

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 Evo-Devo research of chordates ② Comparative embryology of marine invertebrates, including bivalves and echinoderms
	DEGAWA Yousuke	① Natural history and biodiversity of the Kingdom Fungi ② Taxonomy and phylogenetic studies of the basal lineage of Fungi (Zygomycota and Chtridiomycota) ③ Fungal ecology focused on their interactions with other organisms and their life cycles
	NAKANO Hiroaki	① Evolution, development, morphology, and ecology 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
Ecology	SHOJI Akiko	① Behavioural ecology and ecophysiology in free-ranging animals ② Biotransport by top predators from marine to terrestrial ecosystems
	TANAKA Kenta	① Evolutionary ecology focusing on ecological and genetic adaptive mechanisms in wild Arabidopsis ② Conservation ecology in mountains, grasslands and forests
	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 Yukihiro	① Experimental ecology with field and laboratory populations ② Theoretical biology with mathematical models
	HIROTA Mitsuru	① Plant response to environmental changes, perspective from ecology ② Ecosystem ecology focused on carbon cycling in terrestrial ecosystem
	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
	KON Koetsu	① Species interactions of marine organisms ② Human-impacts on faunal communities in coastal habitats
	SATO Yukie	① Behavioral ecology and evolutionary ecology in terrestrial arthropods ② Geographic variation in behavior and ecology, and speciation
Plant Physiology and Developmental Biology	※SATO Shinobu	① Studies on the molecular mechanism of recovery from injury and tissue reunion in incised stems ② Studies on the regulation of root functions by environment & ③ hormones and roles of organic substances in xylem sap

	SUZUKI Iwane	<ul style="list-style-type: none"> ① Acclimation of photosynthetic apparatus to environmental stress ② Mechanisms of perception of the environmental signals in photosynthetic organisms ③ Basic research for the production of useful metabolites by metabolic engineering of algae
	IWAI Hiroaki	<ul style="list-style-type: none"> ① Cell wall functions on the plant development and environmental responses ② Mechanisms of plant cell wall cross-linking
	SUZAKI Takuya	<ul style="list-style-type: none"> ① Molecular genetic studies on root nodule development during legume-<i>Rhizobium</i> symbiosis ② Studies on molecular mechanism of nitrogen nutrient response in plants
	MINODA Ayumi	<ul style="list-style-type: none"> ① Studies on regulation of primary metabolism in algae as unicellular plant model systems ② Studies on metal metabolism in photosynthetic organisms
	IRVING Louis John	<ul style="list-style-type: none"> 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	KOBAYASHI Satoru	<ul style="list-style-type: none"> ① Common mechanisms regulating germline formation in animals ② Genetic pathway regulating sex determination of germline in <i>Drosophila</i> ③ Mechanism regulating germline-stem-cell maintenance in <i>Drosophila</i>
	SASAKURA Yasunori	<ul style="list-style-type: none"> ① Developmental mechanisms of animals ② Metamorphosis of ascidians ③ Molecular biology of mimicry ④ Development and Evolution
	CHIBA Chikafumi	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> ① Mechanisms of interorgan communication in the regulation of development, energy metabolism, stem cell proliferation and environmental tolerance ② Molecular, cellular, and systemic mechanisms of the interaction between insects and parasitoid wasps ③ Structural Biology and Chemical Biology of Insect Growth Control Agents
	YAGUCHI Shunsuke	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> ① Insect hormones and its regulation during development ② Neuro-endocrine control of physiology and behavior in insects
	SAKURAI Keisuke	<ul style="list-style-type: none"> ① Electrophysiological studies on molecular mechanisms of signal transduction in retinal neurons ② Studies on non-visual photoreceptor cells in CNS
Molecular and Cellular Biology	INABA Kazuo	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> ① Genetic analysis of selective protein degradation ② Cell biology of the ubiquitin family ③ Knockout mice analysis of the ubiquitin system
	NAKANO Kentaro	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> ① Perception and signaling mechanisms for abiotic stress response and sugar accumulation in plants ② Production of pharmaceutical proteins with plant biotechnology ③ Production and evaluation of genome editing crops
	SAKAMOTO Kazuichi	<ul style="list-style-type: none"> ① Molecular and physiological analysis of anti-ageing (skin, hair, muscle, locomotion, longevity, behavior, etc.) by using model animals ② Molecular and physiological analysis of preventive medicine (obesity, diabetes, stress tolerance, etc.) by using model animals ③ Application studies for anti-aging and wellness by using bioactive substances (phytochemicals, fermented materials, etc.)
	MIYAMURA Shinichi	<ul style="list-style-type: none"> ① Cell biological studies on evolution of sex in eukaryotic algae ② Studies on sexual reproduction of marine green algae
	ISHIKAWA Kaori	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> ① Plastid evolution via secondary endosymbioses ② Plastid division machinery in microalgae ③ Genome evolution in microalgae
Genomics and Bioinformatics	INAGAKI Yuji	<ul style="list-style-type: none"> 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
	NAKADA Kazuto	<ul style="list-style-type: none"> ① Functional morphology of mammalian mitochondria ② Generation of mouse models for mitochondrial DNA-based diseases ③ Therapeutics for mitochondrial DNA-based diseases
	※HASHIMOTO Tetsuo	<ul style="list-style-type: none"> ① Molecular phylogeny of eukaryotic micro-organisms ② Molecular evolutionary studies on mitochondria and mitochondrion-related organelles
	KUWAYAMA Hidekazu	<ul style="list-style-type: none"> 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
	SAWAMURA Kyoichi	<ul style="list-style-type: none"> ① Evolutionary Genetics ② Genetic analysis of hybrid inviability and sterility in <i>Drosophila</i> ③ Genetic analysis of sexual isolation in <i>Drosophila</i> ④ Interspecific introgression in natural populations of <i>Drosophila</i>
	HARADA Ryuhei	<ul style="list-style-type: none"> ① Computational Biophysics and Theoretical Biology ② Molecular dynamics simulations for analyzing biological functions ③ <i>In silico</i> drug design based on molecular simulations
Advanced Cellular Biology	*OHNISHI Makoto (NIH, Tokyo)	<ul style="list-style-type: none"> ① Comparative study of genomic diversities of enteric bacterial pathogens ② Study on genomic diversification by DNA transformation
	*NAGAMUNE Kisaburo (NIH, Tokyo)	<ul style="list-style-type: none"> 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
	*MATSUI Hisanori (Takeda Pharmaceutical Company, Ltd. Fujisawa)	① Drug discovery research in the field of neuroscience, endocrinology (particularly neuroendocrinology and reproductive endocrinology, and drug repurposing ② Translational research for drug discovery
Advanced Molecular Biology	* KAWACHI Masanobu* (National Institute for Environmental Studies)	① Biodiversity and ecology of microalgae concerning environmental issues. ② Studies on potential biodiversity of microorganisms ③ Development of preservation techniques for microalgae and endangered algae ④ Screening of useful microalgae and its application
	* HOSOYA Tsuyoshi (National Museum of Nature and Science)	① Phylogeny, taxonomy, and evolution of inoperculate discomycetes ② Biodiversity of plant-fungus relationship
	*MASAKI Takashi (FFPRI, Tsukuba)	① Population ecology of woody plants ② Structure and dynamics of forest ecosystem ③ Growth management of forests
	*TAJIMA Yuko	① Life history on marine mammals ② Comparative morphology on marine mammals ③ Health assessments on marine mammals
	*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

※ The faculty member marked with ※ will be retired by March 31, 2023.

Note: *Adjunct Professor of the Cooperative Graduate School

Doctoral Program in Agricultural Sciences

	Field of Research	Faculty	Detailed Description of Research Field
Biological Resource Production Field	Plant Breeding	OHSAWA Ryo 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
	Crop Science	NOMURA Koji	① Physiological and ecological research for raising grain yield and quality of crop plants ② Physiological research on the mechanisms and control of Stress tolerance in crop plants
	Olericulture and Floriculture	EZURA Hiroshi FUKUDA Naoya MATSUKURA Chiaki ARIIZUMI Tohru	① Molecular and physiological dissections of useful traits involved in agricultural production in vegetables and ornamentals ② Development of genetic engineering and intensive production technologies for vegetables and ornamentals ③ Genetics and genomics for fleshy fruit (Solanaceae and Cucurbitaceae) research and development
	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
	Animal Science	ASANO Atsushi	① Physiology of environmental adaptation and production performance in domestic animal. ② Molecular regulation of animal reproduction ③ Functional characterization and utilization of domestic animals
	Crop Production Systems	HAYASHI Hisayoshi	① Establishment of sustainable crop production systems with conscious of environment load ② Development and utilization of high level and stable production systems on millets and regional special crops
	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 WANG Ning	① Genetic analysis of important agronomic traits in crops and vegetables ② Development of analytical platforms to capture quantitative and qualitative changes of metabolite levels ③ Metabolic network biology using “omics” datasets
	Epigenetics	BUZAS Diana Mihaela	① Defining promoter and polycomb recruiting cis acting elements at FLC chromatin. ② Function of Polycomb recruiting elements in Arabidopsis. ③ Epigenetic mechanism for quantitative and priming memory of Vernalization insensitive 3.
	Plant Parasitic Mycology	YAMAOKA Yuichi 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. ③ Functional analysis of genes associated with disease resistance in plant.

Biological Resource Production Field	Applied Entomology and Zoology	FURUKAWA Seiichi	① Biological control and chemical ecological approaches in pest management ② Insect immune mechanisms against pathogens and parasitoids ③ Elucidating volatile compound-mediated plant-plant and plant-insect communications using molecular biology approaches
	Environmental Soil Chemistry	TAMURA Kenji 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
	Forest Ecotopology	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 ④ Conservation of endangered species
	Conservation of Regional Resources	TSUMURA Yoshihiko 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
	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
	International Food Production and Development Sciences	*MURANAKA Satoru Japan International Res. Center for Agricultural Sci. (JIRCAS)	① Morphological and physiological characterization of cowpea breeding materials for the development of machine-harvestable varieties. ② Physiological mechanism of tuber initiation and growth of White Guinea yam, <i>Dioscorea rotundata</i> .
	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
	Biological Regulation in Insects	*SHIMODA Masami (NARO, Institute of Agrobiological Sciences)	① Regulatory mechanisms in insect growth and development ② Optical response in insects and its use in pest management ③ Recycling of organic wastes using insects

*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 “@” .)

	Field of	Faculty	Detailed Description of Research Field
Eco-region Development Engineering Field	Environmental Colloid and Interface Engineering	ADACHI Yasuhisa adachi.yasuhisa.gu#@#u.tsukuba.ac.jp KOBAYASHI Motoyoshi kobayashi.moto.fp#@#u.tsukuba.ac.jp	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
	Bio-resource Process and System Engineering	NOGUCHI Ryoza noguchi.ryoza.gm#@#u.tsukuba.ac.jp	① Resource and energy utilization using agricultural waste, biomass and organic wastewater based on bio-resource recycling system ② LCA, LCC, and simulator development for optimization design of bio-resource conversion process and grasping of biomass potential and its utilization
	Watershed Conservation	NASAHARA(NISHIDA) Kenlo24dakenlo#@#gmail.com	① Mechanism of sediment production and transport ② Sabo planning in harmony with natural environment ③ Environmental analysis through remote sensing
	Water Resources Management Engineering	ISHII Atsushi ishii.atsushi.fu#@#u.tsukuba.ac.jp	① Development and management of irrigation systems ② Water resources evaluation for development ③ Participatory irrigation management
	Bioproduction and Machinery	NOGUCHI Ryoza noguchi.ryoza.gm#@#u.tsukuba.ac.jp Tofael AHAMED tofael.ahamed.gp#@#u.tsukuba.ac.jp	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 ④
	Farmland System Engineering	KOBAYASHI Motoyoshi kobayashi.moto.fp#@#u.tsukuba.ac.jp	① Farmland engineering, soil conservation engineering ② Soil Physics, Environmental materials
Food and Biomass Science Field	Food Resources Engineering	Marcos Antonio das NEVES marcos.neves.ga#@#u.tsukuba.ac.jp	① Micro/nano-engineering for advanced bioresource processing ② Microchannel technology for advanced food processing ③ Formulation of food micro/nano-dispersions and evaluation of their gastrointestinal digestion ④ Effective utilization of food processing waste for value addition
	Agri-Food Process Engineering	KITAMURA Yutaka kitamura.yutaka.fm#@#u.tsukuba.ac.jp	① Milling and spray drying for health food production ② Development of novel food by applying rice slurry
	Science for Food Functions	MIYAZAKI Hitoshi miyazaki.hitoshi.gb#@#u.tsukuba.ac.jp	① Exploration study on food-derived functional compounds for the prevention and improvement of lifestyle-related disease ② Exploration study on food-derived functional compounds for the prevention and improvement of fertility of livestock and human
	Chemistry of Biomaterials	NAKAGAWA-IZUMI Akiko nakagawaizumi.a.gm#@#u.tsukuba.ac.jp	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	ENOMAE Toshiharu t#@#enomae.com OBATAYA Eiichi obataya.eiichi.fu#@#u.tsukuba.ac.jp KAJIYAMA Mikio kajiyama.mikio.fp#@#u.tsukuba.ac.jp	<ul style="list-style-type: none"> ① Creation of paper-based electronics and sensors ② Conservation of aging library collection and flood-damaged paper cultural heritage using salt water immersion method ③ Synthesis of fluorine containing condensation polymers for composite materials ④ Chemical modification of poly (amino acid)s and poly saccharides ⑤ Property enhancement of biomaterials for high-performance musical instruments ⑥ Investigation on the mechanical properties of wood with respect to its fiber-reinforced cellular structure, and development of technology for their effective utilization ⑦ Physical and chemical characterization of natural adhesives such as Japanese lacquer and chitosan, and development of technology for their utilization
Rural Development Economics Field	Agricultural and Bioresource Economics	SHIGENO Ryuichi shigeno.ryuichi.gb#@#u.tsukuba.ac.jp SHUTO Hisato shuto.hisato.ke#@#u.tsukuba.ac.jp	<ul style="list-style-type: none"> ① Agricultural policy and economic development in the globalized world economy ② Quantitative analysis of food demand ③ Industrial organization of agribusiness
	Farm Business and Agribusiness Management	UJIE Kiyokazu ujie.kiyokazu.gf#@#u.tsukuba.ac.jp	<ul style="list-style-type: none"> ① Farm production and supply economics under the risk ② Farm and agribusiness firm management and marketing ③ Food consumption and consumer policy
	Forest Resource Economics	TACHIBANA Satoshi tachibana.satoshi.gn#@#u.tsukuba.ac.jp	<ul style="list-style-type: none"> 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 Resources Sociology	KOHROKI Katsuhisa kohroki.katsuhisa.gu#@#u.tsukuba.ac.jp	<ul style="list-style-type: none"> 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 teruhito#@#affrc.go.jp YOSHIMOTO Shuhei Shuy#@#affrc.go.jp (Institute for Rural Engineering, NARO)	<ul style="list-style-type: none"> 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
	Biosphere Informatic Control Engineering	* MOTOBAYASHI Kota kmoto#@#affrc.go.jp (NARO)	<ul style="list-style-type: none"> ① Fundamental technologies for agricultural machinery ② Advanced information and communication technologies (ICT) for agricultural machinery ③ Development of standardized data transfer technologies for food production

Food and Biomass Science Field	Sustainability of Biomass Resources	*KOSUGI Akihiko akosugi#@affrc.go.jp (Japan International Res. Center for Agricultural Sci.(JIRCAS))	① Development of biomass utilization technology using microbialfunction
	Regional Forest Resource Development	*YAMADA Tatsuhiko yamadat#@affrc.go.jp (Forestry& Forest Products Res. Inst.)	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
Rural Development	Rural Development Study	*FURUYA Jun furuya#@affrc.go.jp (Japan International Res. Center for Agricultural Sci.(JIRCAS))	① Identification of the socio-economic factors and conditions for sustainable agriculture development in the Asian and African countries ② World food model analysis of impacts of global warming on agriculture and food security

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

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

Field of Research	Faculty (e-mail address)	Detailed Description of Research Field
Field Informatics	TANAKA Tsuyoshi (tstanaka#@affrc.go.jp) MITSUNAGA Takayuki (aeiou#@affrc.go.jp)	① Comparative genomics for breeding and molecular evolution study ② Study on construction of pest-occurrence-prediction system using statistical modeling
Crop Production Management Systems	FUKATSU Tokihiro (fukatsu#@affrc.go.jp) SUGIURA Ryo (rsugiura#@affrc.go.jp)	① Farming systems to reduce labor, production costs and environmental loads ② Research on remote sensing technology and image processing technique for agricultural applications
Function and Regulation of Animal Production	MITSUMORI Makoto (mitumori#@affrc.go.jp) TAJIMA Kiyoshi (ktajima#@affrc.go.jp)	① Characteristics of rumen microbiota and its relationship to ruminant productivity ② Utilization of fermented liquid feed and Eco-feed for pig nutrition
Crop Genomic Breeding	TANAKA Junichi (tanajun#@affrc.go.jp) MATSUI Katsuhiko (matsui#@affrc.go.jp)	① Genetic analysis for important agronomic traits and development new crop cultivars. ② Construction of molecular linkage maps and development of Molecular markers for important agronomic characters in crop plants ③ Development of novel breeding strategies using genome information in crop species
Fruit Tree Genomic Breeding	SUGIURA Toshihiko (sugi#@affrc.go.jp) KUNIHISA Miyuki (miyuky#@affrc.go.jp)	① Research on the response to environmental stimuli of fruit trees ② Research on the application of mass data for genomes in apple breeding
Development and Utilization of New Genetic Resources in Ornamental Plants	ONOZAKI Takashi (onozaki#@affrc.go.jp) NAKAYAMA Masayoshi (nakayosi#@affrc.go.jp)	① Breeding for disease resistance and improvement of flower vase life in ornamental crops ② Flower color regulation based on analysis of pigments and their related compounds

*NARO=National Agriculture and Food Research Organization

Doctoral Program in Life and Agricultural Sciences

(*Replace “#@#” with “@”.)

	Field of Research	Faculty	Detailed Description of Research Field
Chemical Life Science	Biochemistry of Bioactive Molecules	USUI Takeo SHIGEMORI Hideyuki SUNOHARA Yukari FURUKAWA Jun YAMADA Kosumi	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 Search for bioactive compounds related to prevention of diseases (Alzheimer's disease, diabetes, osteoporosis, etc.) from edible and medicinal plants) ⑤ Mechanisms how to accumulate various metals in plants ⑥ Signaling mechanisms about nutrient status in the organ to organ interactions in plants ⑦ Functional and structural analysis of plant growth regulators in response to phototropic and gravitropic stimulation ⑧ Functional and structural analysis of extracellular plant metabolites associated with allelopathy and their application in plant production ⑨ Semiochemicals mediating interactions among insects, plants and animals
	Structural Biochemistry	TANAKA Toshiyuki ttanaka#@#tara.tsukuba.ac.jp	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	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	FUKAMIZU Akiyoshi TANIMOTO Keiji	① Molecular mechanisms of aging regulated by methyltransferases (<i>C. elegans</i> & mouse) ② Mammalian epigenetics in genomic imprinting and gene regulatory mechanisms in blood pressure homeostasis
	Molecular and Developmental Biology	KASHIWABARA Shin-ichi kashiwabara.shin.fw#@#u.tsukuba.ac.jp	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	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	KOBAYASHI Michihiko 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	Applied Microbiology	NOMURA Nobuhiko UTADA S. Andrew TOYOFUKU Masanori	① Bacterial cell-cell communication and biofilm formation
	Ecological Molecular Microbiology	TAKAYA Naoki NAKAJIMA-KAMBE Toshiaki NAKAMURA Akira YING Bei-Wen TAKESHITA Norio	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 <i>Thermus thermophilus</i> ⑧ Experimental evolution for investigating the microbial survival strategies ⑨ Multilevel omics analyses of the genome reduced <i>Escherichia coli</i>
	Fungal Interaction and Molecular Biology	HAGIWARA Daisuke	① Activating fungal secondary metabolism by biological interactions ② Elucidating molecular mechanisms underlying the fungal interaction. ③ Investigating fungal physiology and ecology in complex environments .
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
Chemical Life Science	Plant Environmental Genomics	*HABU Yoshiki (NARO)	① Genomics of Plant Responses to Environmental Stresses. ② Epigenomic Engineering of the Plant Genome.
Animal Life Science	Animal Bioresource Engineering	*OGURA Atsuo *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 in-vivo imaging methods for neuronal functions

Applied Microbiology	Applied Bioengineering of Microbial Ecosystems	*KIMURA Nobutada (AIST)	① Culturing the uncultured beneficial and fastidious microorganisms from the environment ② Exploration and elucidation of unidentified functions in novel biological and genetic resources and their application for bio-industries ③ Environmental metagenomics-driven discovery of novel microbial genetic resources ④ Ecophysiology of environmental microorganisms contributing to energy production and environmental remediation
	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 (NARO)	① Screening and utilization of biomolecules for sensing food quality ② Analyses on structure-function relationship of advanced glycation and products

(#) Please contact the Chair of Doctoral Program in Life and Agricultural Sciences (e-mail: keiji#@@#tara.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	Genome Biology	NAKAMURA Kouji	Molecular mechanism of protein secretion, Functional analysis for functional RNA gene
	Plant Biotechnology on Abiotic Stresses	KIKUCHI Akira	Stress physiology, Molecular breeding, Somatic embryogenesis
	Plant Physiology and Biotechnology	ONO Michiyuki	Photoperiodic induction of flowering, Development and differentiation, Circadian rhythms, Gene literacy, Plant biotechnology
	Bioprocess Engineering	NOMURA Nakao	Development of sustainable agriculture, Forestry and fisheries industry using bioengineering technique
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
	Plant Physiology	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	WATANABE N. Kazuo	Biodiplomacy, Assessment of biodiversity, Sustainable use for genetic resource, Biosafety, Access for bioresources and its appropriation
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	KITAMURA Yutaka	Biomass and food waste conversion and utilization
	Biological and Material Cycles	YANG Yingnan	Photocatalytic technology, Solar light utilization system, Bioreactor, High efficiency conversion and effective utilization of bioresources, Renewable energy

Doctoral Program in Geosciences

Field of Research	Faculty	Detailed Description of Research Field
Human Geography	MATSUI Keisuke jiji@geoenv.tsukuba.ac.jp	Cultural geography, Geography of tourism and religion, Theory of cultural tourism
Regional Geography	KUREHA Masaaki mkureha@geoenv.tsukuba.ac.jp TSUTSUMI Jun jtsu@geoenv.tsukuba.ac.jp	Regional geography of Europe and Japan, Geography of tourism Regional geography of Australia, Urban geography, GIS
Geomorphology	IKEDA Atsushi aikeda@geoenv.tsukuba.ac.jp HATTANJI Tsuyoshi hattan@geoenv.tsukuba.ac.jp SEKIGUCHI Tomohiro sekiguchi@ied.tsukuba.ac.jp	Cold region geomorphology, Permafrost monitoring, Mountain environments Hydrogeomorphology, Landslides, Rock weathering, Karst geomorphology Sedimentary processes, Bedform, Experiment
Hydrological Science	ASANUMA Jun asanuma@ied.tsukuba.ac.jp SUGITA Michiaki sugita@geoenv.tsukuba.ac.jp YAMANAKA Tsutomu tyam@geoenv.tsukuba.ac.jp	Hydrometeorology, Land-vegetation-atmosphere system, Atmospheric Turbulence Hydrology, Evapotranspiration, Lakes Water and material cycle, Isotopic tracer, Eco-hydro-meteorology
Atmospheric Science	UEDA Hiroaki hueda.hiroaki.gm@u.tsukuba.ac.jp TANAKA Hiroshi tanaka@ccs.tsukuba.ac.jp UENO Kenichi ueno.kenichi.fw@un.tsukuba.ac.jp MATSUEDA Mio mio@ccs.tsukuba.ac.jp	Atmosphere-ocean-land interaction involved in the climate system General circulation of the atmosphere, Energetics, Low-frequency variability Precipitation system studies, Mountain meteorology, land-atmosphere interaction, Local climate observation Ensemble prediction, Predictability of weather and climate
Geographical Information Science	KUSAKA Hiroyuki kusaka@ccs.tsukuba.ac.jp Matsushita Bunkei matsushita.bunkei.gn@u.tsukuba.ac.jp MORIMOTO Takehiro tmrmt@geoenv.tsukuba.ac.jp	Urban climatology, Mountain meteorology, Applied meteorology (wind energy prediction, biometeorology) Remote Sensing, GIS, Global Environment, Water Quality of Lakes Agricultural and Rural geography, Sustainability of agriculture and rural area, GIS
Analysis of Environmental Dynamics	ONDA Yuichi onda@geoenv.tsukuba.ac.jp KATO Hiroaki kato.hiroaki.ka@u.tsukuba.ac.jp	Transfer of radionuclides in Environment, Hydro-geomorphology, Forest hydrology Forest hydrology, Soil erosion, Environmental radioactivity
Paleobiological Science	AGEMATSU Sachiko agematsu@geol.tsukuba.ac.jp TANAKA Kohei koheitanaka@geol.tsukuba.ac.jp	Conodont, Graptolite, Tentaculite, Paleozoic historical geology of Southeast Asia Vertebrate paleontology and paleoecology

Paleogeosphere Science	KAMATA Yoshihito yoshi_kamata@geol.tsukuba.ac.jp	Geological evolution of Southeast Asia
	FUJINO Shigehiro shige-fujino@geol.tsukuba.ac.jp	Sedimentology and stratigraphy, Geological records of tsunamis in Japan and Asian countries
Geodynamics	YAGI Yuji yagi-y@geol.tsukuba.ac.jp	Earthquake rupture process and seismicity
	UJIIE Kohtaro kujiie@geol.tsukuba.ac.jp	Structural geology and tectonics
Planetary Resource Geology	MARUOKA Teruyuki maruoka.teruyuki.fu@u.tsukuba.ac.jp	Isotope geology, Geochemistry
Petrology	TSUNOGAE Toshiaki tsunogae@geol.tsukuba.ac.jp	Petrology of metamorphic rocks, Collisional orogeny, Gondwana
	IKEHATA Kei ikkei@geol.tsukuba.ac.jp	Petrology of igneous rocks, Economic geology, Volcanology, Geochemistry
Mineralogy	KUROSAWA Masanori kurosawa@geol.tsukuba.ac.jp	Composition and behavior of fluid in crust
	KYONO Atsushi kyono@geol.tsukuba.ac.jp	Mineralogy, Crystallography, Mineral physics
Water-related Disaster Science	SHIMOKAWA Shinya simokawa@bosai.go.jp	Physical oceanography, Coastal disasters, Marine ecosystem
	MISUMI Ryohei misumi@bosai.go.jp	Radar meteorology, Natural disasters
	SHUSSE Yukari shusse@bosai.go.jp	Detailed Description of research Field: Clouds and precipitation, Radar meteorology
Ocean-Atmosphere Interaction System	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
Earth Historical Analysis	KOHNO Naoki kohno@kahaku.go.jp	Paleobiology of Cenozoic animals (especially for aquatic animals)
	SHIGETA Yasunari shigeta@kahaku.go.jp	Paleobiology of cephalopoda
	TSUTSUMI Yukiyasu ytsutsu@kahaku.go.jp	Geochronology

Field of Research	Faculty	Detailed Description of Research Field
Sustainability Hydrology	TSUJIMURA Maki ASANUMA Jun ONDA Yuichi	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● Mode of action of agrochemicals, Stress responses of plants ● Chemical response of plants and microorganisms in the rhizospheric soil
Microbiology for Sustainable Environment	NOMURA Nobuhiko TOYOFUKU Masanori	<ul style="list-style-type: none"> ● 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	ZHANG Zhenya LEI Zhongfang UTSUMI Motoo SHIMIZU Kazuya	<ul style="list-style-type: none"> ● 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
Environmental radiochemistry	SAKAGUCHI Aya	<ul style="list-style-type: none"> ● Development of analytical techniques for environmental radionuclides ● Behaviour of natural/artificial radionuclides in the environment ● Applications of natural/artificial radionuclides as tracers for environmental dynamics
Engineering of Biomaterials	ENOMAE Toshiharu	<ul style="list-style-type: none"> ● Creation of paper-based electronics and sensors ● Conservation of aging library collection and flood-damaged paper cultural heritage using salt water immersion method
Global Climate Variability	KAMAE Youichi	<ul style="list-style-type: none"> ● Cloud Feedback and Climate Sensitivity ● Monsoon and Global Climate Variability ● Paleoclimate Modeling (Pliocene)
Water Resources Management Engineering	ISHII Atsushi	<ul style="list-style-type: none"> ● Development and management of irrigation systems ● Water resources evaluation for development ● Participatory irrigation management
Biodiversity and Conservation Ecology	(YOKOI Tomoyuki*)	<ul style="list-style-type: none"> ● Life History Strategy of Insects ● Ecosystem Conservation and Mitigation Microbial diversity and population genetics , Evolutionary ecology of flower visiting insects

Ecosystem Ecology	HIROTA Mitsuru (OMORI Yuko*)	<ul style="list-style-type: none"> ● Dynamics of bioelements in ecosystems ● Evaluation of the effects of global change to biosphere ● Distribution of terrestrial plants and their adaptive strategy to environments ● Carbon dynamics in terrestrial ecosystem , Response to environmental change in alpine ecosystem: species, community and ecosystem components , Mechanism of successional change in ecosystem functioning and structure ● Aquatic Biogeochemistry and Engineering ● Carbon cycle of terrestrial ecosystems, process-based model
Environmental Health Perspective	KUMAGAI Yoshito (SHINKAI Yasuhiro*)	<ul style="list-style-type: none"> ● Cellular response to environmental chemicals, ● Environmental toxicology, Cellular defense mechanisms against chemicals Infectious Diseases, International Health
Urban Landscape Planning	MURAKAMI Akinobu YAMAMOTO Sachiko	<ul style="list-style-type: none"> ● History of dwelling environment Conservation of traditional built environment, ● Urban planning, Regional planning
Environmental and Socio- economic Policies	YABAR Helmut MIZUNOYA Takeshi KAIDA Naoko	<ul style="list-style-type: none"> ● Evaluation and analysis of technological externality, 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 problem Monitoring natural environment, Environmental change prediction and environmental impact assessment, Policies for environmental preservation, Environmental policy, Environmental economic
Integrated Watershed Management	NASAHARA Kenlo (AKITSU Tomoko*)	<ul style="list-style-type: none"> ● Integrated management of watershed for the prevention of rainfall-induced disasters, ● Environmental monitoring and monitoring with satellite remote sensing Sediment dynamics in mountain watershed ● Earth and environmental sciences, Ecosystem modeling、 Remote sensing, Environmental dynamics analysis, Biogeoscience
Soil Enviroment Conservation	ADACHI Yasuhisa KOBAYASHI Motoyoshi	<ul style="list-style-type: none"> ● 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 soil, colloid and interface
Sustainability Policies and Diplomacy	MATSUI Kenichi	<ul style="list-style-type: none"> ● 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 VILLAREAL Myra (TAKAHASHI Shinya*)	<ul style="list-style-type: none"> ● 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
Plant physiology	SUZUKI Iwane	<ul style="list-style-type: none"> ● Plant molecular biology, Plant physiology

Environmental Disaster Prevention	UCHIDA Taro YAMAKAWA Yosuke	<ul style="list-style-type: none"> ● 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
Regional Air Pollution [Cooperative graduate school system: National Institute for Environmental Studies]	TAKAMI Akinori SUGATA Seiji NAGASHIMA Tatsuya	<ul style="list-style-type: none"> ● Observation and analysis of air pollution including PM2.3 in East Asia and study of its health and climate impact ● Numerical study of regional air pollutants, Material transport in the atmosphere ● Studies on Asian air pollution and its effects using chemical transport model
Regional Environmental Health Sciences [Cooperative graduate school system: National Institute for Environmental Studies]	TIN Tin Win Shwe KOIKE Eiko	<ul style="list-style-type: none"> ● Studies on immune toxicity of environmental chemicals and their mechanisms ● Environmental medicine, Air pollution and behavioral assessment, Air pollution and behavioral assessment ● Biological analysis for the effects of environmental pollutants on immune system

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.

E-mail addresses of the faculty members are available on the following web site: <http://www2.envr.tsukuba.ac.jp/eng/>.