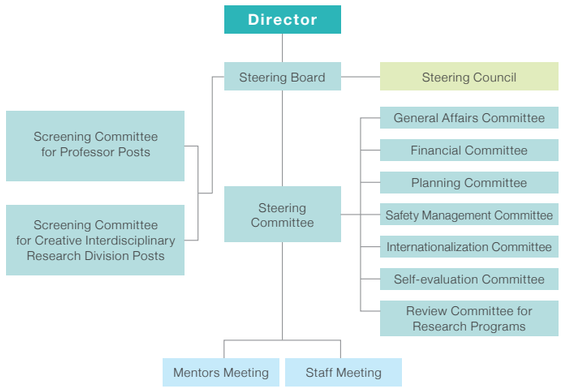
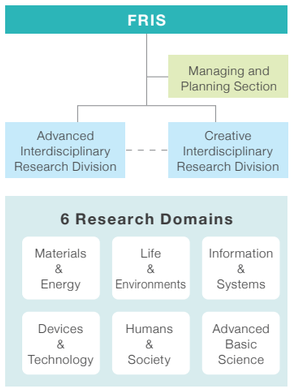
Organization

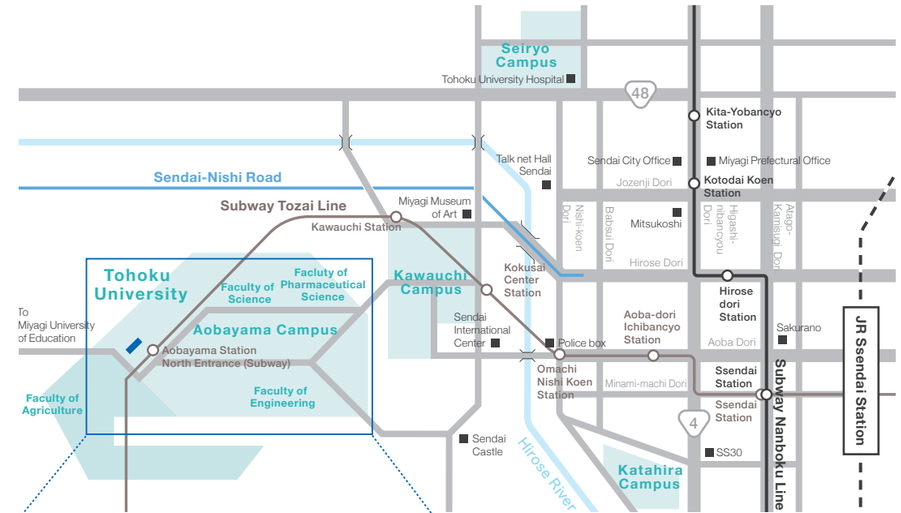
Committees



Research Organization



Location



Subway (Sendai Subway Tozai Line)

15min. from Sendai station
(10min. on a train to Aobayama station, and 5min. on foot from Exit North 1 of Aobayama station)
250yen from Sendai Station

Taxi

15min. About 2,000yen from JR.Sendai Station

Frontier Research Institute for Interdisciplinary Sciences, TOHOKU UNIVERSITY

Aramaki aza Aoba 6-3, Aoba-ku, Sendai 980-8578, Japan **TEL: +81-22-795-5755 FAX: +81-22-795-5756 www.fris.tohoku.ac.jp/**

FRIS FUTURE 2017

Pioneering the future, the interdisciplinary way

Frontier Research Institute for Interdisciplinary Sciences

TOHOKU UNIVERSITY

Pioneering the future, the interdisciplinary way

Powered by the interdisciplinary approach, FRIS pioneers new realms of research in a never-ending quest to create knowledge and value that help humankind to advance.

Frontier Research Institute for Interdisciplinary Sciences (FRIS)

Prof. **Masaaki Sato,** Director

WHAT?

What is interdisciplinary research?

Research transcending the boundaries of established disciplines

Inter means “between, among” and disciplinary refers to familiar, established disciplines such as engineering, medicine, and science. Thus, interdisciplinary research is a pursuit of knowledge that bridges different academic fields. A good example is biomedical engineering, which transcends the boundary between medical science and engineering. Such mergers may evolve into disciplines in their own right, as seen in biochemistry, the fusion of biology and chemistry.

WHY?

Why is interdisciplinary research required?

To deal with the growing number of challenges that cannot be solved with a single approach

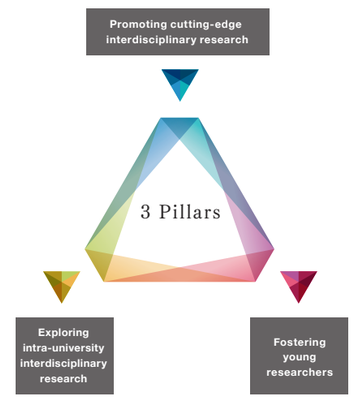
Many of the challenges that need to be addressed in our world cannot be tackled by one discipline alone. International concerns such as the environment and food security, the nuclear power issues precipitated by the Great East Japan Earthquake, and other such challenges require the combined input of diverse fields related to the human body, organisms, disaster mitigation, resource management, and other facets of life. As the number of these problems grows, the interdisciplinary approach will become even more indispensable to the search for solutions.

HOW?

How is interdisciplinary research pursued?

It is driven by the diverse perspectives and creative thinking that come from interactions among researchers from different fields

One pillar of FRIS's activities is fostering young researchers recruited through open invitation. We comprehensively evaluate the candidates on the basis of their achievements, interdisciplinary approaches, and potential. Those selected are expected to develop new possibilities by interacting with researchers in other fields, and the professors who mentor them are asked to take a multifaceted view of their research. Another pillar is providing opportunities for interaction among researchers in various departments of Tohoku University, as a way of planting the seeds of interdisciplinary research driven by creative ideas.

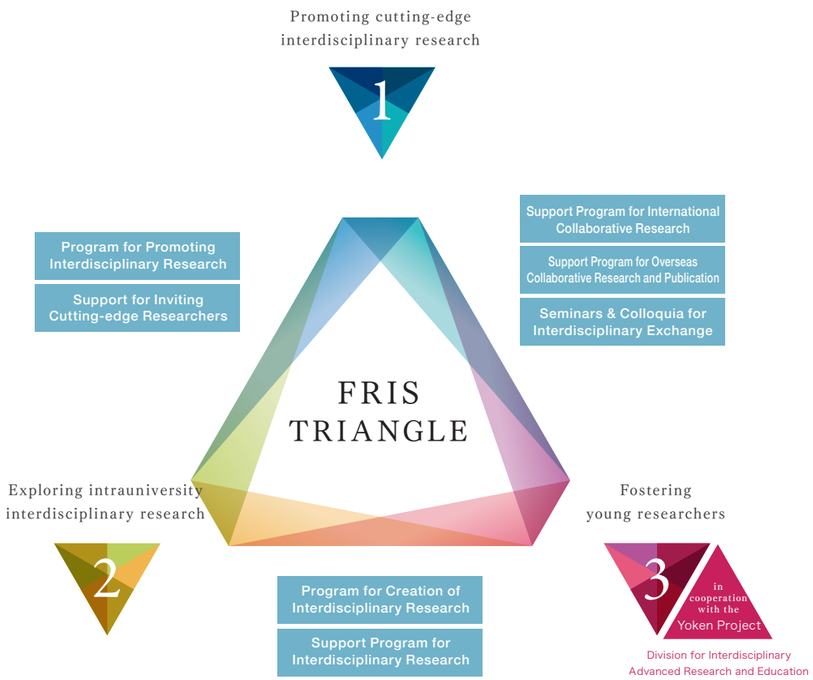


Our Mission

FRIS strives to create knowledge and value that help make our world a better place. To accomplish this mission, we pioneer and pursue interdisciplinary research, and support young researchers through collaboration with the university's graduate schools, institutes, and the Division for Interdisciplinary Advanced Research and Education.

3 Pillars
(FRIS TRIANGLE)

Our activities are founded on three pillars: **(1) Promoting cutting-edge interdisciplinary research by full-time faculty members, (2) Exploring and supporting new and original interdisciplinary research at Tohoku University, and (3) Fostering young researchers. To achieve those goals, we established FRIS as an organization dedicated to developing and running various programs for supporting interdisciplinary frontier research.** Close coordination and collaboration among these three missions produces a synergy that improves the quality of our activities.

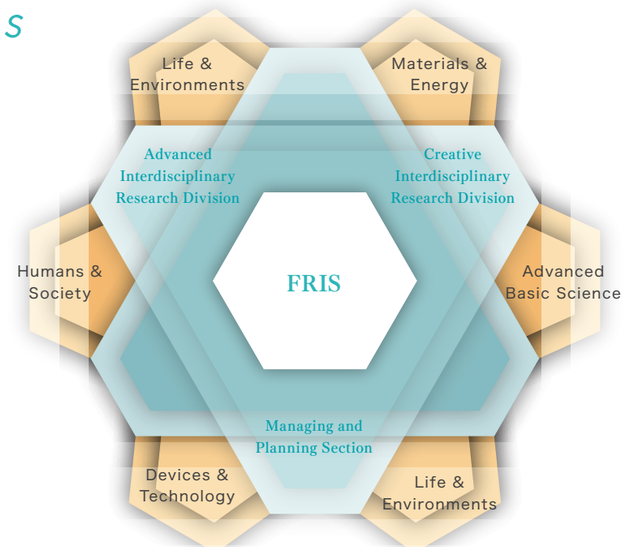


6 Research Domains

FRIS has established six interdisciplinary research domains that cover almost all disciplines represented at Tohoku University: **Materials & Energy, Life & Environments, Information & Systems, Devices & Technology, Humans & Society, and Advanced Basic Science**. FRIS faculty members not only focus on the research domain that forms the backbone of their own research, but also pursue cross-disciplinary integration by actively exchanging and collaborating with researchers in other fields. In addition, we encourage mutual understanding and cooperation among the six research domains, and we have a Managing and Planning team that supports personnel exchanges and collaborative research with other departments and other universities.

2 research divisions and a planning team

FRIS comprises the Managing and Planning Section, the Advanced Interdisciplinary Research Division, and the Creative Interdisciplinary Research Division. The first two are run by full-time faculty members, and the third is staffed with young researchers. Assistant professors pursue their research in their mentor's laboratory.



1

Promoting Cutting-edge Interdisciplinary Research

The Advanced Interdisciplinary Research Division's full-time faculty members leverage their own perspectives to promote high-level interdisciplinary research in all six research domains. FRIS faculty members actively utilize not only their own research resources but also various in-house support programs to build research organizations with researchers at and outside the university in order to cultivate new academic fields. FRIS further supports the advancement of cross-sectional research by offering open-space research environments that enable faculty in different fields to exchange ideas and information.

Materials & Energy

Prof. Hiroshi Masumoto

▶ Research areas

- Inorganic material science
- Multi-functional materials
- Thin film processing

We investigate and develop novel intelligent materials in the realm of information and recognition, including a new high-performance sensor material with integrated functional properties, a biomaterial, and a low environmental impact material. Our aim is to harness new functional properties and create high-performance materials through design harmonizing materials, properties, and processes, such as a magnetic-dielectric material with nano multilayer metal-ceramic structure, an osteoconductive implant material whose titanium surface is modified using plasma, and a nano metallic particle-ceramic material. Our biggest focus is research on integrated functional materials, which combine multiple functions into one material. We develop these materials using mainly various vapor-deposition methods such as sputtering and chemical vapor deposition, as well as plasma irradiation and hot-press sintering. In order to develop these new functional materials efficiently, we rely on collaborative interdisciplinary research with partners at and outside the university. These research projects cover important themes for the sustainable development of society in ways that protect the environment and enhance safety.

Information & Systems

Prof. Takehito Shimatsu

▶ Research areas

- Magnetic film deposition
- Room temperature bonding of wafers
- High-density storage

To realize a sustainable, safe, and secure society underpinned by intelligent communication rich in the human spirit, we must create human-friendly, low-environmental-impact information-and-communication technology (ICT) devices and systems from new electronic materials and device technologies. This requires further advancement of the science and technology needed to fabricate new materials and control nano structures. I have been expanding my study of two applications of sputter film deposition using a UHV technology: fabrication of magnetic films having high uniaxial magnetic anisotropy Ku, and development of room-temperature bonding techniques for use in fabricating wafers. The first study is aimed mainly at realizing high-capacity magnetic storage and memory devices. My colleagues and I fabricated L11 type Co-Pt ordered alloy films, a quasi-stable phase, on glass wafers. We also fabricated high-quality L10-type ordered films at low temperatures of 200-300 ° C. We have been studying structural and magnetic properties of these high-Ku films and dot arrays of these films. The other study focuses on atomic diffusion bonding of two flat wafers at room temperature. We have fabricated very thin metal films on two flat wafer surfaces using sputter deposition, with subsequent bonding of the two metal films on the wafers in vacuum. The 2-4 inch wafers were bonded at room temperature over the entire bonded area using various metal films, even those 0.2 nm thick. We have also been investigating the potential of bonding for application to device fabrication.

Advanced Basic Science

Prof. Kenji Tsuda

▶ Research areas

- Crystallography by electron beam
- Nano structural science
- Structural phase transition

To develop nanoscale functional materials and devices toward energy saving, space saving and high efficiency, it is crucial to investigate correlations between their nanoscale local structures and physical properties. For this purpose, we have been developing methods of local crystal structure and electrostatic potential analysis using convergent-beam electron diffraction (CBED). The CBED method enables us to obtain accurate diffraction intensity data directly from specimen areas of a few nanometers in diameter. We developed an Omega-type energy-filter transmission electron microscope which can take energy-filtered CBED patterns up to a high scattering angle, and a structure analysis software package. The crystal structural parameters and electrostatic potential of a local specimen area can be determined by quantitatively fitting the experimental intensities of energy-filtered CBED patterns with multiple scattering calculations. We have also developed a new method to map local structural variations in a nanoscale spatial resolution with the combined use of the scanning transmission electron microscopy (STEM) and the CBED. We have been applying the methods to ferroelectrics with structural phase transformations, strongly-correlated electron oxides, solid oxide fuel cell (SOFC) materials, long-period stacking order alloys, etc. We are exploring the field of nanoscale local structure analysis for more interdisciplinary applications.

Materials & Energy

Assoc.Prof. Takashi Itoh

▶ Research areas

- Electrochemistry
- Industrial physical chemistry
- Material chemistry

The central topic of our project in "Region and Environment" is electrochemistry, which includes important roles of photo-electrochemistry in chemical conversion systems and for secondary batteries for energy conversion systems. Electrochemical processes in this project are straightforward technology to engineering, region and environment. The objectives of this project are as follows. i) Battery Active Materials for Lithium Batteries and Fuel Cells Electrochemical energy conversion system is a clean technology for reducing environmental impact. In this project, we are developing high-performance new battery active materials. We are performing in situ Raman spectroscopy, the simultaneous measurements of electrochemistry and Raman spectroscopy, to evaluate the stability of the battery active materials. ii) Molecular Electronics Redox system in molecules at the electrochemical interface is one of the alternative device systems to semiconductor materials. In the next generation, we may employ switching "On-Off" devices, whose characteristics come from molecular structures and redox systems. Since these two objectives include multi-interdisciplinary research areas, this project aims to develop a clean society with low environmental impact.

Life & Environments

Assoc.Prof. Wataru Shoji

▶ Research areas

- Neuroembryology
- Molecular biology
- Biochemistry
- Biophysics

The vertebrate nervous system is primarily composed of neurons and glial cells. During development, neural axons and dendrites extend and choose stereotyped pathways and establish synaptic connections with their targets. We are interested in how neural circuits are formed and mature for functions. The transparent zebrafish larva, which has relatively simple neural circuits and yet shows several simple behaviors such as swimming, escaping, and flapping, is a suitable model organism for investigating neural circuit development. Using an interdisciplinary approach, we aim to elucidate the developmental process underlying the formation of neural networks that function in fundamental behaviors.

Devices & Technology

Assoc.Prof. Hiroyuki Miki

▶ Research areas

- Functional materials
- Powder metallurgy
- Solid-state physics

Mechanical systems and structures have become larger and more complicated in recent years. For that reason, society's needs for system simplification, resource saving, and energy saving are attracting attention. One solution for overcoming these challenges is to develop machines with completely new features. The other important possibility is making conventional systems highly efficient and multi-functionalized. Many research projects in mechanical engineering are trying to find specific answers to this problem. In our research group, we have proposed "QOL of materials and mechanical systems" as an important keyword. This aims not only to make mechanical systems highly efficient, but also to improve the functionality of each material composing the machine. In order to improve energy efficiency and reduce operating costs, we develop highly efficient materials and improve the lifetime and reliability of mechanical systems. The following three items are investigated for the design of a highly efficient machine that excels in reliability and durability, where functional integration is given to a design of a function and form in conventional mechanical systems: (1) Functional hard carbon film required for a design of conductivity and contact surface; (2) Magnetic shape memory alloy which has two electro-magnetic functionalities as sensing and actuating; (3) Technique which crystallizes powder dynamically by the simultaneous operation of compression and shearing force.

Advanced Basic Science /
Managing and Planning Section

Assoc.Prof. Junji Saida

▶ Research areas

- Non-equilibrium materials
- Microstructures of materials
- Metal physics

Recently, anomaly stabilized supercooled liquid state has been found in several alloy systems. The discovery has brought us new concepts such as a novel nanostructured bulk material as well as a slowly cooled glassy alloy, i.e. bulk glassy alloy. It has been pointed out that the stabilization of supercooled liquid state is attributed to the unique local atomic configuration (local structure) in the liquid or supercooled liquid state. In recent progress, several unique local structures have been suggested. Moreover, novel nanostructured materials such as nano icosahedral quasicrystalline particle-dispersed bulk glassy alloy have been prepared using the stabilized supercooled liquid state. The research objectives in this subject are to (1) clarify the mechanism of stability of supercooled liquid state and (2) prepare novel nanostructured materials from the stabilized supercooled liquid state.

2

Exploring intrauniversity interdisciplinary research

Part of our core mission is to identify seeds of interdisciplinary research not only within FRIS but across Tohoku University, and provide support for their exploration through diverse programs. The achievements of those programs over the past 20 years attest to our leading role in taking on the research challenges that form today's key areas of academic inquiry.

How interdisciplinary research evolves

A promising research seed is found at FRIS or somewhere else at our university...

FRIS leverages its diverse support programs to grow that seed, from the initial groundwork to the mature phase and on to a world-leading position. We provide not only funds, resources, and facilities, but also opportunities for interaction among researchers in different fields.

And when it goes well...
The interdisciplinary research we support often leads to wide array of achievements from a single project—with each opening the door to yet new paths of exploration.

Support Program for Interdisciplinary Research

This three-year grant supports intradisciplinary studies by researchers from several departments at Tohoku University. Recipients are able to make use of FRIS facilities and apply for other forms of assistance, including for hosting visiting scholars, holding lectures, and sending young researchers on overseas assignments. The principal investigator and collaborators are in residence at FRIS for a certain period as needed, where they evolve their ideas, adopt techniques from other fields, and interact with other researchers, so that they can better pursue novel and pioneering interdisciplinary research. This program focuses on promoting research topics with seeds at the university by providing an environment encouraging active exchange, discussion, and cooperation with the FRIS faculty and other researchers.

Program for Promoting Interdisciplinary Research

Open to research groups led by faculty members of the Advanced Interdisciplinary Research Division, this three-year grant supports research projects aimed at pioneering novel interdisciplinary fields with growth potential and laying foundation for key research areas of the future. Non-FRIS members can join the projects as collaborators. This program seeks to uncover and foster new research topics with seeds at FRIS.

Program for Creation of Interdisciplinary Research

This two-year grant is for putting early-stage pioneering research on track for the Support Program for Interdisciplinary Research and the Program for Promoting Interdisciplinary Research. It is open to Tohoku University researchers, with all applicants screened fairly according the same criteria, regardless of affiliation with FRIS. To be considered, the research must be an interdisciplinary collaborative project led by a full-time associate or assistant professor of Tohoku University, and bring together researchers from three or more departments.

Support Program for International Collaborative Research

This program supports interdisciplinary research conducted with overseas partners, so as to expand FRIS' capacity to robustly and effectively fulfill its role as an international center of excellence in advanced interdisciplinary research that opens up new frontiers of science. The grant is available to research projects that are headed by a full-time FRIS faculty member and include collaborators at research institutions outside Japan.

Program for Key Interdisciplinary Research

FRIS carries out this program to support interdisciplinary research that helps Tohoku University to evolve into a world-leading university, a goal set forth in its Global Vision. The selected projects must aim toward three objectives: establishing world-leading creative research areas in ways that capitalize on the university's strengths and form networks of researchers in diverse disciplines; helping build the foundation for sustainable development of society; and producing innovation that contributes to the solution of political and social challenges. Application is open to research projects led by a full-time Tohoku University faculty members and involving at least two departments.

3

Fostering young researchers

FRIS enlists and supports young researchers who pursue interdisciplinary exploratory research from fresh perspectives through international open recruitment. Selected candidates are assigned to FRIS as associate or assistant professors of the Creative Interdisciplinary Research Division, and collaborate with members of the university's graduate schools, institutes, and Division for Interdisciplinary Advanced Research and Education. By supporting promising, outstanding young researchers, FRIS aims to create new academic fields and nurture top-level researchers active on the global stage.

Support Program for Overseas Collaboration and Publication

The purpose of this program is to foster internationally active young researchers and form networks for international interdisciplinary research. We support the living expenses of young Tohoku University researchers engaged in collaborative research at overseas research institutes, and the travel expenses of young researchers and graduate students giving presentations at academic conferences outside Japan.

Shoshi Program

It is difficult for young researchers to develop their skills and careers in fields of interdisciplinary research where competitive funding is scarce and the potential for achievement is hard to forecast. Since society needs talented people possessing broad perspectives and multifaceted thinking, MEXT funds programs that encourage the development of such talent. FRIS internationally recruits young researchers interested in interdisciplinary research and covers their research expenses.

Young researchers

Selected through international recruitment. Those appointed as assistant professors carry out research in cooperation with their mentor.

Mentors

Professors or associate professors who provide the young researchers with a research environment, guidance, and career path support.

Research and education

Each assistant professor conducts research under a mentor

Collaboration with the Division for Interdisciplinary Advanced Research and Education (Yoken Project)

Recognizing that education and research go hand in hand, and seeking to foster the practical skills of tomorrow's leaders of academia, FRIS and the Division for Interdisciplinary Advanced Research and Education select outstanding graduate students who wish to pursue research in new interdisciplinary fields as members of the Division, and provide them with diverse support. Some 120 graduate students representing various disciplines are enrolled in the Division.

FRIS PEOPLE

Young Researchers

Materials & Energy

1 Hanae Aoki

High-frequency soft magnetic thin films, Multifunctional materials

New energy harvesting antenna with magnetic dielectric nano-hetero structures

2 Tetsuya Kajita

Electrochemistry, Battery materials, Superconducting materials

Synthesis of new anode materials for next-generation secondary batteries

3 Takayuki Kojima

Solid catalysts, Magnetic materials, Metallic thin films

Relationship between catalytic and magnetic properties of metals

4 Pierre Antoine GESLIN

Material science, Numerical simulations, Multi-scale modeling

Developing a multi-scale numerical approach to simulate and clarify the properties of the liquid metal dealloying process, a new technique enabling to produce micro-structured and micro-porous materials with a wide range of applications

5 Yiwen Zhang

Physics of inorganic materials, Film processing engineering, Magnetic films

Development of nano-composite films with high-frequency soft magnetic property and tunnel magneto-resistance effect

6 Gen Hayase

Inorganic chemistry, Materials chemistry, Interface and colloid chemistry

Synthesis of monolithic porous materials and their applications

7 Takuya Mabuchi

Quantum mechanics, Molecular fluid engineering, Material science and engineering

Development of high-proton conducting polymer membranes by controlling higher order structure of polymers

8 Takashi Misaka

Aeronautical engineering, Aviation weather

Atmospheric turbulence, data assimilation, computational fluid dynamics

9 Rui Yamada

Nonequilibrium materials, Materials processing, Powder metallurgy

Structural rejuvenation of metallic glasses, fabrication of micro parts from mono-sized metallic glass particles

Life & Environments

10 Masafumi Nakayama

Immunology, Phagocyte biology

Molecular mechanisms by which phagocytes such as macrophages and dendritic cells recognize biological particles and synthetic nanoparticles

11 Masanori Izumi

Plant physiology, Cell biology

Roles and molecular mechanisms of chloroplast autophagy

12 Junhon Ko

Medical science, Metabolic syndrome

Development of novel therapeutic strategies for metabolic diseases by regulating ER stress and inter-organ network

13 Seiji Kojima

Membrane biochemistry

Studies on molecular basis for permeability and stability of outer membrane of Gram-negative bacteria and chloroplasts

14 Daisuke Saito

Developmental biology

Research on avian transgenic technologies, and technical/resource support

15 Yuji Shimogonya

Biofluid dynamics

Identification of hemodynamic risk factors for cerebral aneurysms

16 Shinsuke Suzuki

Neuroeconomics

Computational and neural mechanisms underlying social decision-making

17 Yasukazu Daigaku

DNA replication, Mutagenesis

Division of labor among DNA polymerases, mutagenesis during DNA replication, development of cancer treatment to target components of DNA replication

18 Tomomi Tsunematsu

Sleep research, Electrophysiology

Elucidation of a regulatory mechanism of sleep/wakefulness, elucidation of a physiological function of sleep

19 Yuichiro Nakajima

Epithelial cell biology, Developmental genetics, Developmental cell biology, Molecular biology

Mechanisms of epithelial homeostasis and pathology mediated by mitotic spindle orientation; mechanisms of aberrant cellular plasticity during EMT, tumorigenesis and regeneration; in vivo mechanisms of epithelial tumor development and malignancy

20 Shinsuke Niwa

Cell biology

The molecular mechanism of cellular morphogenesis

21 Hiroyasu Hatakeyama

Cell biology

Live-cell nano-imaging of cellular dynamics

22 Yuki Furuse

Microbiology, Molecular biology, Public health

Multidisciplinary approach to understanding virus–host interaction from cellular to global level

Devices & Technology

23 Kenichi Funamoto

Fluid engineering, Bioengineerin

Microfluidic device mimicking in vivo microenvironment, cellular responses to hypoxic exposure, hemodynamic analysis by integration of measurement and computation

24 Hitomi Anzai

Computational fluid dynamics, Optimization

Development of optimization platform for next-generation devices

25 Hisashi Kino

Semiconductor engineering

Development of novel functional devices that integrate interactive functions through semiconductor engineering and bionics

26 Yuki Suzuki

Nanobiotechnology

Self-assembly of DNA nanostructures at membrane/solution interfaces, design and construction of functional DNA nanostructures

27 Chrystelle BERNARD

Dynamics behavior of polymers, cold-spray

Thermomechanical behavior of polymers during cold-spray process, understanding of the adhesion mechanisms occurring during cold-spray process

28 Hideaki Yamamoto

Nanobioengineering

Surface nano/micro-modification for biological interfacing, signal processing in neuronal networks

29 Daisuke Yoshino

Mechanobiology, Design engineering

MechanoBioDesign of next-generation stent with high functionality

FRIS
PEOPLE

Information & Systems

30 Naoya Onizawa

Integrated circuits, Computer hardware, Dependable systems

High-speed low-power network VLSI based on probabilistic computation, dependable VLSI based on asynchronous circuits, low-power associative memory design

31 Daisuke Suzuki

Integrated Circuits, Hardware, Reconfigurable systems

Ultra low-power brain-like processor using dynamically-reconfigurable nonvolatile logic

32 Sohei Tasaki

Applied mathematics, Biophysics, Microbiology

Prediction and control of microbial activity, interaction analysis of microbial ecological systems, dynamics analysis of lipid membranes

33 Nobuyuki Matsumoto

Optomechanics

Optical cavity consisting of a movable mirror and fixed mirrors, laser cooling and measurement-based feedback cooling

Humans & Society

34 Alimu Tuoheti

Oriental philosophy and religion

Chinese Confucianism, Japanese Confucianism, Islamic philosophy, relationship between Islamic philosophy and Confucian thought

35 Michiko Kano

Psychosomatic medicine

Role of emotion in brain-body interaction

36 Hiroki Takikawa

Mathematical sociology

Social stratification, social network, social inequality

37 Kohei Tamura

Anthropology

Cultural evolution

38 Ayako Nakamura

International relations

Human security and regional networking: A comparison of regional human trafficking policies in Europe and Southeast Asia

39 Rui Nouchi

Psychology, Neuroscience, Health science

Elucidation of adaptive functions of human mental processes, development of a tool to improve cognitive functions and mental health

40 Yueh Hsuan Weng

Legal informatics, Social robotics

AI ethics and regulation

Advanced Basic Science

41 Yasufumi Araki

Physics (condensed matter theory, spintronics)

Correlations in Dirac semimetals, analysis based on analogy between the physics of early universe and Dirac semimetals, spintronic applications of charge/spin transport properties in Dirac semimetals

42 Takeshi Inoue

Nuclear physics, Atomic physics

Development of biomagnetism measuring apparatus using optical magnetometer, study of the fundamental symmetry violation using optical magnetometer

43 Masaki Okumura

Structural biology, Protein science, Biochemistry

Elucidation of protein quality control mechanism in the endoplasmic reticulum

44 Seiji Kamada

High pressure and temperature experiments, High pressure mineral physics, Experimental petrology, Interior of the Earth, Synchrotron radiation for material science

Physical and chemical properties of Earth materials under high pressure and temperature, phase and melting relationships on Earth's core materials under the core conditions, study of magnetic properties and spin state of Earth's materials based on Synchrotron Mössbauer spectroscopy, sound velocity measurements based on Brillouin scattering, technological development for measurement of material physical properties under high pressure and temperature

45 Masahiro Kayama

Planetary science, Meteoritics, Mineralogy, Spectroscopy

Origin and reservoir of water on the Moon

46 Hirokazu Kawamura

Nuclear physics experiments

Development of a detection method of rare isotopes using laser cooling technique, study of fundamental symmetries using laser-cooled francium atoms

47 Yuki Shibazaki

High-pressure and high-temperature experiments, Planetary science

Study of the formation and evolution of the planetary interiors by the high-pressure and high-temperature experiments, development of new materials using high-pressure and high-temperature techniques

48 Takashi Shimonishi

Astronomy, Astrochemistry

Interstellar and circumstellar chemistry in low metallicity environments

49 Shusaku Sugimoto

Physical oceanography, Atmospheric science

Role of ocean on climate variability

50 Mikito Tanaka

Observational astronomy, Higher education

Study of structures and formation histories of nearby galaxies using the Subaru Telescope, development and implementation of project-based learning programs from science

51 Kohji Tsumura

Infrared astronomy

Astronomy and planetary science through observations of infrared diffuse radiation

52 Atsushi Naruko

Cosmology, Theory of gravity

Cosmology and cosmological perturbation theory, gravitation and tests of gravity

53 Kenji Toma

Astrophysics

Physics of black holes and their jets

54 Hirofumi Noda

Astrophysics

X-ray observation of Active Galactic Nucleus, thermal design of instruments onboard satellites

55 Hidenobu Yajima

Astrophysics

Galaxy formation, formation of massive black holes, computational astrophysics

Next may be you...