations, University of Sydney)

Participants: 9

#### Workshop - Why don't you realize to your ideas? -

- Hosted by:
  - incorporated nonprofit organization natural science
  - Tohoku University
- In association with:
  - Tohoku University Micro System Integration Center
  - Advanced Institute for Materials Research, Tohoku University (AIMR)
  - Tohoku Forum for Creativity, Tohoku University
  - Institute of Multidisciplinary Research for Advanced Materials, Tohoku University
  - The Japan Society of Applied Physics, Tohoku Chapter
- Venue: TOKYO ELECTRON House of Creativity 3F, Lecture Theater, Katahira Campus, Tohoku University

- Monday, January 18, 2016 19:00 - 21:00  
Title: Simple Data Acquisition with Arduino : Illuminance Sensor  
Speaker: Koichi Hiraoka (Graduate School of Frontier Biosciences, Osaka University)
- Monday, February 22, 2016 19:00 - 21:00  
Title: The Acquisition Process and Usefulness of Intellectual Property Rights  
Speaker: Hiroaki Sato (Tohoku Bureau of Economy, Trade and Industry, Director, Patent Office)
- Tuesday, March 22, 2016 19:00 - 21:00  
Title: Practical Use of Arduino : Wireless Communication by Bluetooth  
Speaker: Junpei Masuho (natural science, School of Engineering for 2nd year students, Tohoku University)

#### Support for Young Researchers

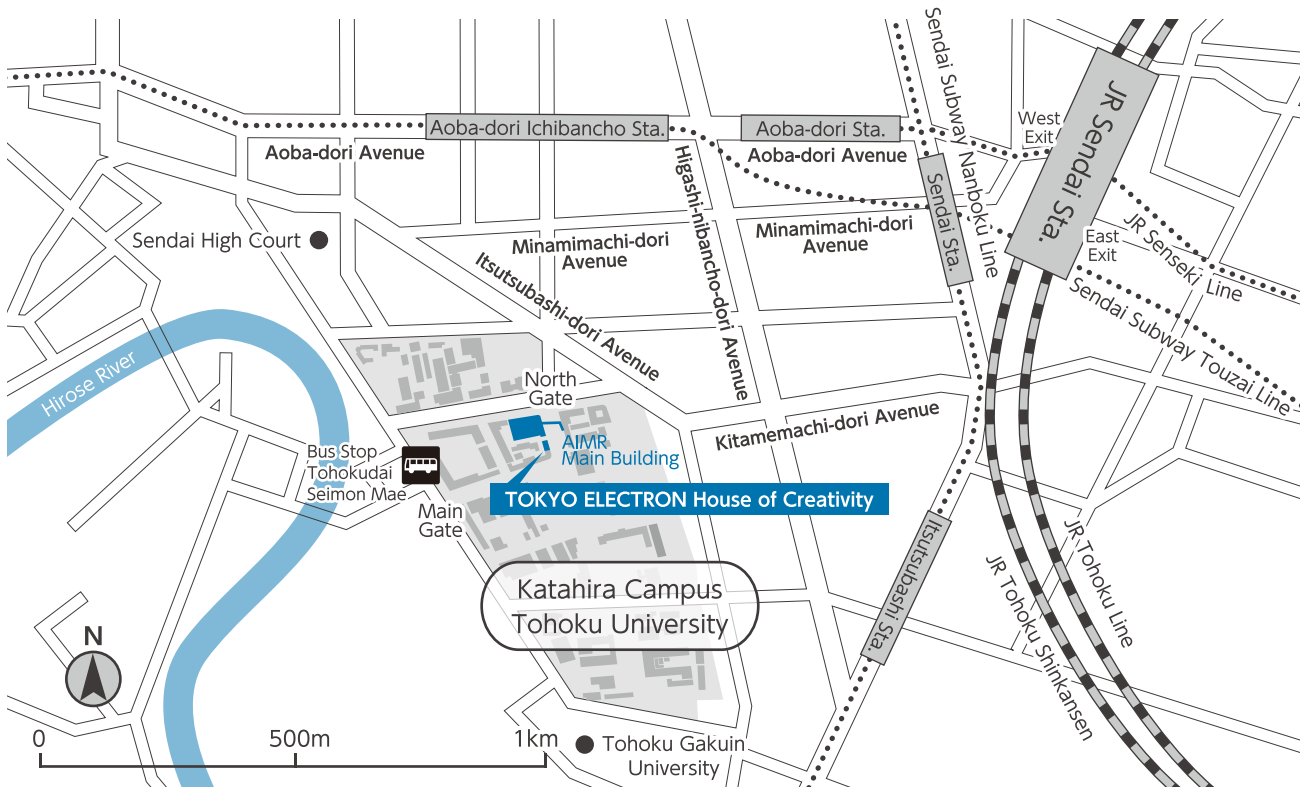
## Leading Young Researcher Overseas Visit Program Visitors List

Period	Name	Affiliation	Position	Visiting institute	Research theme
Jul. 15, 2014 Oct. 15, 2014	Kosuke Ino	Environmental Studies	Assistant Prof.	Harvard Medical School Brigham and Women's Hospital (USA)	Electrochemical devices for construction and evaluation of three-dimensional tissue organs
Jul. 31, 2014 Mar. 29, 2015	Hiroki Takikawa	FRIS	Assistant Prof.	Institute for Research in the Social Sciences, Stanford University (USA)	Mathematical sociology on mechanisms generating social inequality
Sep. 26, 2014 Sep. 21, 2015	Yohsuke Matsushita	Engineering	Associate Prof.	Loughborough University (UK)	Numerical simulation of pulverized coal combustion and gasification with Large Eddy Simulation
Oct. 06, 2014 Aug. 30, 2015	Koichiro Miyamoto	Engineering	Associate Prof.	Institute of Nano- and Biotechnologies Aachen University of Applied Sciences (Germany)	Development of novel analytical system by combining chemical image sensor and microfluidic device
Oct. 07, 2014 Mar. 28, 2015	Kazuki Takashima	RIEC	Assistant Prof.	Dept. Computer Science, University of Calgary (Canada)	Dynamic Space Formation for Interpersonal Communication with Productive Humanity
Mar. 01, 2015 Feb. 28, 2016	Tetsuji Aoyagi	Medicine	Lecturer	University of Michigan (USA)	IL-36 of Novel IL-1 Family Members in Acute Lung Injury and Acute Respiratory Distress Syndrome
Mar. 01, 2015 Feb. 29, 2016	Toshiya Takahashi	Tohoku Univ. Hospital	Clinical Fellow	University of California San Diego (USA)	The Recycle System of Organelle by Macroautophagy in Epidermal Development
Jun. 01, 2015 May 31, 2016	Takahisa Anada	Dentistry	Associate Prof.	Department of Orthopaedic Surgery, Stanford University (USA)	Development of a highly functional interface between biomaterials and cells for bone regenerative therapy
Sep. 26, 2015 Aug. 23, 2016	Hiroshi Naganuma	Engineering	Assistant Prof.	Unite Mixte de Physique CNRS/Thales (France)	Creation of interdisciplinary fusion fields by noble multiple cross correlation effects in multiferroic tunnel junctions
Jan. 16, 2016 Sep. 30, 2016	Shuichi Ogawa	IMRAM	Assistant Prof.	Fritz Haber Institute (Germany)	Development of the near-ambient photoelectron spectroscopy under water vapor condition and its application for oxidation kinetics at metal/semiconductor interface
Mar. 03, 2016 Feb. 28, 2017	Takafumi Fukushima	Engineering	Associate Prof.	University of California Los Angeles (USA)	A Study of Brain Computing System Based on High-Density 3D Interconnect Networking using Directed Self-Assembly
Mar. 22, 2016 Jul. 21, 2016	Kiyoto Kamagata	IMRAM	Assistant Prof.	University of California Los Angeles (USA)	Elucidation of protein design principle -comparison between artificial and natural proteins-

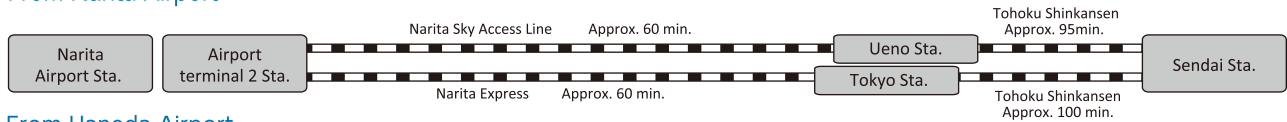
#### Achievement

- Miyamoto K.-I., Sakakita S., Wagner T., Schoning M.J., Yoshinobu T. (2015). Application of chemical imaging sensor to in-situ pH imaging in the vicinity of a corroding metal surface. *Electrochimica Acta*.
- Miyamoto K.-I., Bing Y., Wagner T., Yoshinobu T., Schoning M.J. (2015). Visualization of defects on a cultured cell layer by utilizing chemical imaging sensor. *Procedia Engineering*. **120**, 936-939.
- Yoshinobu T., Miyamoto K.-I., Wagner T., Schoning M.J. (2015). Recent developments of chemical imaging sensor systems based on the principle of the light-addressable potentiometric sensor. *Sensors and Actuators, B: Chemical*. **207**(PB), 926-932.
- Harris J., Law S., Takashima K., Sharlin E., Kitamura Y. (2014). Calamario: Perceiving robotic motion in the wild. *HAI 2014 - Proceedings of the 2nd International Conference on Human-Agent Interaction*. 59-66.

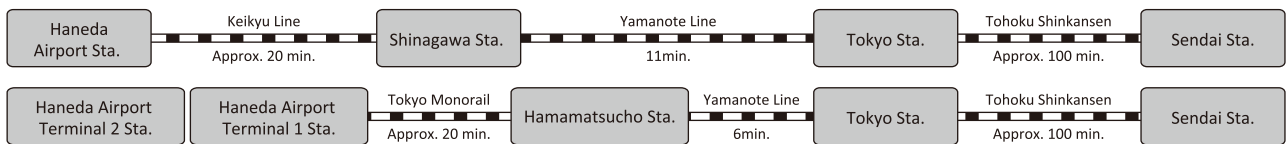
# Access and Contact



## From Narita Airport



## From Haneda Airport



## From Sendai Airport



## From Sendai Station

By taxi : Approx. 10 min. by taxi from the West Exit on the first floor of Sendai Station

By foot : Approx. 15 min. walk from the West Exit of Sendai Station

## From Aoba-dori Ichibancho Station

By foot : Approx. 5 min. walk from the South-1 Exit of Aoba-dori Ichibancho Station

## Contact

### Tohoku Forum for Creativity

2-1-1 Katahira, Aoba-ku, Sendai 980-8577 JAPAN

Administrative Office

3rd Floor, AIMR Main Building

TEL : +81-22-217-6091 FAX : +81-22-217-6097

Administrative Office

1st Floor, TOKYO ELECTRON House of Creativity

TEL : +81-22-217-6292 FAX : +81-22-217-6293

E-mail : [creativity@ml.tohoku.ac.jp](mailto:creativity@ml.tohoku.ac.jp)

URL : <http://www.tfc.tohoku.ac.jp/>



TOHOKU FORUM  
for CREATIVITY

Supported by

**TEL**<sup>TM</sup>  
TOKYO ELECTRON