



TOHOKU
UNIVERSITY

Annual Report 2019



TOHOKU FORUM for CREATIVITY



Message from the Director

To use our comprehensive knowledge to solve the essential societal issues of our times, we must move beyond our specialized fields so that academics and scientists can contribute to the development of our society. When faced with significant social and scientific challenges, we must carefully and thoughtfully consider in which direction we should proceed.

As a platform for these important discussions, the Tohoku Forum for Creativity (TFC) gathers researchers from all over the world and provides a working environment to facilitate communication and innovative developments through daily discussions and the exchange of information. The core of the TFC activities is the thematic program devoted to outstanding problems facing humanity. There are approximately three programs per year, and activities related to each theme last for three months. During a thematic program, we host eminent researchers for extended stays to deepen these discussions. Simultaneously, intensive activities such as workshops and tutorials take place for junior researchers. These junior researchers, who will become our society's leaders, and corporate researchers aiming for more immediate social implementation bring a multifaceted perspective to the thematic programs while creating new researcher networks.

The TFC also sponsors the Junior Research Program to give junior researchers the experience of organizing workshops. Our forward-looking future society design initiatives focus on cooperation among mathematical approaches, social science approaches, and regional revitalization projects. In all these initiatives, we actively engage in information exchange through meetings and lectures both in-person and online events.

Throughout the history of humankind, we have faced many new and difficult challenges; through our responses, much new various science and even new cultures have developed. Tohoku University wants to contribute to this ongoing process of challenge and development of humankind through the Tohoku Forum for Creativity.

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

Motoko Kotani



Overview of the Tohoku Forum for Creativity

Mission

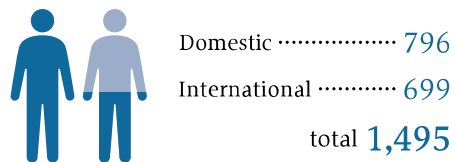
The Tohoku Forum for Creativity (TFC) is an international visitor research institute which was established in 2013 at Tohoku University to facilitate collaborative research. In order to identify important problems across all of the sciences and humanities, the TFC brings together both junior and senior 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 Medalists and Nobel Laureates, junior researchers will be stimulated to develop their own original ideas and to eventually become pioneers in new research areas.

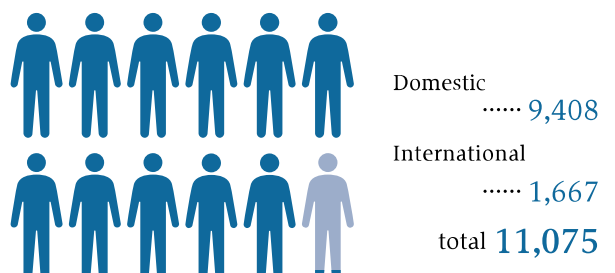
The TFC calls for thematic programs from throughout the world covering all academic domains, from the humanities and social sciences to the natural sciences. The TFC then selects themes for concentrated discussions over a three-month period, for which leading international researchers are invited to 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.

Participants Data FY2014 - FY2019

Invited Researchers



Event Participants



Plant Stem Cells : Source of Plant Vitality

Program Theme The main theme of this program is plant stem cells. Stem cells are the foundation for every organ.

Unlike stem cells in animals, plant stem cells can form after embryogenesis and are dispersed throughout the body of the plant. Moreover, plant stem cells can form de novo from differentiated cells. This extraordinary ability is the source of the plant's incredible developmental plasticity and vitality. Understanding the molecular basis of this unique property of plant stem cells – the principle of pluripotency – is the ultimate purpose of this program.

This program aims to create a new field of research – the study of plant stem cells. All animals, including humans, rely on plants for energy, so an understanding of plant stem cells is critical to ensure a supply of food into the future.



Main Organizer
Junko Kyojuka (Tohoku University)



Events

- Pre-event: The Frontier of iPS/ES Cell Research and Ethics (February 12, 2019)
- International Symposium: Principles of Pluripotent Stem Cells Underlying Plant Vitality (May 11, 2019 – May 14, 2019)
- Workshop 1: Stem Cells and Plant Reproduction (May 15, 2019)
- Workshop 2: Auxin and Plant Stem Cells (May 20, 2019 – May 21, 2019)
- Public Outreach Program: New Horizon in Biology (July 13, 2019)



Program Organizers

Junko Kyojuka (Tohoku University)
David Jackson (Cold Spring Harbor Laboratory)
Masaaki Umeda (Nara Institute of Science and Technology)
Shinjiro Yamaguchi (Kyoto University)

Principal Invited Researchers

Elliot Meyerowitz (California Institute of Technology)
Keiko Torii (University of Washington)
Kiyokazu Agata (National Institute of Basic Biology)
Magdalena Bezanilla (Dartmouth College)

Cancer - from Biology to Acceptance

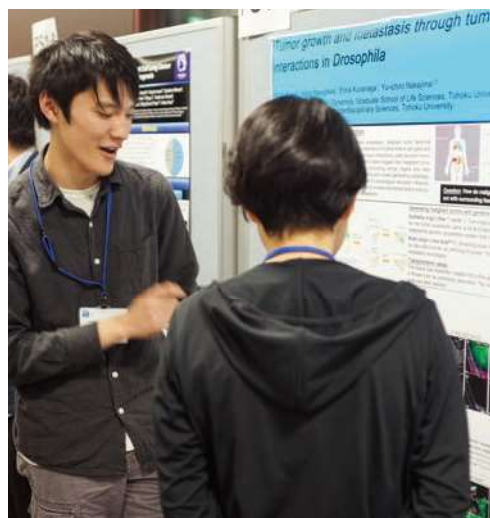
Program Theme

Cancer has been the leading cause of death since 1981 in Japan, accounting for 30% of all deaths. Therefore, cancer study (understanding of the mechanisms of oncogenesis, improvement of diagnostic technology, and development of transformative therapeutics) is considered a central problem in medical science. Cancer has been thought to be driven by the accumulation of genetic mutations. Recently developed technology revealed that tumors consist of many types of cells, including non-tumor cells, and are supported in developing and metastasizing by these genetically normal cells. In other words, cancer is a very complex disease that requires a comprehensive understanding of the disease.

It is therefore valuable to bring together researchers concerned with cancer from basic medical research to clinical research at Tohoku University, to discuss and share up-to-date knowledge and technologies. Our goals are the advancement of science and technology in cancer science and its application to a clinical setting, as well as building a motivated team of cancer researchers.



Main Organizer
Keiko Nakayama (Tohoku University)



Events

- Pre-event: The Kick-Off Symposium of the Advanced Graduate Program for Future Medicine & Health Care (March 5, 2019 – March 7, 2019)
- International Symposium 1: Cancer Etiology (September 24, 2019 – September 25, 2019)
- International Symposium 2: New Technology for Diagnosis and Therapeutics of Cancer (December 2, 2019 – December 3, 2019)
- International Symposium 3: Clinical Research and Supportive Therapy (January 18, 2020 – January 19, 2020)
- Public Lecture: What is Rinsho-Shukyo-Shi? The Leading Edge of Spiritual Care (February 1, 2020)

Program Organizers

Keiko Nakayama (Tohoku University)
Junken Aoki (Tohoku University)
Maho Aoyama (Tohoku University)
Kazuhiro Igarashi (Tohoku University)
Yoshiaki Ito (National University of Singapore)
Akira Inoue (Tohoku University)
Kohsuke Gonda (Tohoku University)
Kozo Tanaka (Tohoku University)
Natsuko Chiba (Tohoku University)
Hozumi Motohashi (Tohoku University)
Mitsunori Miyashita (Tohoku University)

Principal Invited Researchers

Paul R. Clarke (University of Queensland)
Barbara Daveson (University of Wollongong)
Kim Ekroos (Lipidomics Consulting Ltd.)
Bart Vanhaesebroeck (University College London)



Creating a New Frontier through the Synergy of Quasicrystals and Strongly Correlated Electron Systems

Program Theme

The program is devoted to emerging research interests in strongly correlated electron systems realized in structurally complex materials, with a particular focus on quasicrystals and related compounds. The aim is to assess the effect of aperiodic orders on the electronic properties, by bringing together two communities that have been working independently, along with scientists with various academic backgrounds, including mathematics, physics, chemistry and metallurgy, from all over the world. Inspired by the discovery of novel phenomena such as quantum criticality and superconductivity in quasicrystals and approximants, the research on quasicrystals is now reaching a new frontier. This program will serve as a platform to promote interaction and create international collaboration between the two communities.



Main Organizer
An-Pang Tsai (Tohoku University)



Dan Shechtman : Nobel laureate in Chemistry 2011

Events

- Interdisciplinary Symposium for Quasicrystals and Strongly Correlated Electron Systems (June 23, 2019 - June 27, 2019)
- An-Pang Tsai Memorial Joint Symposium of Taipei Tech and Tohoku University (November 24, 2019 - November 26, 2019)
- 2nd Hypermaterials Meeting (24th Quasicrystals Meeting) (February 18, 2020 - February 20, 2020)
- [CANCELED] Once Upon a Time in Kamchatka: The Fantastic Quest for Natural Quasicrystals (March 16, 2020)

Program Organizers

An-Pang Tsai (Tohoku University)
Noriaki Sato (Nagoya University)
Marc de Boissieu (CNRS, UGA, Grenoble INP)
Sven Lidin (Lund University)
Nobuhisa Fujita (Tohoku University)

Principal Invited Researchers

Frank Steglich (Max Planck Institute for Chemical Physics of Solids)
Anuradha Jagannathan (Université Paris-Sud)
Juri Grin (Max Planck Institute for Chemical Physics of Solids)
Alan I. Goldman (Iowa State University)
Dan Shechtman (Israel Institute of Technology)



The Future of Materials Engineering - Dramatic Innovation to the next 100 years -

Program Theme

It has been only about 100 years since the model of the atom was introduced by Bohr. Since then, our knowledge of materials science and engineering has progressed remarkably. Nowadays, we can control phenomena at the atomic size using nanotechnology, and we can predict how atoms behave in materials using supercomputer simulations. These advances were almost inconceivable 100 years ago. What equally dramatic innovations in technology can we expect during the next 100 years?

The main goal of this program is to discuss the next generation of materials engineering with emeritus professors involved in great advances in modern materials engineering, current professors engaged in cutting edge research, and young scientists and students who will be the leaders of the next generation.



Events

- International Symposium (June 24, 2019 – June 25, 2019)
 - Invited Talk (June 24, 2019 – June 25, 2019)
 - Student Session (June 24, 2019 – June 25, 2019)
 - Poster Session (June 24, 2019)
 - Special Talk (June 25, 2019)

Program Organizers

Daisuke Ando (Tohoku University)
Chad W. Sinclair (University of British Columbia)
Mayu Muramatsu (Keio University)
Yuta Saito (National Institute of Advanced Industrial Science and Technology)

Principal Invited Researchers

Alexander V. Kolobov (Herzen State Pedagogical University of Russia)
Varvara Kouznetsova (Eindhoven University of Technology)
Matthias Militzer (University of British Columbia)
Paul Fons (National Institute of Advanced Industrial Science and Technology)
Shinichi Sakurai (Kyoto Institute of Technology)





Pre-Program | September 2019 – February 2020

Designing the Human-Centric IoT Society

-Cooperative Industry-Academic Strategies for Creative Future Connection-



While the innovations driven by IoT and AI are expected to greatly contribute to our society, IoT and AI may have unexpected negative effects depending on how they are developed and implemented in society. The “human-centric IoT society” is realized as a social system where human beings and computers harmonize with each other. The aim of this thematic program is to discuss issues of a future human-centric IoT society for well-being, through industry-academic collaborations.



October 22, 2019

Kick-off Symposium



February 13, 2020 – February 15, 2020

The 8th RIEC International Symposium on Brain Functions and Brain Computer





Emerging Perspectives Program | April 2019 – October 2019

Emerging Perspectives Program

The TFC has carried out the Emerging Perspectives Program (EPP) since 2017 to provide the seeds for future Thematic and Junior Research Programs through workshops or lectures given by invited researchers in various research fields. The TFC held three programs in 2019; Collaboration Research with Lorentz Center: Brain Science and Mathematics to Understand Circadian Rhythm, Lectures on Quantum Computer at Tohoku University, and International Workshop on Future Linear Colliders: International Research Projects and Their Researchers.

April 26, 2019 · June 25, 2019

Collaboration Research with Lorentz Center : Brain Science and Mathematics to Understand Circadian Rhythm



July 26, 2019

Lectures on Quantum Computer at Tohoku University



October 31, 2019

International Workshop on Future Linear Colliders : International Research Projects and Their Researchers





Other Activities | August 30, 2019

Falling Walls Lab Sendai 2019

A presentation competition was held jointly with the Falling Walls Foundation of Germany for junior researchers on August 30, 2019. In 2014, Tohoku University held the first preliminary competition in Asia. This year, it featured participation by nine individuals from this university and others. Dr. Kazuo Kakinuma, the winner of Falling Walls Lab Sendai 2019 was dispatched to Berlin on November 8, 2019 to enter the final round. The TFC conducted a coaching session for the applicants and training sessions for the winner in order to improve his presentation skills.



November 7, 2019

Berlin Science Week Mathematics Nowhere - Mathematics Everywhere

Mathematics has developed into a tool so sophisticated that most people do not even notice its presence in our lives, it exists both nowhere and everywhere!



The 3rd FRIS-TFC Collaboration Event: The First-ever Image of a Black Hole !



The 14th Kavli Asian Winter School on Strings, Particles and Cosmology

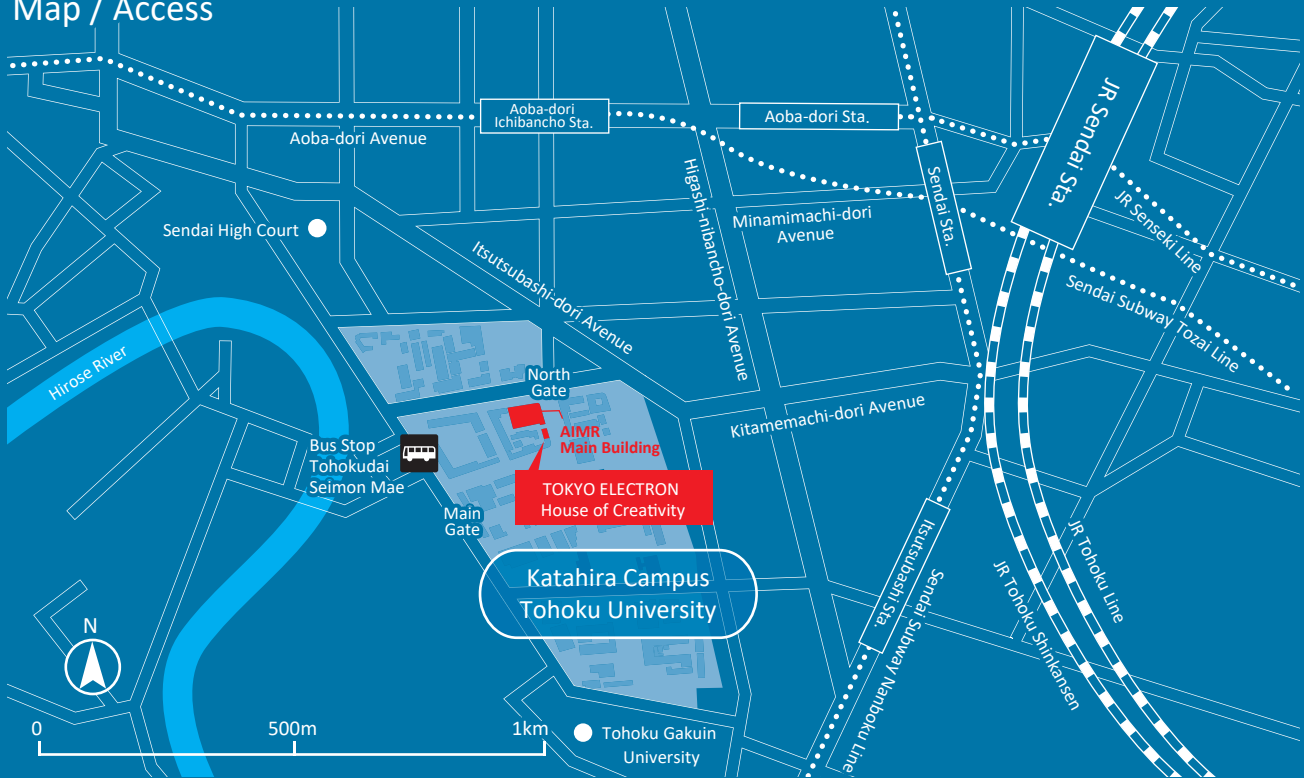


Tohoku Forum for Creativity Premium

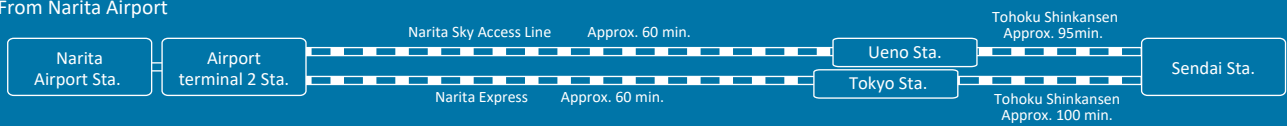
“Tohoku Forum for Creativity Premium” was held in the Nihonbashi Life Science Hub with the aim of making the activities of the TFC widely known.



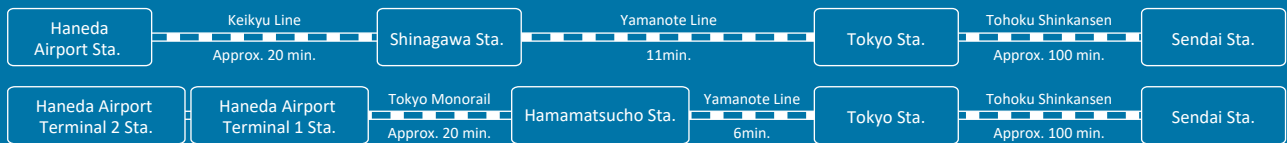
Map / Access



From Narita Airport



From Haneda Airport



From Sendai Airport



From Sendai Sta.

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 Sta.

By foot : Approx. 10 min. walk from the South 1 Exit of Aoba-dori Ichibancho Station

Tohoku Forum for Creativity, Tohoku University

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