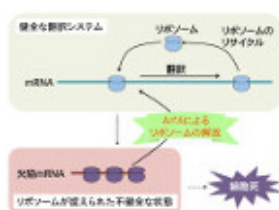


# Earth, Environmental and Life Sciences

Department of Biological Science

## Molecular Genetics

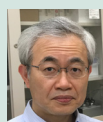


1. Transcriptional Regulation
2. Reproductive and Behavioral Biology
3. Nutritional and Metabolic Genetics

Prof.  
NAKAGOSHI Hideki

### ■ Research Themes

Drosophila/Homeostasis/  
Stress response/Metabolism/  
Fertility/Sexual behavior



Prof. ABO Tatsuhiko

### ■ Research Themes

Life Science/Genetics/Molecular  
biology

Assoc. Prof. CHADANI Yuhei

### ■ Research Themes

Life Science/Molecular biology/  
Ribosome, translation, nascent  
polypeptide

## Plant Ecology and Evolution



Why are some species able to cope with environmental changes?

How have organisms responded to environmental change in the past? We are interested in how plant species cope with and even adapt to environmental changes such as climate change and land use.

We conduct research using field surveys, common garden experiments, diversity manipulation experiments, ecological genomics, and ecological niche modeling, with a particular focus on sources of genetic diversity that enable rapid evolutionary responses and mechanisms of population maintenance through interactions among organisms.

Prof. MIMURA Makiko

### ■ Research Themes

Evolutionary ecology/Ecological genetics/  
Environmental changes

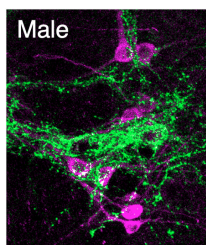


Asst. Prof. NAKAHORI Kiyoshi

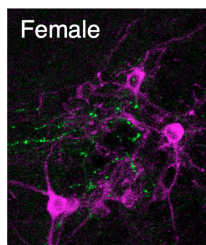
### ■ Research Themes

Conservation ecology of Oriental dollarbird  
(Eurystomus orientalis)

## Neural Control of Behavior



Male



Female

I am studying the behavioral control mechanisms in vertebrates, particularly focusing on the neuroendocrine regulatory mechanisms and the mechanisms involved in sexual differentiation.

Prof. SAKAMOTO Hirotaka

### ■ Research Themes

Neuroendocrinology

Assoc. Prof. OTI Takumi

### ■ Research Themes

Neuroendocrinology

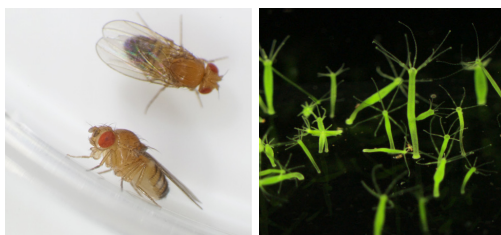


Assoc. Prof. OGOSHI Maho

### ■ Research Themes

Hormones/Hormone receptors/  
Hormone systems/Endocrinology/  
Comparative Endocrinology/  
Evolution

## Environmental Biology and Chronobiology



To reveal the principles of animal evolution, we conduct genome-wide studies using basal animals. In particular, we focus on unique ecology related to environmental adaptation and interactions between organisms, and aim to elucidate its molecular mechanism.



**Prof. YOSHII Taishi**  
 ■ Research Themes  
 Chronobiology/  
 Circadian clock/  
 Drosophila melanogaster



**Prof. ANSAI Satoshi**  
 ■ Research Themes  
 Evolutionary biology/  
 Genetics/Genomics/  
 Genome editing



**Prof. HAMADA Mayuko**  
 ■ Research Themes  
 Animal evolution/  
 Genome/Symbiosis/  
 Environmental adaptation

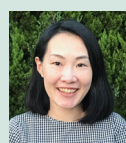
## Chemical Correlation and Control



In our laboratory, we are conducting research on a wide range of contents from physiological actions of hormones to transcriptional regulatory mechanisms of genes, using mice, rats, chickens, frog, medaka and mudskipper.



**Prof. SAKAMOTO Tatsuya**  
 ■ Research Themes  
 Hormones/Hormone receptors/Hormone systems/Endocrinology/Comparative endocrinology/Evolution



**Assoc. Prof. AIZAWA Sayaka**  
 ■ Research Themes  
 Hormones/Hormone receptors/Hormone systems/Endocrinology/Comparative endocrinology/Evolution



**Prof. TAKEUCHI Sakae**  
 ■ Research Themes  
 Hormones/Hormone receptors/Hormone systems/Endocrinology/Comparative endocrinology/Evolution

**Asst. Prof. AKIYAMA Tadashi**  
 ■ Research Themes  
 Hormones/Hormone receptors/Hormone systems/Endocrinology/Comparative endocrinology/Evolution

# Developmental Biology



We are interested in unraveling the molecular basis of plant growth and development. Our current research is focusing on

I. Function of polyamines in growth and development

II. Molecular mechanism of establishment and maintenance of shoot epidermis-specific gene expression

Urodele amphibians, such as newts and axolotls, can regenerate their missing body parts. In contrast, we cannot regenerate "body parts". Our ultimate goal is to understand the tricks of their higher regeneration ability and to apply their tricks onto higher vertebrates.



**Prof. SATOH Akira**

■ Research Themes

Limb regeneration/Regeneration biology/Organ regeneration/FGF signaling/Axolotl

**Prof. TAKAHASHI Taku**

■ Research Themes

Life Science/Plant molecular biology and physiology/Genetics/Morphology and anatomical structure

**Assoc. Prof.**

**MOTOSE Hiroyasu**

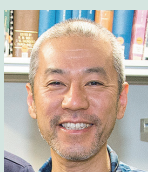
■ Research Themes

Life Science/Cell biology

## Petrology



Rocks record the history from their formation up to the present. Therefore, by observing and analyzing the rock's chemical composition and the types and compositions of the constituent minerals, it is possible to unravel the history of the rock. Deciphering these past geological phenomena can also help us to understand the mechanisms of geological phenomena occurring on the Earth today. We are particularly interested in the formation mechanisms of rocks that make up the ocean floor and plate convergence zones.

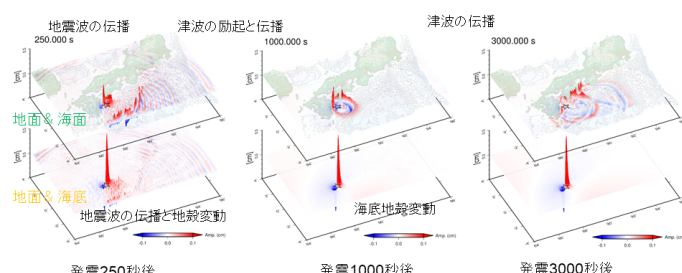


**Assoc. Prof. NOZAKA Toshio**  
 ■ Research Themes  
 Metamorphic rock/Igneous rock/  
 Geology/Crust/Mantle



**Assoc. Prof. NAKAMURA Daisuke**  
 ■ Research Themes  
 Metamorphic rock/Igneous rock/  
 Geology/Crust/Mantle

## Seismology

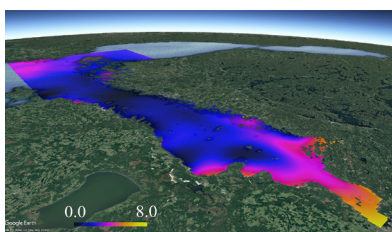


- Modelling of seismic and tsunami waves
- Study on strong motion



**Prof. TAKENAKA Hiroshi**  
 ■ Research Themes  
 Computational seismology/  
 Strong motion/Tsunami

## Geoinformatics



One of research theme is to develop models that contribute to the evaluation of earthquake resistance and safety by applying data on active faults and seismotectonics to long-term and probabilistic hazard assessment of future earthquakes and simulation of landform evolution in 100,000-year time scale. We also modeling the dynamics of the environmental parameters or environmental substances by using Geoinformatics. For the purpose, AI and Kriging method by Python or R are combined with GIS applications are employed.



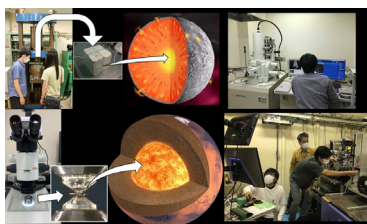
**Prof. KUMAMOTO Takashi**  
 ■ Research Themes  
 Seismic Hazard assessment/Landform  
 Evolution Simulation



**Asst. Prof. YAMAKAWA Junji**  
 ■ Research Themes  
 Geostatistics/AI/Kriging/Geographic  
 Information System (GIS)



## Physics of the Earth and Planetary Interiors



We investigate structures and properties of materials which consist of Earth and planetary interiors to clarify phenomena occurring in the Earth and planetary interiors. Planetary interior environments are produced in the lab using high-pressure devices, such as large-volume press and diamond anvil cell.

**Prof. URAKAWA Satoru**

■ **Research Themes**  
Earth and planetary core/Mineral physics/Amorphous and liquid



**Prof. TERASAKI Hidenori**

■ **Research Themes**  
Planetary core/Formation and evolution of the core/Physical properties of liquids

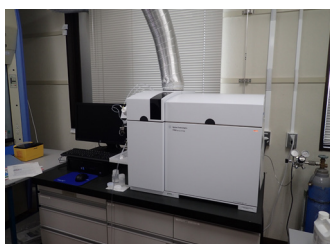


**Asst. Prof. Sakurai Moe**

■ **Research Themes**  
Earth's mantle/Hydrous mechanism/Experimental mineralogy



## Geochemistry



A wide variety of research topics, starting from the origin and evolution of the solar system to modern environmental problems, are being studied by the members of the geochemistry group. Instruments such as the ICP-OES, ICP-MS, TIMS are used in combination with the state-of-the-art clean laboratory to obtain high-precision data from various planetary and environmental materials including meteorites, terrestrial rocks and minerals, calcifying organisms such as corals and sea urchins, and river and groundwater. High quality geochemical data are used to investigate the processes responsible for the evolution of planets, continental crust, modern and ancient ocean, and the impact of human activities on the environment such as the effect of ocean acidification on the calcification of marine organisms.



**Prof. INOUE Mayuri**

■ **Research Themes**  
Paleoenvironments/Coral reefs/Biomineralization



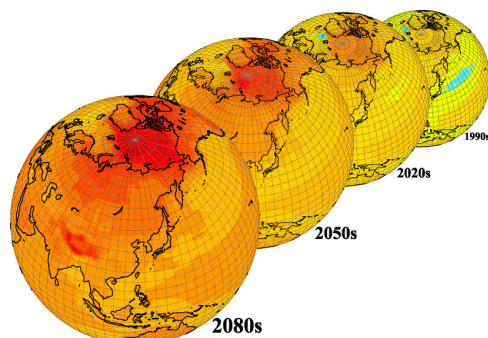
**Assoc. Prof. YAMASHITA Katsuyuki**

■ **Research Themes**  
Meteorites/Continental crust/River water/Groundwater/Asian dust

## Atmospheric Sciences



The global circulation of the atmosphere and local atmospheric phenomena occur through various mechanisms. What factors contribute to climate change from the past to the future, as exemplified by global warming? In the atmospheric science section, we study the mechanisms behind extreme weather



and climate change by comprehensively utilizing numerical simulations, observation products, and reanalysis datasets. We also develop numerical models to understand physical processes and mechanisms of climate change, for more accurate climate predictions.



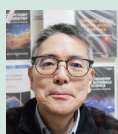
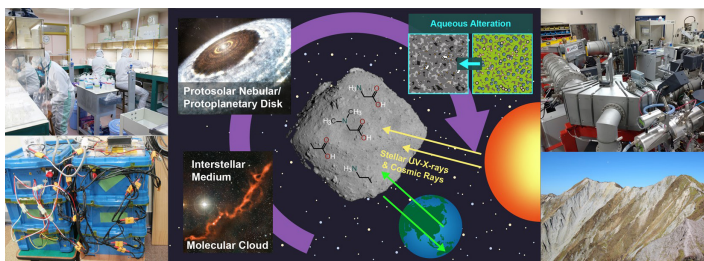
**Prof. NOZAWA Toru**

■ **Research Themes**  
Atmospheric physics/Climate change/Global warming/Numerical simulation

## Planetary Materials Analytical Chemistry



We are exploring the pathway of material evolution over 13.8 billion years from the birth of the universe to the present through comprehensive materials science with analytical chemistry. Through the analysis of meteorites and extraterrestrial materials by sample returns, in addition to terrestrial volcanic and metamorphic rocks, we are exploring to understand the origin, evolution, and dynamics of materials in space and time, in an attempt to understand the roots of humankind. The exploration of the origin of life using methods that integrate inorganic and organic chemistry will continue to grow in the future.



**Prof. MAKISHIMA Akio**

■ **Research Themes**

Silicate planets/Origin of elements origin of life and life-forming materials/Energy storage



**Prof. KOBAYASHI Katsura**

■ **Research Themes**

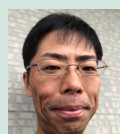
Geochemistry/Petrology/Materials science



**Prof. TANAKA Ryoji**

■ **Research Themes**

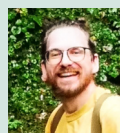
Geochemistry/Cosmochemistry/Isotope geochemistry/Petrology/Astrobiology



**Assoc. Prof. KUNIHIRO Tak**

■ **Research Themes**

Asteroid/The solar nebula



**Assoc. Prof. POTISZIL Christian**

■ **Research Themes**

Prebiotic Chemistry/Origin of Life/Organic Matter/Asteroids/Meteorites



**Asst. Prof. KITAGAWA Hiroshi**

■ **Research Themes**

Petrology/Geochemistry/Geochronology/Analytical chemistry

## Planetary Materials Experimental Physics



Phase relations and melting relations of Earth and planetary materials. Structure, rheology, elastic and electrical properties of Earth's mantle and core materials. Element partitioning between mantle minerals and mantle/core materials. Combine studies of extraterrestrial and terrestrial materials in terms of mineralogy, texture, composition, and spectroscopic properties to interpret the current nature and geological history of other solar system bodies, especially Mars and carbonaceous asteroids.



**Prof. YOSHINO Takashi**

■ Research Themes

Earth and Planetary Material Sciences/  
Mineral physics



**Prof. YAMAZAKI Daisuke**

■ Research Themes

High Pressure Earth Science/Mineral  
Physics



**Assoc. Prof. ISHII Takayuki**

■ Research Themes

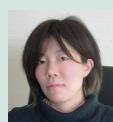
Earth and Planetary Material Sciences/  
Mineral physics



**Assoc. Prof. MORIGUTI Takuya**

■ Research Themes

Earth and Planetary Material Sciences/  
Mineral physics/Magmalogy



**Asst. Prof. MASHINO Izumi**

■ Research Themes

Earth and Planetary Material Sciences/  
Mineral physics



**Prof. XUE Xianyu**

■ Research Themes

Mineral physics/Magmalogy/Spectroscopy



**Assoc. Prof. YAMASHITA Shigeru**

■ Research Themes

Petrology/Magmalogy

## Planetary Surface Environmental Science



To understand the evolution of the surface environment from the past to the future and of the planets' interiors which can influence to the surface environment, we study various phenomena from macroscopic geological and geomorphological processes to molecular-scale water (or melt) – rock interactions based on field surveys, remote sensing techniques, geochemical analysis, high-temperature and high-pressure experiments, and environmental simulations using space chambers. We also challenge practical research that contributes to the preservation of the global environment and future human migration to the moon and the extraterrestrial planet.

**Prof. KAMEDA Jun**

■ Research Themes

Structural geology



**Assoc. Prof. RUJ Trishit**



**Assoc. Prof.  
IZAWA Matthew Richar**

■ Research Themes

Astrobiology/Meteorites/  
Mars/Asteroids/Remote  
sensing/Spectroscopy



## Applied Ecology



In the last few decades, biodiversity loss has been a big issue all over the world. As you know, human activities are one of the most primary factors, which modify the natural habitats of animal and plant species, cause the decline of their population, and sometimes completely make them extinct. To live as a well-behaved passenger on the future earth, we first need to understand the relationship between biodiversity and human activities. In our laboratory, we study for and actually perform for conservation and appropriate management of biodiversity. And, we believe these should be done based on accurate knowledge about biology, ecology, and environmental science. We are targeting various taxa, such as endangered fishes, invasive crustaceans, and native herbaceous plants.



**Prof. NAKATA Kazuyoshi**

■ **Research Themes**

Conservation ecology/Ecology and civil engineering/Biological invasion/Aquatic animals/Crustaceans.



**Asst. Prof. KATSUHARA Koki**

■ **Research Themes**

Plant ecology/Plant-animal interaction/Species coexistence/Asian dayflower/Semi-natural grassland.

## Soil Management



Agriculture is responsible for emissions of greenhouse gases (GHGs) such as carbon dioxide ( $\text{CO}_2$ ), nitrous oxide ( $\text{N}_2\text{O}$ ), and methane ( $\text{CH}_4$ ). Production of these gases in farmland soil results from biological processes like organic matter decomposition, nitrification and denitrification, and highly depends on organic matter inputs. We aim at analyzing the effects of organic matter amendment on GHGs emissions. In particular, we are interested in agricultural soil amended with livestock compost.



**Prof. MAEDA Morihiro**

■ **Research Themes**

Greenhouse gases/Nitrogen/Phosphorus/Sediment/Soil/Organic waste/Water

## Agricultural Land Engineering



In today's global society, where the effects of climate change are becoming increasingly severe, agricultural land, as a production base, is expected to contribute to mitigation and adaptation for climate change through rainwater recharge, organic matter conservation, and greenhouse gas reduction, while producing food in a sustainable and stable manner. Therefore, we are conducting research on management methods of agricultural land through investigation, experimentation, monitoring, and prediction of soil, water, chemicals, and atmospheric environments at multi-layered spatial scales from the earth to the arable land.



**Prof. MORI Yasushi**

■ **Research Themes**

Soil organic matter/Macropore/Greenhouse gas emission/Infiltration



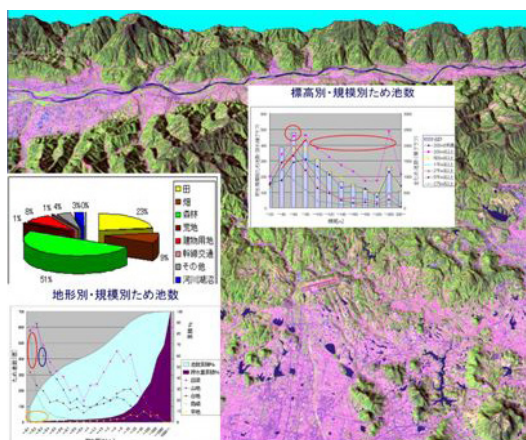
**Assoc. Prof. TSUJIMOTO Kumiko**

■ **Research Themes**

Land-atmosphere interaction/Soil moisture/Micro-wave remote sensing/Climate change impact assessment



## Terrestrial Information Management



In recent years global environmental problems such as desertification, the forest decrease, the degradation of the farmland have become serious, also in our imminent place, local environmental problems such as the Satoyama landscape(rural landscape) have become serious. These environmental problems have large or small spatial scale, but those are all phenomenon occurring on the real field, and the thing which can describe such spatial phenomenon is a map (geography space information). In our laboratory, we have been trying to analyze various environmental problems using a digital map and the artificial satellite image which we can treat with a computer.



**Prof. MORITA Hidenori**

■ **Research Themes**

Terrestrial Information Management/Land Surveying/  
Rural Planning

## Irrigation and Drainage



We attempt to solve problems related to water quantity and quality from a plot to watershed



scale. Our research focuses on the harmony between the environment and human activities, such as the optimal allocation of water quantity (stabilization of food production) in response to global warming and population growth, and the solution of water environment problems caused by human activities.



**Prof. MOROIZUMI Toshitsugu**

■ **Research Themes**

Irrigation and Drainage/Environmental  
Meteorology/Soil Hydrology/Watershed  
Management



**Assoc. Prof. SOMURA Hiroaki**

■ **Research Themes**

Irrigation and Drainage/Environmental  
Meteorology/Soil Hydrology/Watershed  
Management

## Catchment Hydrology



Hydrology is the science which deals with water cycle on global or regional scales through observation of hydrological processes and numerical simulations. To enhance reliability of flood control in river basins, we need hydrological models that can represent the regional hydrological cycle and predict flood discharges accurately. Our laboratory works on developing mathematical models that quantitatively accounts for the water cycle and probability statistical models that express the scale and frequency of hydrological and meteorological phenomena for appropriate water management, disaster prevention and mitigation against floods and impact assessment of climate change on flood/drought damages.



**Prof. CHIKAMORI Hidetaka**

■ **Research Themes**

Hydrological cycle/Flood/Drought/  
Disaster Risk Reduction



**Assoc. Prof. KUDO Ryoji**

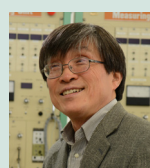
■ **Research Themes**

Hydrological cycle/Flood/Drought/  
Disaster Risk Reduction

## Design of Environmental Infrastructures



Design and maintenance of the natural ground and geo-structures included in the social infrastructures are studied here. Especially, the water storage facilities as the dams and the headworks are focused on. Related to the objects, the ways of the laboratory and the in-situ tests and the simulation technics are developed.



Prof. NISHIMURA Shinichi

### ■ Research Themes

Geotechnical engineering/Irrigation and rural engineering

## Management of Environmental Infrastructures



The maintenance of damaged irrigation tunnels has become a major social concern; and thus, evaluating the damage conditions of current tunnels is of crucial importance. Voids behind the tunnel lining may be created during or after construction by the conventional method, and these voids are the main factors in its failure. Hence, it is imperative to comprehend the behaviors of the ground, the tunnel lining and the voids. This study presents model tests of the interacting behaviors between the ground and a tunnel lining with voids under loading conditions.



Assoc. Prof. SHIBATA Toshifumi

### ■ Research Themes

Geotechnical engineering/Numerical analysis

## Rural Planning



Rural communities in East Asian countries, including Japan, are currently facing problems related to the sustainability of the local environment, such as depopulation, ageing, increasing abandoned farmland, and emerging damage by wildlife. Our laboratory focuses on the planning to solve these problems, and examines the effects of the planning systems, how they should be operated, their history and paradigm shifts, as well as exploring future visions for rural areas by engaging in planning processes and its implementation at community scales.



Prof. KUKI Yasuaki

### ■ Research Themes

Rural planning/Community planning/Damage by wildlife/Abandoned farmland/Ordinance/Land use

## Material Cycles and Waste Management



To achieve Sustainable Development Goals, it is indispensable to promote citizens behavior modification and drive social transformation along the lines with 3R hierarchy which means Reduce as the 1st priority followed by Reuse and Recycle. Our laboratory aims to support science-based/data-driven decision making in MSW management planning, establish good practices on 3Rs, and expand their actual practices.



Prof. FUJIWARA Takeshi

■ Research Themes

Environmental System Engineering/  
Waste management



Asst. Prof. HABUER

■ Research Themes

Waste management/LCA/Material  
flow analysis/Environmental impact  
assessment

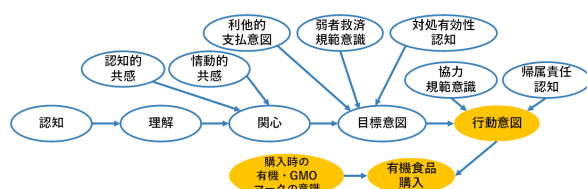
## Science for Sustainable Society System



To support rational and effective decision making on municipal solid waste management toward sustainable society, our laboratory aims to accumulate the scientific base by the following research activities:

- Detail survey on municipal solid waste generation, demographics, 3R behavior, pro-environmental attitudes, lifestyle, and household expenditure in Japan and Vietnam
- Exploring influence factors and Bayesian modeling of waste generation and 3R behavior
- Political effect prediction on 3Rs and reliability verification
- Accuracy improvement on sales prediction of food items by Deep Learning toward food loss reduction

有機食品の購買行動の規定因モデル



Assoc. Prof. MATSUI Yasuhiro

■ Research Themes

Municipal Solid Waste/Food loss from  
business sectors/Combustion ash from wood  
biomass/3Rs/Behavior modification/Behavior  
modeling/Bayesian network/Life Cycle  
Assessment (LCA)/GIS/Collection and transport



### Plant Ecology



The stand structure and dynamics of forests are researched to demonstrate the mechanism of regeneration in forests. The eco-physiological characteristics of invasion, establishment, survival, and growth in relationship to whole-plant water use and matter production of tree species are analyzed to determine the strategies of different species. Based on these research results, an optimal model in the management of forests is constructed for the sustainable conservation of the forests.



**Prof. MIKI Naoko**

■ **Research Themes**  
Plant physiological ecology/  
Water use characteristics/  
Drought stress



**Assoc. Prof. MIYAZAKI Yuko**

■ **Research Themes**  
Plant reproductive ecology/  
Environmental responses/  
Forest dynamics

### Environmental Soil Science



In order to develop re-vegetation techniques for forests after disturbances such as fires or clear-cutting, we study the change factors that regulate the dynamics of nutrient mineralization, immobilization, and turnover in the soil-plant ecosystems. We also study techniques of utilization and recycling of organic waste as a re-vegetation material.



**Prof. SHIMA Kazuto**

■ **Research Themes**  
Nutrient dynamics in soil-plant ecosystems

### Forest Ecology

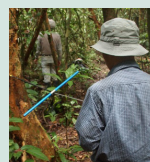


We conduct research at various scales, from genes to entire ecosystems, with the aim of understanding the structure, function, and dynamics of forest ecosystems that provide a variety of ecosystem services to human society. Special attention is paid to the mechanisms of elemental cycles and the role of organisms in elemental cycles.



**Prof. HIROBE Muneto**

■ **Research Themes**  
Elemental cycles/Structure, function,  
and dynamics of forest ecosystems



**Prof. HYODO Fujio**

■ **Research Themes**  
Food web/Isotopes/Feeding habit/Soil ecology



## Conservation of Aquatic Biodiversity



Molluscs including shellfish, snails, slugs and so on are a very diversified animal group and consist of more than 80,000 Recent species in the world, but their taxonomy and recognition of species are still poorly understood. For example, *Turbo sazae* is one of the most well-known marine snails in Japan since ancient age, but nevertheless the species has long been misidentified with *Turbo cornutus*, a species endemic to China, until recently and documented to be unnamed in 2017. Another edible species *Tegula kusairo* exhibited the similar case and it was described as a new species in 2020. Furthermore, many species become extinct or critically endangered by artificial environmental changes before recognizing their presences by human beings. The alpha-taxonomy of this group is thus highly important and an urgent matter in terms of biodiversity conservation.

Assoc. Prof.  
FUKUDA Hiroshi

### ■ Research Themes

Taxonomy/Systematics/  
Malacology/Biodiversity/  
Conservation biology

## Insect Ecology



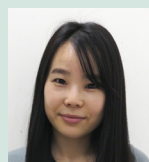
We research behavior, ecology and evolution mainly using insects. Research topics are the evolutionary process from the view point of natural selection and/or sexual selection, environmental effects on traits in animals, life-history evolution, and applied entomology in evolutionary biology.



Prof. MIYATAKE Takahisa

### ■ Research Themes

Evolutionary biology/Animal behavior/  
Entomology/Ethology/Chronobiology/  
Beetle/Fly/Ant



Asst. Prof. FUJIOKA Haruna

### ■ Research Themes

Evolutionary biology/Animal behavior/  
Entomology/Ethology/Chronobiology/  
Beetle/Fly/Ant

## Evolutionary Ecology



Using several insects, we are conducting researches for evolution and ecology. Specifically, we focus on reproductive behavior, learning behavior and life history, and analyze them to clarify their adaptive significance. We are also analyzing the physiological mechanisms gene expression that control these behavioral traits for understanding their proximate factors. In addition, we will apply the experimental results as above to the development of technology for pest control methods and are attempting to expand our research into applied researches.



Assoc. Prof. OKADA Kensuke

### ■ Research Themes

Ecology

## Bioproduction Systems Engineering



In our laboratory, we are conducting research on agricultural robots that contribute to automation and labor saving in biological production, plant factories that propose new farming methods in an optimal environment based on biological measurements, and smart agriculture that navigates agriculture based on big data such as farm environment and yields, all based on a systems engineering approach, in preparation for the serious labor shortage and other agricultural problems our country will face in the near future. We are also conducting research on smart agriculture, which navigates agriculture based on big data such as the farm environment and yields.



**Prof. MONTA Mitsuji**

■ **Research Themes**

Agricultural Engineering/Agricultural Machinery



**Assoc. Prof. NAMBA Kazuhiko**

■ **Research Themes**

Agricultural Engineering/Agricultural Machinery

## Resources Management



The effective and sustainable management method of local resources is studied in a viewpoint of social science.



**Assoc. Prof. DATAI Hisashi**

■ **Research Themes**

Resource Managements/Agricultural Economics

## Food and Environmental Policy



Toward the "Asian Ways" of Sustainable Development: Viewing Our Food and Environment from Social, Political, and Economic Perspectives  
Social sciences and humanities (SSH) can contribute to solving food and environmental problems. We are especially employing area studies/political and economic perspectives to broadly re-examine these issues in Asia, such as agriculture, resource industries, environmental policies, community-based development, disaster management, etc. The 21st century is believed to be the Asian century. The future of our world thus largely rests on how Asia commits to sustainability. Based on domestic, foreign, and international research from Asia and other regions, we wish to examine changes in human-nature relationships and the balance between development and the environment.



**Prof. UBUKATA Fumikazu**

■ **Research Themes**

Development studies/Environmental studies/Policy/Asia/Area studies/Social sciences and Humanities (SSH)



**Assoc. Prof. OHNAKA Katsutoshi**

■ **Research Themes**

Food security/Development and environment/Policy/Asia/Area studies/Social sciences and Humanities (SSH)

# International Rural Studies



Based on field surveys in Asia, we examine relationships between rural development and the environment in contemporary globalized societies. We also explore how we can redirect ourselves toward "sustainable development" from the perspective of local communities.



**Prof. KIM Doo-Chul**

■ Research Themes

Rural Geography/Environmental Geography



**Assoc. Prof. HONDA Yasuko**

■ Research Themes

Rural Sociology/Environmental Sociology

# Applied Natural Product Chemistry

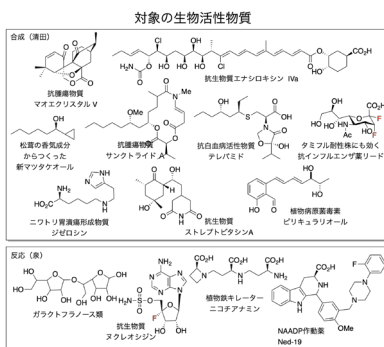


Our research targets are biologically active natural organic compounds. Using synthetic organic chemistry, we aim to elucidate the mechanism of activity expression and structure-activity relationship of physiologically active substances, and to apply them to agricultural chemicals and medicines.

Overview: Synthesis and activity evaluation of natural organic compounds and analogues, Elucidation of biosynthetic pathways of physiologically active substances, Application of biocatalysts (microorganisms and enzymes) to organic synthesis, Development of useful organic reactions

Target: antibiotics, plant pathogenic toxins, plant hormones, anorexia, insect attractants; repellents, aroma substances

Development: anticancer agents, antitumor agents, antiviral agents (influenza, novel coronavirus, HIV), herbicides, antibiotics, insecticides, perfumeries



Prof. KIYOTA Hiromasa

## ■ Research Themes

Organic synthesis/Natural product chemistry/Medicinal chemistry/Pesticide chemistry



Prof. IZUMI Minoru

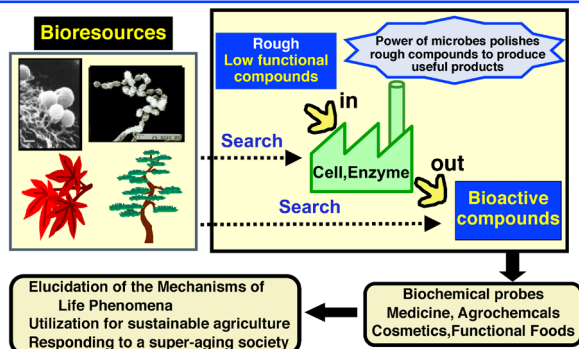
## ■ Research Themes

Glycotechnology/  
Chemical Biology

# Chemistry of Bioactive Compounds



## Search for High functional Compounds & Establishment of Their Effective Conversion from Low Functional Compounds



Search for bioactive organic compounds produced by microorganisms and plants, i.e., highly-functionalized compounds, and study on microbial conversion of these highly-functionalized compounds from low-functional compounds.

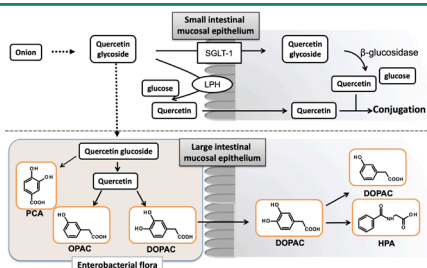


Prof. NITODA Teruhiko

## ■ Research Themes

Applied Microbiology/Natural Products/  
Chemistry/Enzyme Chemistry

# Food Biochemistry



The values of foods are defined by three categories: nutritional function, sensory function, and health-maintenance function. Our research has been focused on health promotion and disease prevention.



Prof. NAKAMURA Yoshimasa

## ■ Research Themes

**Food Chemical Biology (Biological and physiological functions of food phytochemicals)/Functional Mechanism and Bioavailability of Food Factors**



Assoc. Prof. NAKAMURA Toshivuki

## ■ Research Themes

## Food Chemical Biology (Biological and physiological functions of food phytochemicals)/Functional Mechanism and Bioavailability of Food Factors



## Chemistry of Bio-signalling



In particular, our research focuses on stress signaling regulating stomatal movement. Stomatal pores, which are formed by pairs of guard cells in the epidermis especially of leaves, regulate gas exchange for photosynthesis and transpirational water loss. Guard cells can perceive various stimuli such as light, CO<sub>2</sub>, pathogen infection, and various phytohormones such as abscisic acid, then transducing the inputs to a change in stomatal aperture. Using multidisciplinary approaches, we aim to reveal the detailed mechanisms of signaling cascading from stress sensing to stomatal aperture regulation in guard cells. We also study the basic mechanisms of heavy metal and salt stress responses in plants using model plants as well as cultured cells. Our research advance will contribute to develop new technologies that improve crop productivity and safety.



**Prof. MURATA Yoshiyuki**

■ **Research Themes**

Plant physiology/Molecular biology/  
Electrophysiology/Agricultural and  
biological chemistry

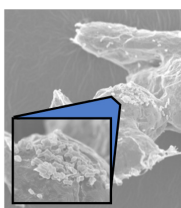
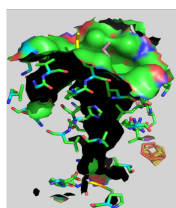


**Assoc. Prof. MUNEMASA Shintaro**

■ **Research Themes**

Plant physiology/Molecular biology/  
Electrophysiology/Agricultural and biological  
chemistry

## Microbiological Chemistry



We are conducting research to elucidate the metabolic functions of microorganisms and others so as to apply them to solving environmental problems and producing useful materials. We are pioneering a new field of bioinorganic chemistry that elucidates the interaction between proteins and minerals at the molecular level, such as microorganisms that breathe iron, marine organisms that produce magnetite, and catalytic mechanisms of metalloenzymes. In our laboratory, we are promoting interdisciplinary education and research that incorporates information systems such as machine learning and computational chemistry into general-purpose experimental methods such as genetic engineering, protein engineering, genome editing, and RNA engineering.

**Prof. TAMURA Takashi**

■ **Research Themes**

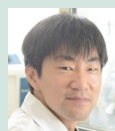
Biofuel hydrogen/  
Chemoautotrophic  
bacteria/Biomineralization



**Prof. KANAO Tadayoshi**

■ **Research Themes**

Applied microbiology/  
Acidophilic bacteria/  
Iron- and sulfur-oxidizing bacteria



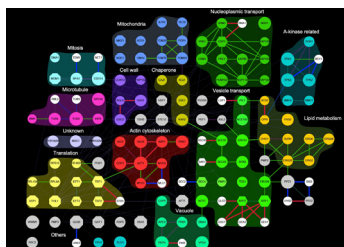
**Assoc. Prof. NEMOTO Michiko**

■ **Research Themes**

Biomineralization/Omics



## Cellular Systems Chemistry



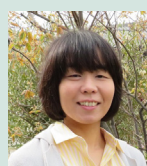
Investigate cellular systems biology from the perspective of agricultural chemistry. 1) Understand the makeup of yeast cells, which are applied microorganisms, as a system and connect it to applications such as substance production. 2) Clarify the function of glycans that control the coordination of cellular systems and apply it.



**Prof. MORIYA Hisao**

■ **Research Themes**

Eukaryotes/Systems Biology/  
Applied Microbiology



**Assoc. Prof. MAEDA Megumi**

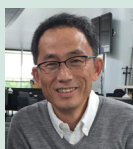
■ **Research Themes**

Eukaryotes/Functional Glycobiology/  
Immunology

### Plant Genetics and Physiology



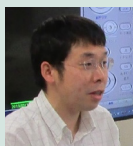
Our life on earth cannot continue without the atmospheric environment, which is maintained by oxygenic photosynthesis. Plants perform photosynthesis in chloroplasts, where light energy is converted into chemical energy by a series of electrochemical reactions. In contrast, land plants are exposed incessantly to excess light energy or harsh atmospheric environments that engender 'photodamage'. How do plants cope with such photosynthetic inactivation? What are the key elements to maintaining or even maximizing chloroplast functions? Our group studies various aspects of chloroplast development and photosynthesis. By understanding the factors involved in photoprotection and chloroplast function, we aim to improve crop productivity against atmospheric stress over the long term.



**Prof. SAKAMOTO Wataru**

■ **Research Themes**

Chloroplast/Photosynthesis



**Assoc. Prof. MATSUSHIMA Ryo**

■ **Research Themes**

Amyloplast/Starch biosynthesis



**Assoc. Prof. OZAWA Shin-Ichiro**

■ **Research Themes**

Light-harvesting complex/Protein structural biology

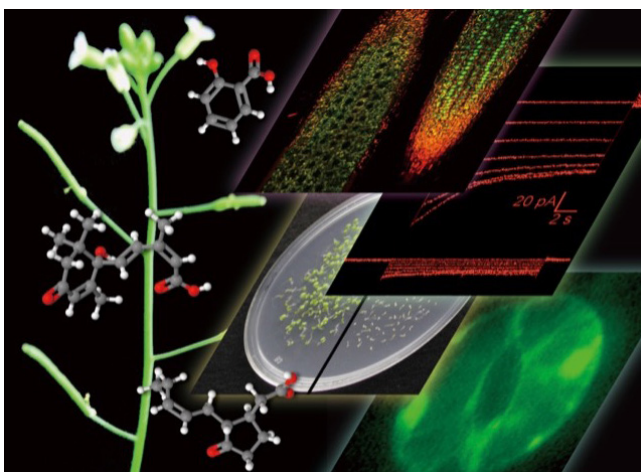


**Asst. Prof. OKEGAWA Yuki**

■ **Research Themes**

Photosynthetic electron transport/Redox regulation

### Signaling Mechanisms



Did you know that plants, despite being rooted in one spot, are actually quite adaptable to changes in their environment? It's fascinating to think about how they sense and respond to these changes without having a nervous system or brain like animals do. This is a question that scientists are still trying to answer. Our research group is specifically investigating how plants integrate and analyze environmental information, even at the tissue level, to determine the best response as individuals. We're focusing on plant hormone responses and chromatin regulation, using techniques like physiological and molecular biology, as well as molecular genetics. Our ultimate goal is to apply this knowledge to develop stress-tolerant crops that can thrive even in challenging conditions. By understanding how plants handle environmental stress, we can help create a more sustainable and resilient food supply for the future.

**Prof. HIRAYAMA Takashi**

■ **Research Themes**

Environmental response mechanism of plants/Plant molecular genetics/Model plants/Epigenetics/Stomatal movement/Integration of environmental stimuli in plants



**Assoc. Prof. MORI Izumi**

■ **Research Themes**

Environmental response mechanism of plants/Plant molecular genetics/Model plants/Epigenetics/Stomatal movement/Integration of environmental stimuli in plants



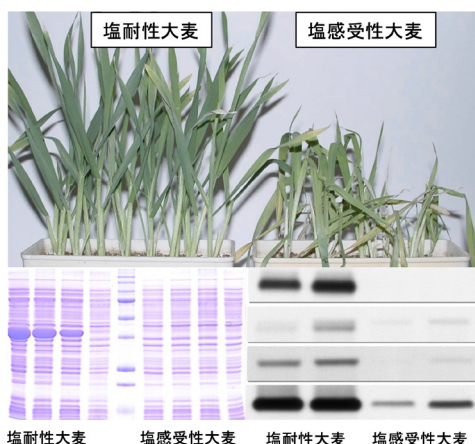
**Assoc. Prof. IKEDA Yoko**

■ **Research Themes**

Environmental response mechanism of plants/Plant molecular genetics/Model plants/Epigenetics/Stomatal movement/Integration of environmental stimuli in plants



## Plant Cytomolecular Biochemistry



Plants are sensitive to various environmental stimuli. They respond to physical, chemical, and biological stress factors. Consequently, plants can undergo changes in their development, morphology, and physiology during their life cycle. We have used biochemical and molecular biological techniques to elucidate the functions of enzymes, proteins, and gene regulating factors, which are all related to stress tolerance mechanisms of plant cells under environmental stress conditions. Through our research, we aim at developing plants that can adapt well to adverse and extreme environments to resolve difficulties such as food shortages and environmental degradation.

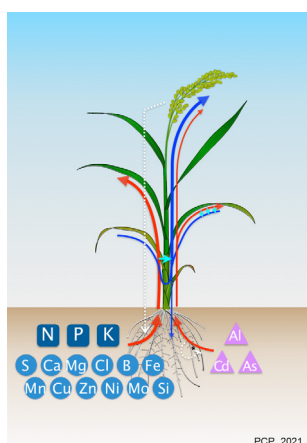


Assoc. Prof.  
SUGIMOTO Manabu  
■ Research Themes  
Environmental Stress  
Biochemistry



Asst. Prof.  
RIKIISHI Kazuhide  
■ Research Themes  
Plant Molecular  
Genetics

## Plant Stress Responses



Since plants cannot move, they must cope with various environmental stresses. In our group, we are focusing on "mineral stress" including deficiency of essential nutrients or excess of toxic and essential elements. We are working on the identification of transporters involved in the uptake, root-to-shoot translocation, and distribution/redistribution of different mineral elements mainly in rice, and on the regulatory mechanisms of these transporters in response to environmental changes. Our goal is to improve the productivity and safety of crops through the manipulation of transporters.



Prof.  
MA Jian Feng  
■ Research Themes  
Plant stress/Mineral  
transport/Transporters

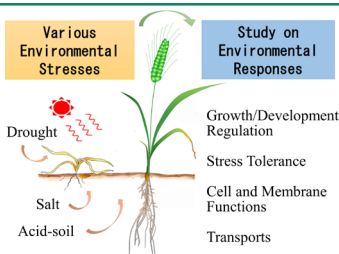


Assoc. Prof.  
YAMAJI Naoki  
■ Research Themes  
Plant stress/Mineral  
transport/Transporters



Assoc. Prof.  
MITANI Namiki  
■ Research Themes  
Plant stress/Mineral  
transport/Transporters

## Plant Molecular Physiology



Our research has been focusing on the molecular, cellular, and physiological response and adaptation mechanisms of plants under environmental stresses. We report ion conduction in the plasma membrane and water conducting aquaporins in the tonoplast. We also report the relationship of transport function and structure regarding guard-cell-type ALMT family malate transporters.



Prof.  
KATSUHARA Maki  
■ Research Themes  
Ion transport/Water  
transport/Root/Salt  
stress



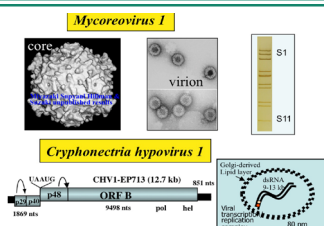
Assoc. Prof.  
SASAKI Takayuki  
■ Research Themes  
Acid-soil stress/Aluminum  
tolerance/Malate  
transporter/Stomatal closure



Asst. Prof.  
UTSUGI Shigeko  
■ Research Themes  
Drought stress/Aquaporin  
/Water transport/Seed



## Molecular Virology



Plant growth is influenced by various microorganisms including both beneficial and harmful ones. Among them are plant-infecting viruses that cause serious damage to crops and mycoviruses infecting phytopathogenic fungi that serve as biocontrol (virocontrol agents). Also, an increasing number of bacteria and fungi mutualistic to plants that enhance plant growth and stress tolerance. This group is mainly engaged in the three projects below.

Prof.  
SUZUKI Nobuhiro

■ Research Themes  
Virus/Phytopathogenic  
fungi/Plant Disease/Plant-Microbe  
Interactions/Plant Pathology/  
Biological Control



Assoc. Prof.  
KONDO Hideki

■ Research Themes  
Virus/Phytopathogenic  
fungi/Plant Disease/Plant-Microbe  
Interactions/Plant Pathology/  
Biological Control

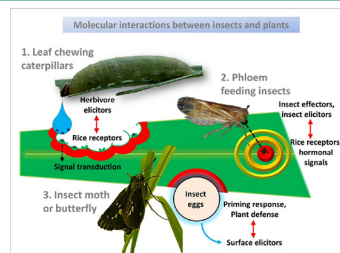


Assoc. Prof.  
HYODO Kiwamu

■ Research Themes  
Virus/Phytopathogenic  
fungi/Plant Disease/Plant-Microbe  
Interactions/Plant Pathology/  
Biological Control



## Plant-Insect Interactions

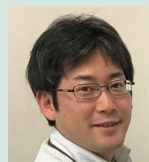


Establishment of effective plant defense systems against herbivores in natural history reflects the existence of extremely variable interactions between plants and insects, also known as co-evolution process. Our group strives to understand, at a molecular level, the mechanisms of activation, signal transduction and metabolic basics of plant defenses triggered after the recognition of insect attack. Furthermore, we target sustainable pest control by the use of natural enemies and their attraction to herbivore-infested plants by the emissions of various volatile organic compounds (VOCs) from plants.



Prof. GALIS Ivan

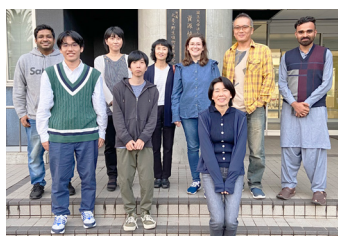
■ Research Themes  
Plant-insect interactions/Plant defense  
mechanisms/Chemical ecology/Herbivore



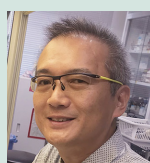
Assoc. Prof. SHINYA Tomonori

■ Research Themes  
Plant-insect interactions/Plant immunity/  
Biofunctional molecules

## Plant-Environmental Microbiology



By understanding the ecology of Methylobacterium species, which utilize methanol released by plants and dominate on leaves, we will apply their function as growth-promoting bacteria to agriculture. We are also analyzing the rhizosphere microbial community structure in crop ecosystems. On the other hand, we are trying to uncover the mechanism of growth and mortality of bloom-forming phytoplankton, which cause damage to fisheries, by focusing on symbiotic bacteria.



Assoc. Prof. TANI Akio

■ Research Themes  
Plant growth promoting bacteria/  
Methylophages/Lanthanides



Assoc. Prof. UEKI Shoko

■ Research Themes  
Bloom-forming phytoplankton/Marine  
bacteria



## Plant-Pathogen Interactions



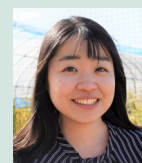
Rice is the world's most important crop, and improving rice is an important research challenge.



Our ultimate goal is to design new rice varieties that exhibit resilience against abiotic stresses while augmenting essential agronomic traits. To achieve this ambitious goal, we investigate immunoreceptors and the small G protein OsRac1, both of which play pivotal roles in rice immunity. We firmly believe that we can successfully engineer a robust rice immune system by acquiring a comprehensive understanding of the functions performed by immunoreceptors and OsRac1.



**Prof. KAWANO Youji**  
■ Research Themes  
Rice/Immunity/NLR

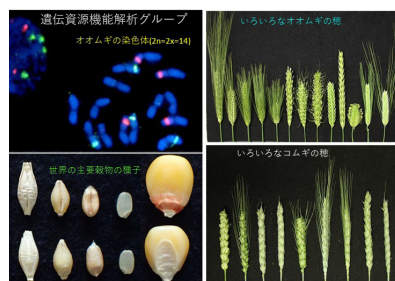


**Asst. Prof. FUKADA Fumi**  
■ Research Themes  
Plant pathology, Plant-microbe interaction

## Plant Functional Genomics



Barley, the fourth most important cereal crop in the world, typically has seeds with adhered hulls. This hulled seed trait is suitable for breweries. Some naked seed mutants with easily separable hulls were generated through spontaneous mutation. They are suitable for food usage. We have revealed that barley awns and spike hulls are photosynthetically active. Our current research specifically examines molecular identification and characterization of beneficial genes controlling (1) seed morphology and quality, including water soluble healthy dietary fiber, and (2) photosynthetic contribution of awns and hulls by using mutants. We seek application of our basic findings to practical breeding.



**Prof. TAKETA Shin**  
■ Research Themes  
Barley/Seed/Gene hunting/  
Plant molecular genetics/  
Plant physiology



**Asst. Prof. Dr. YAMASHITA Jun**  
■ Research Themes  
Wild plant/Database/  
Evolution/Adaptation/  
Resources

## Plant Diversity Analysis



We conserve and evaluate barley genetic resources (varieties and lines) collected from all over the world. These genetic resources vary in characteristics depending on the location of collection and purpose of use, for example, there are regional differences in vernalization requirements (the degree of low-temperature exposure required for flowering).

Based on our evaluation of genetic resources, we carry out genetic analysis, gene isolation, and functional analysis of stress tolerance, such as grain dormancy and disease resistance, for application use.



**Prof. HISANO Hiroshi**  
■ Research Themes  
Plant molecular breeding/  
Plant genetic resources/Barley



**Assoc. Prof. SAISHO Daisuke**  
■ Research Themes  
Plant breeding/Plant Molecular genetics/  
Population genetics/Barley

# Integrated Genomic Breeding



Rice is cultivated globally and exhibits a wide range of phenotypic variations resulting from genetic diversity. These variations serve as valuable genetic resources for enhancing rice plants to meet human needs. Although many of these traits are governed by numerous genes, the genetic foundations and biological functions of the majority remain largely unknown, hindering their practical application. To address this, we leverage useful phenotypic variations from diverse rice germplasms and identify the underlying genes by combining recent advancements in genomics and bioinformatics. Our efforts are focused on developing new breeding materials and proposing more effective breeding methodologies.

**Prof.  
YAMAMOTO Toshio**

■ **Research Themes**  
Crop breeding/Genome/  
Polyploidy



**Assoc. Prof.  
NAGAKI Kiyotaka**

■ **Research Themes**  
Genome/Chromosome/  
Haploid



**Assoc. Prof.  
FURUTA Tomoyuki**

■ **Research Themes**  
Crop breeding/  
Wild species/Bioinformatics



## Genetic Engineering



Understanding the pathogenicity of plant pathogens and elucidating plant defense mechanisms against plant pathogens is essential for plant disease control. Our research is focused on elucidating the



the pathogenicity of plant pathogens and plant resistance mechanisms at the genetic level using molecular genetic methods, with a view to their application in disease control.

Prof.  
ICHINOSE Yuki



■ Research Themes

Pathogenicity of phytopathogenic bacteria/Virulence factor

Assoc. Prof.  
MATSUI Hidenori



■ Research Themes

Pathogenicity of phytopathogenic bacteria/Virulence factor

Asst. Prof.  
SAKATA Nanami



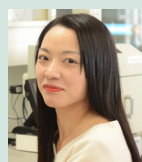
■ Research Themes

Pathogenicity of phytopathogenic bacteria/Virulence factor

## Plant Genome Dynamics Analysis



Our laboratory conducts genetic and breeding research on sweetpotato. Using a Next Generation Sequencer (hereinafter referred to as NGS) that outputs a huge amount of DNA sequence data, we are working on the development of DNA markers and gene identification related to important agricultural traits such as disease and pest resistance and yield. We are also conducting gene expression analysis (Iso-Seq, RNA-seq analysis, etc.) to elucidate the mechanism of disease resistance, and also developing novel genotyping systems applicable to polyploid crop species.



Assoc. Prof. MONDEN Yuki

■ Research Themes

Sweetpotato/Plant breeding and genetics/ Genetic analysis/NGS/Polyploid/Cultivar discrimination/DNA marker

## Plant Pathology



The Food and Agriculture Organization (FAO) reports that over 850 million people face insufficient access to food, and an estimated 24,000 people succumb to hunger daily. Given that plant diseases cause annual yield losses of up to 20% in food and cash crops, continuous improvement and advancement of pest management systems is essential to sustainably feed a growing world population. To achieve this goal, we focus on elucidating the molecular mechanisms that govern plant immunity and pathogen virulence, and on innovating new technologies to control plant diseases.



Prof. TOYODA Kazuhiro

■ Research Themes

Plant pathology/Molecular plant pathology/Plant-microbe interactions



Prof. NOUTOSHI Yoshiteru

■ Research Themes

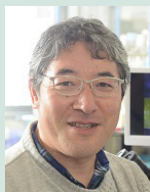
Plant pathology/Plant immunity/Plant chemical biology/Infection strategy of filamentous plant pathogen/Plant defense activators/Biocontrol



## Plant Genetics and Breeding



Molecular genetic study on diversity of crops and their wild relatives and its application to breeding



**Prof. Dr. NISHIDA Hidetaka**

■ **Research Themes**

Plant breeding  
Studies on genetic diversity and agronomic traits in crop genetic resources including wheat, and development of DNA markers available for marker-assisted selection

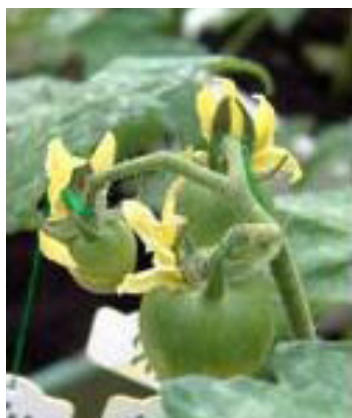


**Asst. Prof. Dr. NISHIMURA Kazusa**

■ **Research Themes**

Plant breeding  
Identification of useful genes in crops, especially wheat and barley.  
Development of rapid genotyping methods, and cultivar identification methods.

## Postharvest Physiology



We focus on a molecular understanding of fruit ripening and senescence using the omics approach, gene engineering and genetic analysis in fruit, vegetables and flowers. Based on the basic understanding, we develop functional technology to improve quality and to reduce postharvest loss of horticultural crops, which are useful in both developed and developing countries.

**Prof. USHIJIMA Koichiro**

■ **Research Themes**

Molecular Physiology/Plant Genetics

## Control of Flowering



Our research includes breeding, flowering regulation, cultivation, and post-harvest utilization techniques based on the physiology of flowers and vegetables. Future agriculture must be friendly to plants, people, and the environment. We contribute to future agriculture by developing rational and simple environmental control, fertilization, and irrigation technologies.



**Prof. GOTO Tanjuro**

■ **Research Themes**

Root restriction/High temperature/  
Physiological disorder/Flowering control



**Senior Asst. Prof. ENDO Minori**

■ **Research Themes**

Vegetable horticulture/Strawberry/  
Asparagus

## Plant Production Science



過繁茂する雑草の防除

Development and systematization of production technology for crop cultivation based on improvement of productivity and environment conservation



Assoc. Prof. TANAKA Yu

■ Research Themes  
Crop Science



Assoc. Prof.  
NAKASHIMA Yoshitaka

■ Research Themes  
Weed Science Establishment of an appropriate management system for weed vegetation and its effective use for environmental protection

## Pomology



Okayama prefecture, known as a "Fruit Kingdom", is famous for the production of high-quality fruit, mainly peaches and grapes. One of the aims of our laboratory is to establish new resolution and cultivation methods to improve the productivity and quality of peaches and grapes. We also attempt to elucidate the physiological and genetic mechanisms regulating important agronomic traits, such as fruit development, ripening, texture, and inner disorder, by combining field-based experiments and molecular biological approaches.



Prof.  
FUKUDA Fumio

■ Research Themes

Peach/Grape/Fruit development/Fruit ripening/Fruit quality/Inner disorder/Nondestructive evaluation/Postharvest storage/Cultivation method/Eye tracking/Smart agriculture



Assoc. Prof.  
HIRANO Ken

■ Research Themes

Grape/Fruit development/Fruit ripening/Fruit quality/Seedlessness/Parthenocarp/Plant growth regulator/Aroma component



Assoc. Prof.  
KAWAI Takashi

■ Research Themes

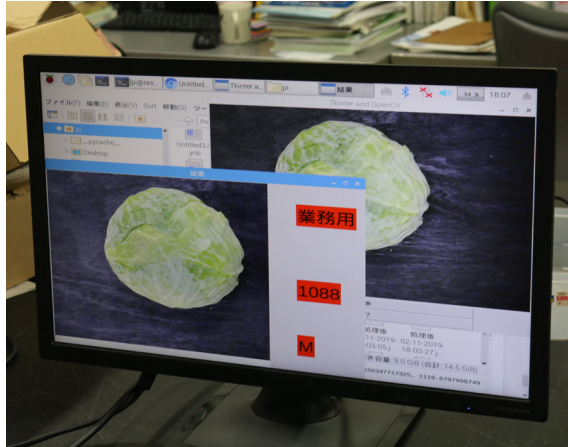
Peach/Fruit development/Fruit ripening/Fruit quality/Inner disorder/Nondestructive evaluation/Postharvest storage/Softening trait/Genetic analysis/3D point cloud analysis



# Vegetable Crop Science



Investigation of physiological characteristics related to vegetable production and development of production systems



We are conducting research on vegetable production, such as tomatoes and strawberries, from the perspective of how the growing environment affects crop quality, yield and other agricultural traits. Recently, we especially focus on efficient environmental control in greenhouse cultivation and pollination control in strawberry production.

Another research theme is the use of the flowering hormone (florigen) in vegetable production and breeding. We are conducting basic research and developing technologies to efficiently deliver florigen using grafting for cruciferous vegetables such as cabbage and radish.

We are also carrying out various other studies on vegetables, such as the evaluation of quality characteristics of traditional vegetables, the development of efficient watering technology in cucumber cultivation, and the development of vapor pressure deficit (VPD) control methods in the cultivation of melons and eggplants.



Prof. YASUBA Ken-ichiro

## ■ Research Themes

Vegetable crop science/Agricultural information science

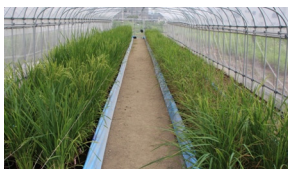


Asst. Prof. MOTOKI Ko

## ■ Research Themes

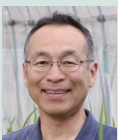
Vegetable crop science

# Crop Science



Environmental destruction is progressing now at an unprecedented scale, in the form of global warming and accompanying desertification, salt accumulation in soil, depletion of water resources, and so on. On the other hand, the human population continues to increase, and there is strong demand for expansion of food production. Therefore, in addition to improving the grain yield in arable land suitable for

cultivation, production of agricultural crops is necessary even in inadequate lands affected by water shortage, salt accumulation etc. In this field we conduct physiological and ecological research and education concerning various crops for the purpose of improving crop production under defective environmental conditions.



Prof. HIRAI Yoshihiko

## ■ Research Themes

Rice/Salt tolerance/Grain yield



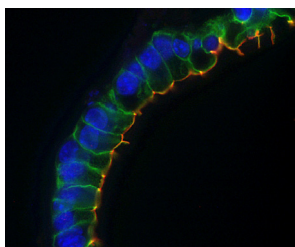
Asst. Prof. TOMITA Asami

## ■ Research Themes

Rice/Breeding/Abiotic stress tolerance



## Reproductive Physiology



We investigate the reproductive mechanisms of mammals, particularly the functions of the ovary, oviduct, and uterus, aiming contribution to the efficient production of livestock animals and human reproductive medicine.



Prof. KIMURA Koji

## ■ Research Themes

Reproductive Physiology/Endocrinology/  
Cell Physiology

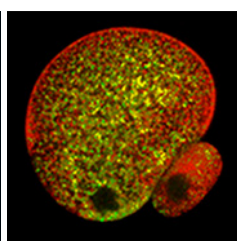
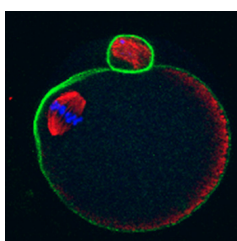


Asst. Prof. KAWANO Kohei

## ■ Research Themes

Reproductive Physiology/Endocrinology/  
Cell Physiology

## Animal Development and Reproductive Biotechnology



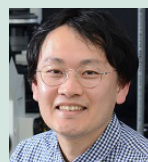
We are developing new more effective IVF systems and micromanipulation techniques for gametes in mammals including humans. Through these technological developments, we are also undertaking basic studies to make clear the systems of gamete (oocytes and spermatozoa) formation, fertilization and early development, as well as applied studies to improve the efficiency in the production of more value-added useful animals. The details are as follows.



Prof. FUNAHASHI Hiroaki

## ■ Research Themes

Reproductive biology/Oocyte  
maturation/Sperm capacitation/In  
vitro embryo production/Mitochondrial  
quality control



Assoc. Prof. WAKAI Takuya

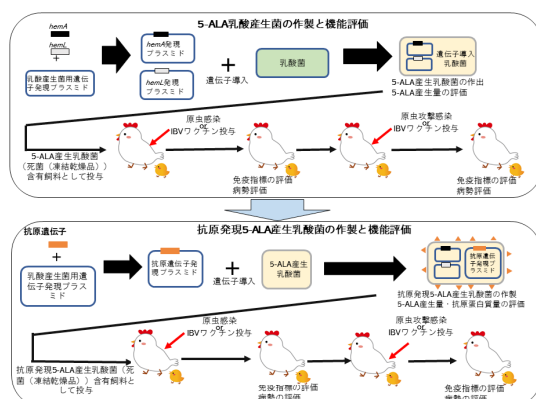
## ■ Research Themes

Reproductive biology/Oocyte  
maturation/Sperm capacitation/In  
vitro embryo production/Mitochondrial  
quality control

## Animal Physiology



To obtain the knowledge for homeostasis system by elucidating pathogenesis and immune system using chicken and parasite as an experimental model. Also, exploration of beneficial microorganisms, feed crops, nutrients etc. that have protective effects against infectious diseases or effects of symptom alleviation, and vaccine development for livestock.



Prof. HATABU Toshimitsu

## ■ Research Themes

Host-Parasite relationship/Probiotics/Avian  
coccidiosis/Vaccine development

## Animal Breeding and Genetics



The aim of animal breeding and genetics is to investigate invisible genetic events using statistical and molecular genetics analysis. In particular, we are interested in genetic evaluation using genomic information and the genetic diversity in the animal population. Through our research activity, young scientists are encouraged to acquire the necessary knowledge and techniques to pursue scientific careers in quantitative genetics in the post-genome era. Additionally, we are studying the effects of pre-slaughter fasting stress on meat quality and skeletal muscle protein degradation. By accurately estimating the genetic traits of animals and elucidating the mechanisms by which stress impacts productivity, we strive to optimize animal production systems.

$$Y = XH + Zs + \varepsilon$$

$$\begin{bmatrix} X'X & X'Z \\ Z'X & Z'Z + A^{-1}\sigma_s^2/\sigma_e^2 \end{bmatrix} \begin{bmatrix} H \\ s \end{bmatrix} = \begin{bmatrix} X'Y \\ Z'Y \end{bmatrix}$$

Y: vector of observed phenotypes

X, Z: known incidence matrices

A: vector of fixed effects (for example, sex, farm, etc.) (unknown)

s: vector of genetic effects (unknown)

ε: vector of residual (environmentally) effects (unknown)

A: numerator relationship matrix



Assoc. Prof. IBI Takayuki

■ Research Themes  
Animal Breeding



Asst. Prof. KATSUMATA Sachi

■ Research Themes  
Animal Nutrition and Physiology

## Applied Animal Genetics

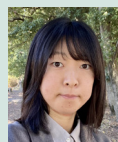


Our lab investigates the genetic factors underlying human and animal diseases by analyzing genes responsible for hereditary diseases in experimental animals and livestock. We mainly focus on the functions of genes involved in reproductive function and bone growth by utilizing mutant mice and genetically modified mice/rats through genome editing. For industrial animals, we explore favorable and unfavorable genetic variants and evaluate genetic diversity from genome sequences, with the aim of utilizing these genetic characteristics.



Prof. TSUJI Takehito

■ Research Themes  
Animal genetics/Genome/Genetic disease/Mouse/Cattle



Asst. Prof. NAGAE Mayuko

■ Research Themes  
Reproductive biology/Reproductive endocrinology/Developmental engineering/Animal genetics/Genetic diseases/Mouse/Rat

## Animal Nutrition and Feed Science



Nutrition is the study of a series of biological processes necessary for life. The goal of nutrition study is to improve human health and quality of life. Animal nutrition is a field that has been expanded to include animals. In our laboratory, we are doing research using a variety of animals, i.e., model animals, food-producing animals (livestock), wild animals, and companion animals. The research using model animals aims to clarify biochemical and physiological mechanisms associated with nutrition and metabolism. The members working on the projects use model animals and cultured cells for functional analyses of food. Several students work on food processing and its control. They are examining the characteristics of microorganisms involved in fermentation to improve the safety and value of food and feed. Our goal is to solve problems in the industries, clarify the functions of food and feed, and achieve technological innovation related to nutrition, metabolism, and health.

Microbiome research to gain insights into food, health, and environment relationships



A healthy environment and healthy animals support food for humans  
Disease prevention and food hygiene require microbiome management  
Collaboration with tropical Asia to tackle food production under global warming

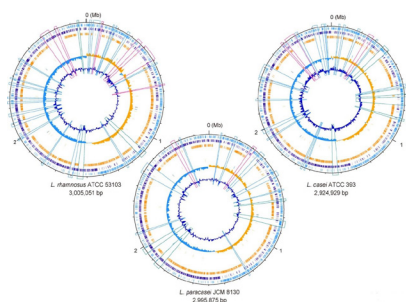


Prof. NISHINO Naoki  
■ Research Themes  
Nutrition/food/Hygiene/management/Farm animal/Wild animal/Companion animal



Assoc. Prof. TSURUTA Takeshi  
■ Research Themes  
Food Immunology/Functional Food Science

## Animal Applied Microbiology



It has become clear that gut microbiota (microflora) changes depending on the food components ingested by humans and their lifestyle, and that differences and changes in the microflora affect human health and disease. Morita group analyzes the gut microbiota of humans and animals, and tries elucidating the functions of the microbiota.

In Arakawa group, roles and application of beneficial microorganisms, mainly lactic acid bacteria, for processing and preservation of milk and egg products are researched. In particular, it is aimed to create novel safe and high quality milk and egg products using functional substances from and fermentation techniques with lactic acid bacteria.

In addition, both groups also carry out whole-genome analysis of intestinal bacteria, bifidobacteria and lactic acid bacteria radically to understand them.

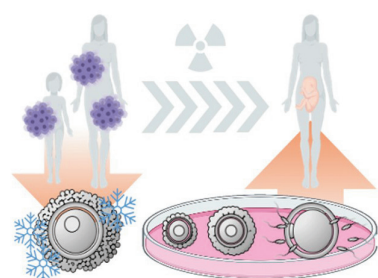


Assoc. Prof. ARAKAWA Kensuke

### ■ Research Themes

Milk and egg science/Lactic acid bacteria/  
Food microbiology

## Assisted Reproductive Technology



Our laboratory aims to develop safer and more reliable assisted reproductive technologies by analyzing in detail the effects of the environment surrounding oocytes, sperm, and embryos. We are engaged in research on cryopreservation of gametes and embryos for the purpose of fertility preservation (ability to conceive) due to cancer treatment, etc., and in vitro culture of ovarian tissue and oocytes. We are committed to conducting research to contribute not only to the medical field but also to animal production and species conservation.



Asst. Prof. TASAKI Hidetaka

### ■ Research Themes

Reproductive Medicine/Oocyte/Ovary/  
Fertility Preservation



