Graduate School of Science and Technology
Degree Programs in Life and Earth Sciences
List of research fields（Doctoral Programs）

Doctoral Program in Biology

Field of Research	Faculty	Detailed Description of Research Field
Systematics and Evolutionary Biology	ISHIDA Ken-ichiro	① Classification of micro-and macro-algae based on ultrastructure and molecular phylogenetic analyses ② The endosymbiotic acquisitions and evolution of plastids ③ Searching for new useful algae for algal biomass research
	HONDA Masanao	① Taxonomy of reptiles based on morphological data ② Molecular phylogeny and biogeography of reptiles and birds ③ Conservation genetics of amphibians and reptiles
	WADA Hiroshi	① Comparative embryology of marine invertebrates, including bivalves and echinoderms ② Population Biology of Echinoderm Development ③ Evolution of the unique bodyplan of the cephalopods
	DEGAWA Yousuke	① Natural history and biodiversity of the Kingdom Fungi ② Taxonomy and phylogenetic studies of the basal lineage of Fungi (Zygomycota and Chytridiomycota) ③ Fungal ecology focused on their interactions with other organisms and their life cycles
	NAKANO Hiroaki	① Natural history of placozoans, xenacoelomorphs, and echinoderms ② Origins and evolution of deuterostomes and metazoans ③ Diversity and evolution of marine invertebrates
	NAKAYAMA Takeshi	① Classification of protists including microalgae based on ultrastructural characters and molecular phylogenetic analyses ② Searching for new useful algae for algal biomass research
	SHIRATORI Takashi	① Studies on early evolution of eukaryote through the screening of novel protists ② Studies on the evolution of predatory bacteria
	TAKENAKA Masaki	① Developmental Genetics Using Non-Model Insects ② Evolutionary and Ecological Studies Using River Ecosystems ③ Phylogeography
Ecology	HIROTA Mitsuru	① Plant response to environmental changes, perspective from ecology ② Ecosystem ecology focused on carbon cycling in terrestrial ecosystem
	TSUDA Yoshiaki	① Population genetics/genomics and population demographic inference of several species (e.g. trees, fishes, insects, mammals) ② Ecosystem management and conservation using molecular ecology approaches ③ Impact of human activities on forest ecosystems and their history
	TOQUENAGA Yukihiko ※2	① Experimental ecology with field and laboratory populations ② Theoretical biology with mathematical models
	OHASHI Kazuharu	① Foraging behavior of pollinators with special reference to their cognitive abilities ② The evolution of floral phenotypes via ecological interactions with flower visitors
	SATO Yukie	① Behavioral ecology and evolutionary ecology in terrestrial arthropods ② Geographic variation in behavior and ecology, and speciation
	HARVEY Benjamin	① Marine community ecology, utilizing field surveys, aquarium experiments and modelling. ② Understanding the effects of environmental change on coastal systems, such as ocean acidification, global warming, and marine heatwaves
	MASUMOTO Shota	① Community assembly for plants and microorganisms ② Plant-fungal interactions and function in ecosystems

Ecology	OMORI Yuko	① Research on carbon cycling driven by marine microorganisms ② Dynamics of marine-derived organic matter and air–sea interactions
	YOKOI Tomoyuki	① Entomology ② Behavior and life history of bees ③ Pollination service and conservation of flower-visiting insects
Plant Physiology and Developmental Biology	SUZAKI Takuya	① Studies on molecular mechanisms of plant-microbe symbiosis ② Studies on molecular mechanisms of plant development and environmental responses
	SUZUKI Iwane	① Photosynthetic acclimation and signal perception to environmental stress ② Production of useful metabolites by metabolic engineering in algae ③ Application of quantum beams and nuclear resonance reaction for biological breeding
	MAEDA Yoshiaki	① Functional analyses of genomes and chromosomes in algae ② Production of useful metabolites by metabolic engineering in algae ③ Digital transformation of algal research
	MINODA Ayumi	① Investigating environmental responses in photosynthetic organisms using unicellular algae as a model system ② Understanding the role of photosynthetic organisms in global elemental cycles
	IRVING Louis John	① Effect of nutrient status on the host – parasite interaction ② Exploring the influence of abiotic factors on grass plant growth and competition
Animal Physiology and Developmental Biology	SASAKURA Yasunori	① Developmental mechanisms of animals ② Metamorphosis of ascidians ③ Molecular biology of mimicry ④ Development and Evolution
	CHIBA Chikafumi	① Molecular mechanism of adult newt body-part regeneration ② Molecular mechanisms of injury responses and injury-caused disorders in mammalian tissues ③ Induction and regulatory mechanisms of transdifferentiation
	NIWA Ryusuke	① Molecular, cellular, and systemic mechanisms of the interaction between insects and parasitoid wasps ② Mechanisms of interorgan communication in the regulation of development, stem cell proliferation, post-mating responses, and aging ③ Studies on molecular mechanisms of cancer cachexia using Drosophila as a model ④ Structural biology and chemical biology of insect growth control agents
	HARUMOTO Toshiyuki	① Molecular mechanisms underlying reproductive manipulation induced by insect symbiotic microorganisms ② Studies on endosymbiosis between insects and microorganisms
	YAGUCHI Shunsuke	① Axis specification/formation of the sea urchin embryo ② Development of the serotonergic neurons in the sea urchin embryo ③ Evolution of the anterior neuroectoderm
	OKAMOTO Naoki	① Insect hormones and its regulation during development ② Neuro-endocrine control of physiology and behavior in insects
	SHIMADA Yuko	① Action machinery and diversity of parasitoid wasp venom proteins ② Nutrient-dependent neuronal network underlying growth and maturation
	SAKURAI Keisuke	① Electrophysiological studies on molecular mechanisms of signal transduction in retinal neurons ② Studies on non-visual photoreceptor cells in CNS
	ISHIKAWA Yuki	① Neural mechanisms underlying the evolution of animal behavior ② Sensory and behavioral mechanisms underlying plant‐insect interactions

	SUZUKI Daichi	① Evolutionary morphology and behavioral neurobiology mainly focusing on cyclostomes (lampreys and hagfish) ② Early evolution of vertebrate brain, behavior, and consciousness.
Molecular and Cellular Biology	※1 INABA Kazuo	① Structure, motility, and regulation of cilia and flagella ② Diversity of cilia and eukaryotic evolution ③ Mechanism of fertilization and reproduction of marine organisms (protists, marine invertebrates and fishes)
	CHIBA Tomoki	① Genetic analysis of selective protein degradation ② Cell biology of the ubiquitin family ③ Knockout mice analysis of the ubiquitin system
	NAKANO Kentaro	① Investigation of signal transduction controlling cytoskeleton and membrane dynamics ② Studies on the molecular diversity and evolution of cytoskeleton and its regulatory systems ③ Molecular biology of the mechanisms of cell division using yeast and Protist
	MIURA Kenji	① Signaling mechanisms for abiotic stress response and sugar accumulation in plants ② Production of useful proteins (pharmaceutical proteins, etc.) with plant biotechnology ③ Production and evaluation of genome editing crops
	ISHIKAWA Kaori	① Analyses of influences by mutations of mitochondrial DNA on cellular and physiological functions ② Studies on the interactions between nuclear-coded genes and mitochondrial functions ③ Investigation of disease mechanisms of mitochondria-related diseases using model animals
	TSURUTA Fuminori	① Molecular basis of the developing brain regulated by microglia ② Neuron-glia communication coordinating the brain environment in the neonatal period ③ Mechanisms of the architecture of neural circuits influenced by environmental stresses
	HIRAKAWA Yoshihisa	① Plastid evolution via secondary endosymbioses ② CO_2 fixation in microalgae ③ Genome evolution in microalgae
	TANI Kazutoshi	① Structural analysis of biomolecules using cryo-electron microscopy ② Structural mechanism of light energy absorption in anoxygenic photosynthetic bacteria
	NOSAKI Shohei	① Molecular basis of plant-specific signaling factors based on protein science ② Structural basis of the evolution of transcription factors that drove the acquisition of species-specific traits in plant
Genomics and Bioinformatics	INAGAKI Yuji	① Molecular phylogeny of eukaryotes ② Evaluation of the impact of lateral gene transfer to genome evolution ③ Estimation of protein functions combining evolutionary parameters and tertiary structures
	KUWAYAMA Hidekazu	① Molecular analysis of biological soliton in multicellular movement ② Functional analysis of a genetic disease in intracellular signaling pathway ③ Memory of cell and spatio-temporal pattern recognition ④ Analyses of a novel anti-tumor factor and the mechanism of caffeine-dependent enhancement of anticancer drugs
	NAKADA Kazuto	① Functional morphology of mammalian mito-chondria ② Generation of mouse models for mitochondrial DNA-based diseases ③ Therapeutics for mitochondrial DNA-based diseases

Genomics and Bioinformatics	SAWAMURA Kyoichi	① Evolutionary Genetics ② Genetic analysis of hybrid inviability and sterility in Drosophila ③ Genetic analysis of sexual isolation in Drosophila ④ Interspecific introgression in natural populations of Drosophila
	HARADA Ryuhei	① Computational Biophysics and Theoretical Biology ② Molecular dynamics simulations for analyzing biological functions ③ *In silico* drug design based on molecular simulations
	NAKAYAMA Takuro	① Symbiogenesis in unicellular organisms ② Genomic research on evolution and diversity of protists
	SUZUKI Shigekatsu	① Genome evolution in eukaryotic microorganisms ② Evolutionary process of multicellularity ③ Intercellular communication in eukaryotic microorganisms
	TOKUNOU Yoshihide	① Research on microbial interactions and microbial energy metabolism ② Application of 3D biofilm imaging to medical and energy technologies ③ Development of electricity-generating wastewater treatment technologies using microbes (microbial fuel cells)- ④ Biotechnology utilizing microbe-derived membrane vesicles
Advanced Cellular Biology	*TAKENOUCHI Takato (NARO, Tsukuba)	① Establishment and utilization of mammalian immune cell lines ② Development of in vitro models for analyzing host-pathogen interactions ③ Studies on genetic disease resistance in pigs
	*NAGAMUNE Kisaburo (NIH, Tokyo)	① Understanding the infectious mechanism of parasitic protozoa ② Study about the unusual organelle of parasitic protozoa ③ Basic research for the development of anti-parasitic drug
	*SHITARA Hiroshi (IGAKUKEN, Tokyo)	① Molecular genetics of mitochondrial DNA in mammals ② Generation of new mouse strains using transgenic technology ③ Imaging techniques for visualizing mitochondria in mammals
	*YABUKI Akinori (JAMSTEC, Yokosuka)	① Diversity and classification of microbial eukaryotes ② Ecological function and role of microbial eukaryotes in ocean ③ Diversity and functional evolution of RNA-editing and its related phenomena in microbial eukaryotes ④ Monitoring of the diversity of microbial eukaryotes on ocean environmental changes
Advanced Molecular Biology	*NORIO Tanaka (National Museum of Nature and Science)	① Phylogenetic and taxonomic studies of aquatic vascular plants ② Adaptive evolution of aquatic vascular plants ③ Distribution and geographic genetic structure of aquatic vascular plants ④ Conservation studies of rare and threatened aquatic species ⑤ Research on ex situ conservation in botanical gardens
	*HOSAKA Kentaro (National Museum of Nature and Science)	① Taxonomy, phylogenetics and biogeography of fungi, especially mushrooms ② Fungal diversity in the environment (soil, water and air) ③ Natural history of fungi based on museum specimens, DNA and other metadata
	*TAJIMA Yuko (National Museum of Nature and Science)	① Life history on marine mammals ② Comparative morphology on marine mammals ① Health assessments on marine mammals
	*CHIBA Youko (RIKEN, Wako)	① Search for novel metabolisms in microorganisms. (Prokaryote) ② Diversity of CO2 fixation and amino acid synthetic pathways ③ Analysis of metabolic evolutionary by physical chemistry
	*FUJIWARA Sumire (AIST, Tsukuba)	① Basic studies of transcriptional regulation mechanisms in higher plants ② Research and development of useful plants by modifications of transcription factors or genes ③ Functional analyses of transcription factors in higher plants
	*MORIYA Shigeharu (RIKEN, Yokohama)	① Research and development of biomass utilization process ② Research and development of symbiosis based biotechnology ③ meta- and single-cell transcriptome analysis

※1 The faculty member marked with ※1 will be retired by March 31,2028.

※2 The faculty member marked with ※2 will be retired by March 31,2029.

Note: *Adjunct Professor of the Cooperative Graduate School

Doctoral Program in Agricultural Sciences

＜Biosphere Resource Science and Technology＞

	Field of Research	Faculty	Detailed Description of Research Field
Genetic Science Field	Plant Breeding	YOSHIOKA Yosuke	① Study on conversation and efficient utilization of genetic resources ② Genetic analysis of important traits in crops ③ Pollination biology for seed multiplication of crops ④ Development of digital phenotyping method
	Animal Science	ASANO Atsushi	① Integrated physiology of homeostatic functions useful for animal production ② Study on molecular and cellular basis for fertilization and development in model animal ③ Development of reproductive and genomic biotechnologies for livestock production
	Plant Genome Sciences	（ ＊ ）	① Exploring molecular mechanism for fruit development in tomato ② Identification of genes related to important breeding traits in crops and horticultural plants by genome analysis. ③ Rapid and efficient development of new cultivars by genome editing technology. ④ Establishment of large-scale tomato mutant populations, and integration and utilization of phenotypic, metabolomic, and genomic data. ⑤ Innovation of gene modification technology by modified CRISPR/Cas9 system.
Horticulture and Crop Production Field	Olericulture and Floriculture	FUKUDA Naoya KANG Seung Won NONAKA Satoko	① Elucidation of gene functions related to important traits in vegetables and ornamental plants ② Research on adding high value and increasing yield in vegetables and ornamental plants ③ Research on the application of information technology in vegetable and ornamental plant production ④ Research on the advancement of transformation efficiency and genome editing technology ⑤ Research on introduction of beneficial traits into Cucurbitaceae, Solanaceae, and Asteraceae plants using genome editing technology
	Pomology and Postharvest Physiology of Fruit	SUGAYA Sumiko	① Physiology of fruit during pre- and postharvest ② Environmental and chemical growth regulation on fruit trees ③ Propagation of woody plants
	Crop Science	MATSUKURA Chiaki WANG Ning	① Comparative studies on the efficient crop production systems and its management ② Establishment of sustainable crop production systems and its assessment ③ Physiological and ecological researches for yield and quality of crops ④ Physiological research on the mechanisms and control of stress tolerance in crop ⑤ Analysis of gene function for critical agronomic traits in crops

Plant Protection Field	Plant Parasitic Mycology	OKANE Izumi ISHIGA Yasuhiro	① Systematics of plant parasitic fungi including symbiotic fungi, particularly rust fungi, blue stain fungi, endophytes and mycorrhizal fungi. ② Studies on ecology and physiology of these fungi and bacteria. ③ Studies on the mechanisms of pathogenicity in plant pathogenic bacteria ④ Studies on plant–microbe interactions
	Applied Entomology and Zoology	FURUKAWA Seiichi KURAMITSU Kazumu	① Insect immune mechanisms against pathogens and parasitoids ② Elucidation of strategies of parasitoids to survive in the host insect species ③ Improvement of biological control of insect pests ④ Ecology and ethology of parasitoids
Forest Environmental Science Field	Forest Ecology	KAMIJO Takashi KAWADA Kiyokazu	① Dynamics and function of forest ecosystem ② Vegetation science and management ③ Conservation and restoration of arid and semi-arid ecosystem ⑤ Conservation of endangered species
	Conservation of Regional Resources	SEINO Tatsuyuki TSUDA Yoshiaki	① Conservation genetics of tropical tree species, and phylogeography of forest tree species and genetic study of local adaptation ② Study on conservation of regional resources ③ Wildlife management and biodiversity conservation
	Environmental Soil Chemistry	ASANO Maki	① Environmental chemistry of soils ② Ecological studies on soil organic matter ③ Soil conservation under semi-arid grasslands
	Environmental Plant Biochemistry	YAMAJI Keiko	① Effect of endophytic microbes on heavy-metal stress tolerance in plants ② Effect of endophytic microbes on environmental stress tolerance in plants ③ Effect of endophytic microbes on radio Cs accumulation in plants
Advanced Interdisciplinary Agricultural Science Field	Plant Molecular Biology	SHIBA Hiroshi	① Molecular mechanisms of epigenetic regulation in heterosis ② Molecular mechanisms of epigenetic regulation in sexual plant reproduction ③ Epigenetic engineering of plant development
	Metabolic Network Biology	KUSANO Miyako	① Development of analytical platforms to capture quantitative and qualitative changes of metabolite levels ② Metabolic network biology using “omics” datasets ③ Flavor analysis of important crops and vegetables
	Epigenetics	BUZAS Diana Mihaela	① Molecular genetic analysis of the perennial life history in *Arabidopsis halleri gemmifera* ② Analysis of seasonal response in *Wasabi japonica* ③ Identification of memory DNA elements in crucifers ④ Reciprocal conversion between annual and perennial life histories using CRISP/Cas9 ⑤ Integration of circadian clock with all year memory ⑥ CRISP/Cas9-medited Jacksonian domestication of “the smart cousin of tomato”
	Plant Cell and Synthetic Biology	KINOSHITA Natsuko	① Plant and insect interaction ② Production of high added value products in plants ③ Visualization of plant environmental response mechanisms

Agro-biological Sciences Field	Plant Stress Biology	*FUJITA Yasunari (Japan International Res. Center for Agricultural Sci. (JIRCAS))	① Molecular elucidation of stress tolerance mechanisms in plants ② Development of environmental stress-tolerant crops
	Climate Change Impact Assessment on Vegetation	*MATSUI Tetsuya (Forestry and Forest Products Research Institute (FFPRI))	① Relations between distributions of forest vegetation and climatic conditions ② Impact assessment and adaptation planning of climate change on forest ecosystem functions and ecosystem services
	Tropical Forestry	*TANI Naoki (Japan International Res. Center for Agricultural Sci. (JIRCAS))	① Improvement of tropical forestry using indigenous genetic resources in Southeast Asian tropical forest ② Reproductive biology in Southeast Asian tropical forest and its application to sustainable forest management
	Animal Functional Biology	*SAKUMOTO Ryosuke (Institute of Livestock and Grassland Science, NARO)	① Factors involved in the animal productive functions ② Study on animal reproductive biology, especially on the establishment of pregnancy and its maintenance in ruminants. ③ Development of effective technique to improve reproductive performance of domestic animals
	Insect Functional Regulation	*TABATA Jun (Institute for Plant Protection, NARO)	① Chemical ecology of insects and associated plants ② Development of insect functional regulation techniques based on chemical ecological studies
	Environmental Agronomy	*MINAMIKAWA Kazunori (Japan International Res. Center for Agricultural Sci. (JIRCAS))	① Development and assessment of climate change mitigation and adaptation technologies in rice production ② Observation and modeling of greenhouse gas emission and carbon and nutrient cycling in rice production

(＊) Please contact the Chair of the Doctoral Program in Agricultural Sciences (e-mail: shiba.hiroshi.gm#@#u.tsukuba.ac.jp) in regard to this research field. (*Replace "#@#" with "@".)

*Adjunct professor of the Cooperative Graduate School (not assigned an academic advisor's position for research students [kenkyusei]).

Doctoral Program in Agricultural Sciences

＜Appropriate Technology and Sciences for Sustainable Development＞

	Field of Research	Faculty	Detailed Description of Research Field
Eco-region Development Engineering Field	Environmental Colloid and Interface Engineering	KOBAYASHI Motoyoshi SUGIMOTO Takuya	① Water and solute transportation in soil. Salinity and erosion of soil ② Water resource engineering in arid land, water quality control, water treatment ③ Physics and chemistry of soil, soil pollution soil, colloid and interface
	Watershed Conservation	NASAHARA(NISHIDA) Kenlo	① Mechanism of sediment production and transport ② Sabo planning in harmony with natural environment ③ Environmental analysis through remote sensing
	Ecosystem Structure Engineering	YAMAKAWA Yosuke	① Processes and mechanisms of rainwater runoff in mountainous watersheds ② Erosional processes and collapse mechanisms of mountain slopes
	Bioproduction and Machinery	Tofael AHAMED	① Intelligent machinery and robotics for agricultural production ② System analysis for bioenergy production and utilization ③ Real-time crop monitoring systems for site-specific management
	Farmland System Engineering	KOBAYASHI Motoyoshi	① Farmland engineering, soil conservation engineering ② Soil Physics, Environmental materials
Food and Biomass Science Field	Food Resources Engineering	Marcos NEVES	① Micro/nano-engineering for advanced bioresource processing ② Bioactive compound encapsulation for functional foods ③ Formulation of food micro/nano-dispersions and evaluation of their gastrointestinal digestion ④ Effective utilization of food processing waste for value addition
	Chemistry of Biomaterials	NAKAGAWA-IZUMI Akiko	① Chemistry for wood pulping and pulp bleaching ② Chemical utilization of biomaterials and bio-refinery ③ Micro-analysis of wood components (lignin, tannin,carbohydrate and others) and the related compounds
	Engineering of Biomaterials	OBATAYA Eiichi	① Acoustic property and property enhancement of biomaterials used for musical instruments ② Development of intelligent processing to utilize the cellular structure and FRP structure of wood
Rural Development Economics Field	Agricultural and Bioresource Economics	SHUTO Hisato	① Farm production and consumer behavior ② Analysis of food industries with specific attention to issues of productivity, R&D, scale economies, and economics of organization ③ Economic analysis of agricultural and food security policies
	Resource Economics and Development Studies	SHUTO Hisato	① International trade analysis of agricultural commodities and resources ② Agricultural and rural development ③ Regional planning and resource management

Rural Development Economics Field	Forest Resources Economics	(＊)	① Study on forest economics and policy ② International comparative study on management and utilization of forest resources ③ International comparative study on production and Marketing of forest products
	Forest Policy	KOHROKI Katsuhisa	① Historical study of forest management in Japan ② Socioeconomic study on regional forest management in Japan ③ Comparative study on forestry organizations
Eco-region Development Engineering Field	Rural Environment Improvement	*MIYAMOTO Teruhito (Institute for Rural Engineering, NARO)	① Irrigation and drainage management in farmland ② Modeling, measurement and interpretation of mass and energy flow in soil ③ Hydrological investigations and conservation of groundwater resources in rural areas
	Nano and Micro-scale Food Analysis	*MANO Junichi *GENKAWA Takuma (Institute of Food Research,NARO)	① Development of analytical methods for evaluating food quality ② Development of food processing methods using biotechnology
Food and Biomass Science Field	Sustainability of Biomass Resources	*KOSUGI Akihiko (Japan International Res. Center for Agricultural Sci. (JIRCAS))	Development of biomass utilization technology using microbialfunction
	Regional Forest Resource Development	*YAMADA Tatsuhiko (Forestry and Forest Products Research Institute (FFPRI))	① Development of lignin based functional bio-materials ② Chemical conversion of cellulosic biomass for preparing useful chemicals, liquid fuels and fuel additives ③ Rapid analysis of lignocellulosics to evaluate potential of forest biomass
Agricultural Economics and Sociology Field	International Agriculture and Forestry Development	*IIYAMA Miyuki (Japan International Res. Center for Agricultural Sci. (JIRCAS))	① Trends and prospects of international agriculture research agendas on global food systems. ② Sustainable agricultural intensification of smallholder systems.
	Regional Forest Resource Development	*ISHIZAKI Ryoko (Forestry and Forest Products Research Institute (FFPRI))	① Identification of social conflicts over forest resources ② Study on how to lead rural development by utilizing forest resources
	Farming System	*SAWADA Mamoru (Central Region Agricultural Research Center (NARO))	① Agricultural Workforce and Human Resource Development ② Local Agricultural Support Systems to Revitalize Rural Communities

(＊) Please contact the Vice Chair of the Doctoral Program in Agricultural Sciences (e-mail: ishii.atsushi.fu#@#u.tsukuba.ac.jp) in regard to this research field. (*Replace "#@#" with "@".)

*Adjunct professor of the Cooperative Graduate School (not assigned an academic advisor's position for research students [kenkyusei]).

(* E-mail address: add following domain name: @u.tsukuba.ac.jp . Or replace "#@#" with "@" .)

Sub-Program in Advanced Agricultural Technology and Science cooperated with NARO*

(*Replace "#@#" with "@".)

Field of Research	Faculty (e-mail address)	Detailed Description of Research Field
Innovative Crop Production and Quality control System	TANAKA Tsuyoshi (tanaka.tsuyoshi760#@#naro.go.jp) ※MITSUNAGA Takayuki (mitsunaga.takayuki853#@#naro.go.jp) KIMURA Toshiyuki (kimura.toshiyuki032#@#naro.go.jp)	① Comparative genomics for breeding and molecular evolution study ② Study on construction of pest-occurrence-prediction system using statistical modeling ③ Study on application for agricultural research by using LC-MS/MS analysis
	FUKATSU Tokihiro (fukatsu.tokihiro604#@#naro.go.jp) SUGIURA Ryo (sugiura.ryo710#@#naro.go.jp) TANAKA Daisuke (tanaka.daisuke054#@#naro.go.jp)	① Sensor network and support system based on ICT and RT for smart agricultural production ② Research on remote sensing technology and image processing technique for agricultural applications ③ Studies on cryopreservation of genetic resources as a long-term conservation technique
Innovative Animal Production System	SASAKI Keisuke (sasaki.keisuke521#@#naro.go.jp) TOHNO Masanori (tohno.masanori288#@#naro.go.jp) OGINO Akifumi (ogino.akifumi543#@#naro.go.jp)	① Studies on measurement and improvement of quality, sensory traits, and consumer satisfaction of animal products ② Exploring the individual roles of plants, microbes, and animals and their interactions in animal production systems. ③ Research on development of environmentally sound and sustainable livestock production systems
Innovative Crop Breeding and Cultivation System	TANAKA Junichi (tanaka.junichi725#@#naro.go.jp) MATSUI Katsuhiro (matsui.katsuhiro254#@#naro.go.jp) TAGUCHI Kazunori (taguchi.kazunori363#@#naro.go.jp)	① Developments of new crop breeding methods using genome information ② Study on efficient trait improvement of resource crops and underutilized plants ③ Breeding and genetics of high performance varieties by heterosis in root and tuber crops
	TATSUKI Miho (tatsuki.miho124#@#naro.go.jp) KONO Atsushi KUNIHISA Miyuki (kunihisa.miyuki700#@#naro.go.jp)	① Study on fruit maturing, senescence and postharvest technology of fruit tree ② Stone fruit breeding and research for improving breeding efficiency ③ Research on the application of mass data for genomes in apple breeding

Innovative Crop Breeding and Cultivation System	SHIBUYA Kenichi (shibuya.kenichi573 #@#naro.go.jp) SUMITOMO Katsuhiko (sumitomo.katsuhiko564 #@#naro.go.jp) TAKAHASHI Megumu (takahashi.megumu000 #@#naro.go.jp)	① Study on regulatory mechanism of flower senescence and postharvest technology in ornamental plants ② Genetic approaches to growth and flowering in ornamentals ③ Developments of stable production system for open-field vegetables

※Faculty members due to retire in March 2029

*NARO=National Agriculture and Food Research Organization

Doctoral Program in Life and Agricultural Sciences

	Field of Research	Faculty	Detailed Description of Research Field
Chemical Life Science	Biochemistry of Bioactive Molecules	USUI Takeo SUNOHARA Yukari FURUKAWA Jun YAMADA Kosumi ※2 MATSUYAMA Shigeru	① Identification of molecular targets of the bioactive compounds in mammalian and plant cells and their action mechanisms ② Antioxidative responses to oxidative stresses ③ Elucidation of the molecular mechanisms of bioactive substances involved in biological phenomena of plant (germination, phototropism, gravitropism, senescence, etc.) ④ Mechanisms how to accumulate various metals in plants ⑤ Signaling mechanisms about nutrient status in the organ to organ interactions in plants ⑥ Functional and structural analysis of plant growth regulators in response to phototropic and gravitropic stimulation ⑦ Functional and structural analysis of extracellular plant metabolites associated with allelopathy and their application in plant production ⑧ Semiochemicals mediating interactions among insects, plants and animals
	Structural Biochemistry	※1 TANAKA Toshiyuki	① Analysis of the structure-function relationships of proteins involved in signal transduction and transcription regulation ② Analysis of the chromophore-protein interactions of chromoprotein antitumor antibiotics ③ Protein engineering based on detailed structural information on functional proteins
	Functional Foods and Food Chemistry	※1 YOSHIDA Shigeki	① Structure and function of bioactive compounds in food ② Production of bioactive compounds by using bioconversion process ③ Development of industrial enzymes for food production
Animal Life Science	Genomic Biology	TANIMOTO Keiji DAITOKU Hiroaki ※2 KAKO Koichiro	① Molecular mechanisms of aging regulated by transcription and metabolism ② Protein methylation and its modifying enzymes involved in hypertension ③ Mammalian epigenetics in genomic imprinting and gene regulatory mechanisms in blood pressure homeostasis
	Molecular and Developmental Biology	KASHIWABARA Shin-ichi	① Transcriptional and translational regulation of genes during gametogenesis ② Functional roles of proteins involved in fertilization, egg activation, and early embryonic development ③ Development of reproductive and developmental technologies for future life
	Biology for Gene Regulation	※2 KIMURA Keiji	① Analysis for dynamics of mitotic chromosomes. ② Analysis for function of condensin complex. ③ Analysis for novel function of the nucleolus.

Applied Microbiology	Molecular Microbial Bioengineering	HASHIMOTO Yoshiteru	① Screening of new metabolism, and functional analysis of physiological functions. ② Metabolic engineering and screening/ analysis /design/ remodeling of useful enzymes and genes. ③ Functional analysis of enzymes involved in cleavage and synthesis of a C-N bond and their molecular evolution. ④ Development of super biological catalysts with novel functions of microorganisms and their enzymes. ⑤ Functional analysis of nucleic acid-related enzymes and its application to DNA/RNA engineering.
	Applied Microbiology	NOMURA Nobuhiko UTADA S. Andrew TOYOFUKU Masanori	① Bacterial cell- cell communication and biofilm formation ② Microfluidics for analysis of bacterial communities ③ Biophysical analysis of biofilm formation ④ Bacterial interactions through membrane vesicles ⑤ Molecular microbiology of environmental bacteria and their applications
	Ecological Molecular Microbiology	TAKAYA Naoki NAKAJIMA-KAMBE Toshiaki ※1 NAKAMURA Akira YING Bei-Wen TAKESHITA Norio YAWATA Yutaka	① Environmental response and morphogenesis of filamentous fungi ② Enzymology and molecular biology of microbial enzymes ③ Bacterial metabolisms and communication ④ Screening of novel microorganisms/genes with useful functions and their engineering ⑤ Fermentative production of useful compounds from waste biomass by metabolic engineering ⑥ Study on microbial catabolic pathway of L-form sugars ⑦ Development and application of host-vector system in *Thermus thermophilus* ⑧ Experimental evolution for investigating the microbial survival strategies ⑨ Multilevel omics analyses of the genome reduced *Escherichia coli* ⑩ Physiological functions of sulfur-containing amino acids and its applications
Biochemical Engineering	Cell Cultivation Engineering	AOYAGI Hideki	① Development of cultivation system for cell and protoplast with novel functional activities and their biotechnological application ② Analysis of naturally-occurring microbial symbiotic association, construction of artificial symbiotic system and their application for various bioprocesses ③ Cell cultivation engineering and development of novel bioreactors ④ Development of cultivation system for uncultured microbes (microbial dark matter), animal cells, and plant cells and their biotechnological application
	Bioreaction Engineering	ICHIKAWA Sosaku HIRAKAWA Hidehiko	① Application of polymolecular aggregates for bioprocesses ② Production of useful materials by enzymes and microorganisms ③ Development of tools for selective protein conjugation ④ Interdisciplinary studies for practical use of cytochrome P450s
	Biomimetic Chemistry	（ ＊ ）	① Enzyme isomerism leading chiral homogeneity ② Characterization of polyelectrolyte complex ③ Polymer chemistry for exploration and simulation of biological functions

Animal Life Science	Animal Bioresource Engineering	*INOUE Kimiko (RIKEN)	① Characterization of the germ cell genome using a nuclear transfer technique ② Analysis of the mechanisms for zygotic gene activation using a nuclear transfer technique ③ Development of techniques for preservation of male germ cells using microinsemination
	Molecular Neurobiology	*DOI Motomichi (AIST)	① Molecular analysis of nervous-system formation and maintenance ② Development of screening systems for neuronal dysfunctions and diseases ③ Development of live-cell imaging methods using fluorescent and luminescent techniques
Applied Microbiology	Applied Bioengineering of Microbial Ecosystems	*TAMAKI Hideyuki (AIST)	① Culturing the uncultured fastidious microorganisms in the environment and exploring their novel biological functions ② Omics-driven discovery of novel microbial and genetic resources ③ Ecophysiology and diversity of uncultured microorganisms in the environments (gut, plants, deep subsurface, etc.)
	Evolutionary Biology of Symbiosis	*FUKATSU Takema (AIST)	① Biological function, evolution and origin of endosymbiotic associations between insects and microorganisms ② Molecular, physiological and regulating mechanisms underlying sophisticated inter-organismal interactions in symbiosis, parasitism, manipulation and sociality
Biochemical Engineering	Food Molecular Engineering	*KOBORI Toshiro （Institute of Food Research, NARO)	① Screening and utilization of biomolecules for sensing food quality ② Analyses on structure-function relationship of advanced glycation and products

※1 Faculty members due to retire in March 2028
※2 Faculty members due to retire in March 2029

(＊) Please contact the Chair of Doctoral Program in Life and Agricultural Sciences (e-mail: kimura.keiji.gm #@#u.tsukuba.ac.jp) in regard to this research field. (*Replace “#@#” with “@”.)
*Adjunct professor of the Cooperative Graduate School (not assigned an academic advisor’s position for research students [kenkyusei]).

(NARO) = National Agriculture and Food Research Organization
(RIKEN) = RIKEN
(AIST) = National Institute of Advanced Industrial Science and Technology

Doctoral Program in Bioindustrial Sciences

	Research Field	Faculty	Specialized Field
Genetic Resource Science and Technology Area	Plant Biotechnology on Abiotic Stresses	KIKUCHI Akira	Stress physiology, Molecular breeding, Somatic embryogenesis
	Bioprocess Engineering	NOMURA Nakao	Development of sustainable agriculture, Forestry and fisheries industry using bioengineering technique
	Energy Microbiology	TOKUNOU Yoshihide	3D visualization of bacterial populations, microbial biotechnology, energy science using bacteria, infectious diseases, gut bacteria, and electricity generation using bacteria
Bioindustry and Bioscience Area	Bioactive Natural Products Chemistry	※ SHIGEMORI Hideyuki	Naturally occurring bioactive substances, Phototropism, Gravitropism, Flowering, Apical dominance, Allelopathy, Plant growth regulators, New drugs from unexplored natural resources, Preventive medicines of lifestyle-related disease, Environmental preservation-type functional agents
		MIYAMAE Yusaku	Molecular tools for control of cellular protein stability, Establishment of drug screening system, Identification and mechanism elucidation of nuclear receptor ligand, Chemical biology on natural products
	Plant Physiology and Chemistry	YAMADA Kosumi	Plant growth regulators, Phytohormones, Environmental response in plants, Chemical communication in plants
	Industrial Microbiology and Bioresource Science	NAKAJIMA-KAMBE Toshiaki	Isolation and screening of microorganisms with potential for bioproduction/biotransformation. (plastic degradation, biotransformation of oil/fat-related biomass, and methane conversion)
		AOYAGI Hideki	Analysis of naturally-occurring microbial symbiotic association, construction of artificial symbiotic system and their application for various bioprocesses
	Bioindustrial Resources	OGUCHI Taichi	Plant biotechnology, plant physiology on environmental response, Environmental and health risk assessment of biotech plants, Detection method on biotech foods
	Animal Cell Biotechnology	ITO Yuzuru	Basic technology of the regenerative medicine using human stem cells (Quality control, mass cultivation, differentiation) Drug discovery support technology (organ cell differentiation for drug discovery using knowledge from regenerative medicine, microphysiological system)
Eco-system Technology Area	Bio-Environmental Control Engineering	UTSUMI Motoo	Functional analysis of marine microorganisms and its role in cycling of matter, Bio eco-engineering
Bioresource Development Technology Area	Food System	KOKAWA Mito	Post-harvest technologies, Processing of functional foods, Development of novel alternative proteins, Non-destructive analysis of food quality using light
	Biological and Material Cycles	YANG Yingnan	Photocatalytic technology, Solar light utilization system, Bioreactor, High efficiency conversion and effective utilization of bioresources, Renewable energy

Genetic Resource Science and Technology Area	Industrial Sciences for Genetic Resources	*MARUYAMA Kyonoshin (JIRCAS)	Comparative genomes (plants), Environmental stress responses, Transcriptional regulatory networks, Plant genetic resources
	Electrochemical Biotechnology	*OKAMOTO Akihiro (NIMS)	Development of biotechnology using electrogenic bacteria, Data-driven chemical biology research using a high-throughput electrochemical system, Development of resource recovery technology using the interaction between materials and bacteria

※ Faculty members due to retire in March 2028

Note: *Adjunct Professor of the Cooperative Graduate School

(JIRCAS) = Japan International Research Center for Agricultural Sciences
(NIMS)= National Institute for Materials Science

Doctoral Program in Geosciences

Field of Research	Faculty	Detailed Description of Research Field
Atmospheric and Hydrospheric Sciences	IGARASHI Yasunori Igarashi.yasunori.gm@u.tsukuba.ac.jp	Ecohydrology, Biogeoscience, Environmental dynamics of radionuclides
	UEDA Hiroaki ueda.hiroaki.gm@u.tsukuba.ac.jp	Atmosphere-ocean-land interaction involved in the climate system
	※ONDA Yuichi onda@geoenv.tsukuba.ac.jp	Transfer of radionuclides in Environment, Hydro-geomorphology, Forest hydrology
	KATO Hiroaki kato.hiroaki.ka@u.tsukuba.ac.jp	Forest hydrology, Soil erosion, Environmental radioactivity
	KUSAKA Hiroyuki kusaka.hiroyuki.ff@u..tsukuba.ac.jp	Urban climatology, Mountain meteorology, Applied meteorology (wind energy prediction, biometeorology)
	TSUMUNE Daisuke tsumune.daisuke.gw@u.tsukuba.ac.jp	Oceanic material cycle, simulation of oceanic radioactivity dynamics.
	DOAN Quang Van doan.van.gb@u.tsukuba.ac.jp	Extreme weather and climate, regional climate change, urban environment, numerical modeling, artificial intelligence/machine learning methods
	YAMANAKA Tsutomu tyam@geoenv.tsukuba.ac.jp	Water and material cycle, Isotopic tracer, Eco-hydro-meteorology
Human Geosienc	IKEDA Atsushi aikeda@geoenv.tsukuba.ac.jp	Cold region geomorphology, Permafrost monitoring, Mountain environments
	KUBO Tomoko tmkkb@geoenv.tsukuba.ac.jp	Urban Geography, Housing Studies. Regional Geography of North America and Japan
	KUREHA Masaaki mkureha@geoenv.tsukuba.ac.jp	Regional geography of Europe and Japan, Geography of tourism
	SEKIGUCHI Tomohiro sekiguchi@ied.tsukuba.ac.jp	Sedimentary processes,Bedform,Experiment
	TSUTSUMI Jun jtsu@geoenv.tsukuba.ac.jp	Regional geography of Australia, Urban geography, GIS
	HATTANJI Tsuyoshi hattan@geoenv.tsukuba.ac.jp	Hydrogeomorphology, Landslides, Rock weathering, Karst geomorphology
	MATSUI Keisuke jiji@geoenv.tsukuba.ac.jp	Cultural geography, Geography of tourism and religion, Theory of cultural tourism
	Matsushita Bunkei matsushita.bunkei.gn@u.tsukuba.ac.jp	Remote Sensing, GIS, Global Environment, Water Quality of Lakes
	MORIMOTO Takehiro tmrmt@geoenv.tsukuba.ac.jp	Agricultural and Rural geography, Sustainability of agriculture and rural area, GIS
	YAMASHITA Akio akio@geoenv.tsukuba.ac.jp	Regional geography of Latin America, Water environment in urban area, Water supply-demand on watershed scale

Solid Earth Sciences	IKEHATA Kei ikkei@geol.tsukuba.ac.jp	Volcanology, Geochemistry
	UJIIE Kohtaro kujiie@geol.tsukuba.ac.jp	Structural geology and tectonics
	OKUWAKI Ryo rokuwaki@geol.tsukuba.ac.jp	Seismic source processes of earthquakes and non-earthquakes
	KAMATA Yoshihito yoshi_kamata@geol.tsukuba.ac.jp	Geological evolution of Southeast Asia
	KYONO Atsushi kyono@geol.tsukuba.ac.jp	Mineralogy, Crystallography, Mineral physics
	KUROSAWA Masanori kurosawa@geol.tsukuba.ac.jp	Mineralogy, Fluid inclusion analysis
	TSUNOGAE Toshiaki tsunogae@geol.tsukuba.ac.jp	Petrology of metamorphic rocks, Collisional orogeny, Gondwana
	FUJINO Shigehiro shige-fujino@geol.tsukuba.ac.jp	Sedimentology and stratigraphy, Geological records of tsunamis in Japan and Asian countries
	YAGI Yuji yagi-y@geol.tsukuba.ac.jp	Earthquake rupture process and seismicity
Biogeosciences	AGEMATSU Sachiko agematsu@geol.tsukuba.ac.jp	Conodont, Graptolite, Tentaculite, Paleozoic historical geology of Southeast Asia
	TANAKA Kohei koheitanaka@geol.tsukuba.ac.jp	Vertebrate paleontology and paleoecology
Solid Earth Sciences / Biogeosciences Complex	FUJISAKI Wataru wataru-fujisaki@geol.tsukuba.ac.jp	History of life on earth, Tectonics
	MARUOKA Teruyuki maruoka.teruyuki.fu@u.tsukuba.ac.jp	Isotope geology, Geochemistry
[Cooperative Graduate School system] Atmospheric and Hydrospheric Sciences	IIZUKA Satoshi iizuka@bosai.go.jp	Atmosphere-ocean interaction, Meteorological disaster, Extreme event
	ISHII Masayoshi maish@mri-jma.go.jp	Oceanography, Atmosphere-Ocean Interactions, Climate Variations
	KAJINO Mizuo kajino@mri-jma.go.jp	Atmospheric Chemistry, Aerosol-Cloud-Radiation Interactions
	SHIMOKAWA Shinya simokawa@bosai.go.jp	Physical oceanography, Coastal disasters, Marine ecosystem
	SHUSSE Yukari shusse@bosai.go.jp	Clouds and precipitation meteorology, Rader meteorology
[Cooperative Graduate School system] Biogeosciences / Solid Earth Sciences	SHIGETA Yasunari shigeta@kahaku.go.jp	Paleobiology of cephalopoda
	TSUTSUMI Yukiyasu ytsutsu@kahaku.go.jp	Geochronology

※ Faculty members due to retire in March 2028

Doctoral Program in Environmental Studies

https://www.envr.tsukuba.ac.jp/eng/

Field of Research	Faculty	Detailed Description of Research Field
Sustainability Hydrology	TSUJIMURA Maki ASANUMA Jun ※ONDA Yuichi	● Groundwater contamination and human activities,monitoring of water resources and water environment ● Dynamics of radio nuclides in water environment Hydro-geomorphology
Environmental Sustainable Soil Science	YAMAJI Keiko	● Mode of action of agrochemicals, Stress responses of plants ● Chemical response of plants and microorganisms in the rhizospheric soil
Environmental Microbiology	NOMURA Nobuhiko TOYOFUKU Masanori NAGAKUBO Toshiki*	● Applied microbiology for bioremediation ● Microbial control for creating functional materials ● Applying physics and engineering techniques to understand bacterial behavior and biofilm formation
Sustainable Recycling of Bio-resources	LEI Zhongfang UTSUMI Motoo YUAN Tian	● Techniques for improving water quality with lower load and friendly symbiosis to environment ● Recycling and reusing of agricultural wastes and development of functional food materials from them ● Development of wastewater treatment technologies based on ecosystem engineering ● Aquatic biogeochemistry and engineering ● Aquatic environmental remediation for sustainable water use ● Inhibition by microbial metabolite on water purification process and development of its measures ● Toxicity assessment and remediation of environmental pollutants
Environmental radiochemistry	★SAKAGUCHI Aya	● Development of analytical techniques for environmental radionuclides ● Behavior of natural/artificial radionuclides in the environment ● Applications of natural/artificial radionuclides as tracers for environmental dynamics
Global Climate Variability	KAMAE Yoichi Doan Quang Van	● Monsoon and Global Climate Variability ● Applied meteorology and climate
Biodiversity and Conservation Ecology	YOKOI Tomoyuki	● Life history and biodiversity of insects ● Pollination service and conservation of pollinators ● Behavior and life history of wild bees ● Interaction between alien plants and native insects
Ecosystem Ecology	HIROTA Mitsuru MASUMOTO Shota OMORI Yuko*	● Distribution of terrestrial plants and their adaptive strategy to environments ● Response to environmental change in alpine ecosystem: species, community and ecosystem components ● Dynamics of bioelements in ecosystems ● Evaluation of the effects of global change to biosphere ● Aquatic Biogeochemistry and Engineering
Urban Landscape Planning	★MURAKAMI Akinobu ★YAMAMOTO Sachiko	● History of dwelling environment Conservation of traditional built environment, ● Urban planning, Regional planning

Environmental and Socio- economic Policies	YABAR Helmut MIZUNOYA Takeshi ★KAIDA Naoko	● Evaluation and analysis of technological externalities, market failure, revealed preference in demand and common property in the ecosystem, ● Methods for comprehensive evaluation of the environment integrated waste management systems: policy and planning ● Remote sensing and GIS application to environmental problems Monitoring natural environment, Environmental change prediction and environmental impact assessment, Policies for environmental preservation, Environmental policy, Environmental economics ● Environmental psychology, environmental economics, pro-environmental behavior, environmental decision-making
Paleo-environment	MATSUMOTO Hironao	● Environmental perturbations during the Paleozoic and Mesozoic. ● Bio- and chemostratigraphy of old sedimentary rocks ● Past marine elemental cycles
Science and Technology in Soil and Water Environments	KOBAYASHI Motoyoshi SUGIMOTO Takuya	● Fundamental of colloid science and its application to soil and water ● Water and solute transportation in soil. Salinity and erosion of soil ● Water resource engineering in arid land, water quality control, water treatment ● Physics and chemistry of soil, soil pollution, and soil colloid and interface
Sustainability Policies and Diplomacy	MATSUI Kenichi	● Environmental dispute resolution and diplomacy ● Rural resources management and forest conservation in developing nations, ● Environmental/water ethics and law ● Environmental and agricultural policies for sustainability ● Environmental disaster policies ● Traditional knowledge for sustainability
Functional food resources	※ISODA Hiroko MIYAMAE Yusaku TAKAHASHI Shinya Farhana FERDOUSI	● Mechanisms behind functional food resources for potential applications in food and cosmetics. ● Studies on small molecules that modulate the cellular metabolism ● Pigment Cell Research (Melanogenesis and Melanoma Research) ● Search for functional components from biomass ● Bioinformatics, Omics Research, Clinical trial, Epidemiology
Plant physiology	SUZUKI Iwane MAEDA Yoshiaki	● Photosynthetic acclimation and signal perception to environmental stress ● Production of useful metabolites by metabolic engineering in algae ● Application of quantum beams and nuclear resonance reaction for biological breeding
Watershed Management and Environmental Disaster Prevention	UCHIDA Taro NASAHARA Kenlo YAMAKAWA Yosuke*	● Policy of natural disaster prevention, Strategy for natural disaster prevention, Risk management against natural disaster, Risk assessment and mitigation for natural disasters, Crisis management for natural disasters, Satellite remote sensing
Regional Air Pollution [Cooperative graduate school system: National Institute for Environmental Studies]	NAGASHIMA Tatsuya	● Studies on Asian air pollution and its effects using chemical transport model

International disaster management [Cooperative graduate school system: National Institute for Land and Infrastructure Management]	YAMAKOSHI Takao	● Mechanisms of landslides and floods ● International disaster management theory ● Development of countermeasure technologies for landslide and flood disasters according to local conditions

※ Faculty members due to retire in March 2028

Faculty members marked by * cannot be assigned as thesis director, but can advise the student under the direction of a qualified thesis director within the same research field.

★The faculty member marked with ★ is a dual-role faculty member and cannot be a primary supervisor.

E-mail addresses of the faculty members are available on the following web site: https://www.envr.tsukuba.ac.jp/eng/