



# Institute for Multidisciplinary Sciences

Yokohama National University



FACULTY  
PROFILE

# YNU

YOKOHAMA National University

# The Positioning of the Institute for Multidisciplinary Sciences (IMS)

By comparison with the Institute of Advanced Sciences (IAS), which undertakes outstanding, world-class research in cutting-edge technology research spheres, the Institute for Multidisciplinary Sciences (IMS) is a vision-driven research institute seeking to help build an ideal society through interdisciplinary collaboration across diverse research fields that aims to realize a vision for the society of the future. The IMS' s Principal Investigators (PIs) include many up-and

-coming younger researchers who will be playing an important role in the society of the future, and the IMS is aiming to accelerate the strengthening of diversity and interdisciplinary collaboration. The IMS is boldly undertaking work on current research topics which have been selected through back-casting from the vision of where we want to be in the future, and is realizing research activities that will lead to the generation of new academic fields and of new value for society.

## ABOUT IMS



## Framework for Collaboration with External Partners

In recent years, the competition in the university sector to secure high-level international research talent has become increasingly intense, and the movement of research talent between countries has accelerated. As with the IAS, which has made the recruitment and securing of first-rate foreign researchers a priority, and has been proceeding with the putting in place of the necessary systems, the IMS has also been forging an international collaboration network with overseas companies, overseas universities, and other

international partner organizations, aimed at realizing the YNU' s vision, and has been strengthening measures to build itself into an International Network Hub that will be at the center of innovative, high-level research activities. In addition, by implementing initiatives for ongoing strengthening of collaboration with non-academic bodies, including the local community and industry, the IMS is aiming both to enhance international research capabilities and promote the social implementation of research results.

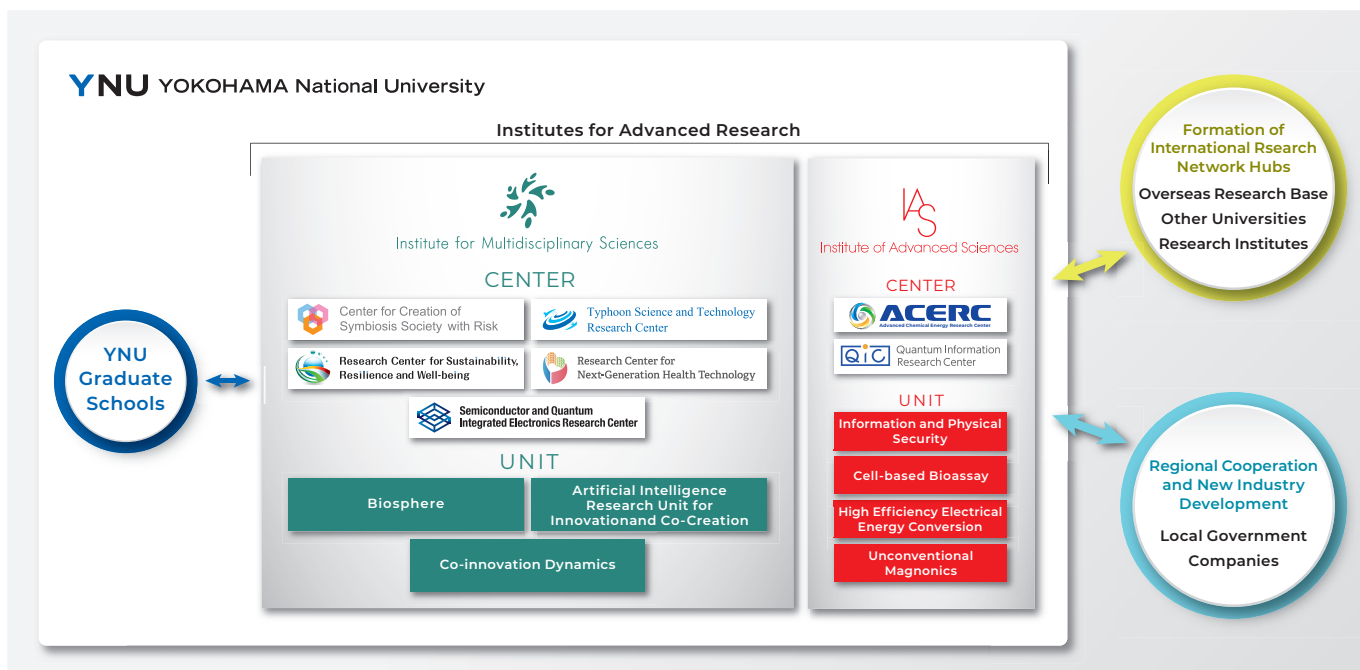
# Research Organization Structure

The establishment of the Institute for Multidisciplinary Sciences (IMS) in April 2023 also represented a new start for the IAS. To drive world-class research in cutting-edge research fields, the IAS has adopted a structure that comprises two academic research centers – the Quantum Information Research Center and the Advanced Chemical Energy Research Center – and four research units led by outstanding researchers: Information

and Physical Security, Cell-based Bioassay, High Efficiency Electrical Energy Conversion, and Unconventional Magnonics. The aim is for the research results generated by these research units and research centers, together with those generated by the IMS, to contribute toward the building of new social and economic systems, toward the fostering of innovation, and toward the development of science and technology.



# IMS Organizational Structure



# Research Support System

The IAS and the IMS bring together international researchers in a wide range of fields from both within and outside Japan to undertake high-level research projects. Dedicated research strategy planning managers have been assigned to realize focused support not only for the putting in place of a leading -edge research environment, external funding management,

and research outreach activities (including research PR and science communication), but also for the building of a researcher network that links together the researchers at the IAS and the IMS across the boundaries of their respective research fields.





### Center for Creation of Symbiosis Society with Risk



**Center Director**  
**SHIBUTANI Tadahiro**

**VISION**  
The Center aims to create a society that is flexible and earns public approval in the face of change, based on the study of risk symbiosis.

**ABOUT**  
Risk symbiosis is a novel approach for resolving social issues, a concept for handling risk that originated with the Center. Through research on ways of appraising diverse risks inherent in society, the Center seeks to create models of society as a risk-symbiotic phenomenon and as a receptacle for ideal harmonization. In so doing, we aim to create a safe, secure and dynamic society.

**RESEARCH CONTENTS**  
The Center for Creation of Symbiosis Society with Risk consists of four units: the Risk Symbiosis Study Unit, whose activities focus on risk communication and academic structures; the Social Risk Liaison Unit, which practices risk symbiosis and promotes academic research; the Research Unit, which aims to implement a risk-symbiotic society; and the Education Unit, which focuses on creating sub-major programs and e-learning. Through these four Units, the Center is moving forward with implementation of a risk-symbiotic society.



### Typhoon Science and Technology Research Center



**Center Director**  
**FUDEYASU Hironori**

**VISION**  
As Japan's first dedicated typhoon research facility, the Typhoon Science and Technology Research Center aims to contribute to the formation of a safe, active and sustainable society, by reducing typhoon disaster risk. The Center also aims to contribute to a carbon-free society by harnessing typhoon energy.

**ABOUT**  
As Japan's first dedicated typhoon research institute, the Typhoon Science and Technology Research Center aims to contribute to the formation of a safe, active and sustainable society, by reducing typhoon disaster risk. The Center also aims to contribute to a carbon-free society by harnessing typhoon energy.

**RESEARCH CONTENTS**  
**The Typhoon Science and Technology Research Center contributes in four ways:**

1. Contribution to the formation of a safe, active and sustainable society, by reducing typhoon disaster risk
2. Contributing to a carbon-free society by creating a new source of renewable energy
3. Contributing to the recovery of Japan as a technology superpower through typhoon innovation
4. Contribution to cultivation of personnel who can succeed on the world stage through seamless research partnership between industry and academia



### Research Center for Sustainability, Resilience and Well-being



**Center Director**  
**HOSODA Akira**

**VISION**  
The Center aims to create a society that is flexible and earns public approval in the face of change, based on the study of risk symbiosis.

**ABOUT**  
The Research Center for Sustainability, Resilience and Well-being conducts comprehensive academic and practical research and education aimed at producing an "abundant society": a prosperous and fruitful society in which everyone can leverage their talents and characteristics to live dynamic lives, cherish dreams and hopes for the next generation as they harvest.

**RESEARCH CONTENTS**  
To create an abundant society, we conduct research fusing the sciences and humanities, tackling educational challenges and implementing the results of these efforts in society. In so doing we strive to implement a society resistant to disasters such as fires and earthquakes, supported by resilient infrastructure.

**Establishment of three research centers**

1. **Resilient Infrastructure Research Center:** Contributing to the longevity of infrastructure
2. **Possibility and Visualization Research Center:** Improving the prevention and reduction of disasters by using digital twins, etc.
3. **Ways of Connection Research Center:** Contributing to a happier society through the science of human relations



### Research Center for Next-Generation Health Technology



**Center Director**  
**SHIMONO Tomoyuki**

**VISION**  
The Center builds health innovation ecosystems based on research evidence from general knowledge, linking development of medical and healthcare technology to technology development and practical research. In this way the Center creates innovative spaces where people can enjoy health and happiness through movement, work and residential living.

**ABOUT**  
By gathering the Center's "seeds" related to general health technology, including health, medicine and social services, the Center becomes a hub that links industry, academia and citizens, advancing world-leading academic research. We aim to be an organization that shoulders the responsibility of organically and effectively advancing regional liaison, industry-academic-public liaison and medical-industrial liaison.

**RESEARCH CONTENTS**  
**Establishment of five laboratories**

1. **Revolutionary Medical Device Creation Laboratory:** Conducts R&D in medical devices to support new medical technologies
2. **Healthcare MaaS Laboratory:** Development of high-value-added service technologies linking movement with medicine, such as transport for hospital admissions, emergency care and critical care.
3. **Medical Data Science Laboratory:** Research on use of Big Data linked to early diagnosis of presymptomatic and latent disease in the healthcare and medical fields
4. **Femtech/Assistive Tech Research Laboratory:** Research on femtech to achieve divergence and inclusion and support technologies considering disabilities and other differences in abilities
5. **Health Innovation Ecosystem Co-creation Laboratory:** Advancement of research fusing social science and urban science as needed to form ecosystems centered on health technologies





## Semiconductor and Quantum Integrated Electronics Research Center

### VISION

The Centre will contribute to solving issues and improving the convenience of our increasingly diverse societies by promoting the realisation of smart cities, for example, through the research and development, and diffusion of cutting-edge electronics technologies.

### ABOUT

As a specialized organization for semiconductor and quantum technology located in Yokohama, we will foster innovation by connecting research institutions and companies worldwide and by connecting university and society.

### RESEARCH CONTENTS

- Semiconducting heterogeneous integration laboratory:** focuses on the true value, deepening, and evolution of chiplet technology, and promote research on "heterogeneous integration" that can "connect" various devices in an "energy-saving" and high-speed manner with enabling parallel operation.
- Advanced integrated device laboratory:** promotes researches on new devices that transcend the limitations of conventional semiconductor devices, as well as on their integration technologies.
- Quantum Internet laboratory:** promote research and development for the realization of the quantum Internet as the foundation for global connectivity of quantum devices.
- Photonics laboratory:** contribute to the pioneering of next-generation optical communication technologies and non-destructive and accurate diagnostic technologies for social infrastructure.
- Social value innovation laboratory:** practical and theoretical research on methods of innovation (especially social implementation) is conducted to realize value by disseminating SQIE research results to society.



Center Director

MANABE  
Seiji

## UNIT 2

# Artificial Intelligence Research Unit for Innovation and Co-Creation

### VISION

We contribute to a prosperous future society by pursuing original artificial intelligence (AI) technologies and promoting the beneficial application of AI in various fields.

### RESEARCH CONTENTS

This research unit conducts innovative and co-creative research through the development of original techniques related to automated machine learning, evolutionary machine learning, and AI design with known unknowns. This research is based on AI, including machine learning, deep learning, and evolutionary computation. This research also promotes the application of AI technologies to other fields, such as biotechnology, biomedical engineering, security, and industry-academia-government collaborative research activities.



Principal Investigator

SHIRAKAWA  
Shinichi

## Institute for Multidisciplinary Sciences INTRODUCTION OF THE UNIT

## UNIT 1

# Biosphere

### VISION

To address various problems such as climate change and biodiversity loss, we will provide scientific evidence to leverage the value of nature to maximum effect and present new ways of interacting with nature and society that consider humans as a part of the biosphere.

### RESEARCH CONTENTS

This research unit will provide the scientific evidence needed to utilize the boundless value of nature, in applications such as climate stabilization, disaster risk reduction, pandemic control, food and water security, and cultural diversity. Through collaboration among science, society, and policy, this research unit aims to build sustainable development for the biosphere, including humanity.



Principal Investigator

KAGAMI  
Maiko

## UNIT 3

# Co-innovation Dynamics

### VISION

To achieve new social value by socially implementing advanced knowledge and technology, the Lab clarifies mechanisms for transfer and sharing of knowledge and technology both within and among organizations. The Lab also conducts practical research on the dynamics of strategy, management and innovation in partnership with industry, academia and government, to achieve co-innovation.

### RESEARCH CONTENTS

We are asked to aim to promote innovation and achieve new social value by deploying advanced technologies and knowledge discovered by universities and the like in society (social implementation). This objective requires understanding the methods and dynamics of co-innovation among a variety of players in society. This Research Unit is primarily devoted to investigating the mechanisms and process of transfer /sharing of knowledge and technologies within and among organizations. This Unit also conducts practical research on the dynamics of innovation to realize social value, including the strategy and management of industry-academia-government collaboration for co-innovation.



Principal Investigator

MANABE  
Seiji



Principal Investigator

YASUMOTO  
Masanori





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