UTSIP Kashiwa 2026

Host Laboratory List

Division of Transdisciplinary Sciences

- Advanced Materials Science
- Complexity Science and Engineering

Division of Biosciences

- Integrated Biosciences
- Computational Biology and Medical Sciences

Division of Environmental Studies

- Environment Systems
- Human and Engineered Environmental Studies
- International Studies
- Graduate Program in Sustainability Science

Division of Transdisciplinary Sciences

Department of Advanced Materials Science

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Sugimoto Laboratory	Prof. SUGIMOTO Yoshiaki	Our laboratory focuses on understanding surface and interfaces of materials at the atomic scale. We are particularly interested in how atomic structure determines the electronic, magnetic, and chemical properties of nanostructures and materials for advanced technology. To explore this, we use scanning probe microscopy techniques, which allow us to visualize and probe electonic and topographical structure of surfaces with atomic resolution. By combining these techniques with basic modelling, we aim to clarify the fundamental properties and emergent phenomena of quantum materials at the nanoscale. Our research is relevant for future technologies in areas such as nanofabrication, quantum devices and sensing, and surface-based electronics. The laboratory environment is highly interdisciplinary, bringing together ideas from physics, materials science, and chemistry. We place strong emphasis on transferable skills through careful experimental work, quantitative data analysis, and clear scientific communication. Students are encouraged to ask questions, develop their own ideas, and gain hands-on experience in research at the frontiers of nanoscience.	Nanoscience; Advanced materials; Acanning probe microscopy; Surfaces and interfaces; Atomic-scale imaging	Summer programme students will join ongoing experimental projects that use scanning probe microscopy and spectroscopy to investigate the surfaces and interfaces of various materials. After safety instruction and basic training, students will learn how to prepare clean samples, operate the microscope systems under supervision, and record atomic-resolution images and spatially resolved spectra. Typical tasks include optimizing imaging conditions, identifying atomic defects or adsorbed molecules, and comparing experimental data with simple models. Depending on their interests and background, students may also participate in developing advanced mechanical sensors for simultaneous measurements of tunneling current and interatomic forces. In addition, students will gain experience in analysing their data using standard scientific software and preparing short scientific reports and presentations summarising their results. Throughout the internship, they will attend regular group meetings, where they will contribute to scientific discussions and place their work in a broader research context. The projects are designed to be accessible to undergraduate students while still providing a realistic introduction to research in nanoscience and nanotechnology.

Division of Transdisciplinary Sciences

Department of Complexity Science and Engineering

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Ejiri-Tsuji Laboratory	Prof. EJIRI Akira	In Ejiri-Tsujii laboratory, fusion-oriented high-temperature plasma research is performed. The main research topic is the start-up and sustainment of a spherical tokamak configuration using RF wave power. This is an important issue to realize an economical reactor producing energy from the nuclear fusion reaction of deuterium and tritium. Besides the issue, development of new diagnostic is another research topic, which is necessary for new findings. We have a spherical tokamak device (TST-2) in our laboratory located at the Kashiwa campus, and we are running it by ourselves. The major radius of the plasma is 0.36 m, and the maximum electron temperature is about 400 eV, and the density is up to about 2x10^19 m^-3, and the discharge duration is less than about 0.1 sec. In order to study the above topics, RF wave technology, plasma measurements, analysis and simulation techniques are important. Please visit our website http://fusion.k.u-tokyo.ac.jp/index_e.html for more information.	plasma physics, nuclear fusion, tokamak, RF wave physics, nonlinear phenomena	The following shows the three planned projects. The participant may also propose another project, which we can discuss after the assignment. (1) Analysis of wave phenomena. The strong waves in plasma often induce nonlinear phenomena, and parametric decay instability (PDI) is one typical nonlinear phenomenon. Although such phenomena are clear in the power spectrum of magnetic fluctuations, the spectra show various detailed features. One approach is the application of the machine learning techniques to classify or extract different features. This would provide new information on the nonlinear phenomena. (2) Impurity injection. The majority components of the wave sustained plasmas in our lab are electrons and deuterium ions. The other atoms, such as oxygen, carbon, nitrogen, are called impurity. Although the fraction of the impurity is small it can affect the plasma through radiation cooling, slowing down of fast electrons, etc. In our lab, we can inject helium gas, nitrogen gas, and argon gas. The project is to see the impurity effects. (3) We can discuss and choose new topics.

Division of Biosciences

Department of Integrated Biosciences

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Laboratory of Signal Transduction	Assoc. Prof. SUZUKI Kuninori	The budding yeast Saccharomyces cerevisiae is a very attractive model organism for studying the fundamental theories and concepts of eukaryotic cells. We applied the power of yeast genetics to understand many aspects of yeast cells. Our current research is mainly focused on (1) molecular mechanism of autophagosome formation using live imaging techniques, (2) molecular mechanism of autophagic body degradation by biochemistry, (3) screening of new membraneless organelles, and (4) analysis of intracellular phospholipid dynamics. (1) Autophagy is a major pathway of bulk degradation of cytoplasmic materials. In yeast, autophagy has been studied as a cellular response for survival during nutrient-limited conditions. During autophagy, cytoplasmic components are enclosed in a membrane compartment, called an autophagosome. We have been studying the molecular mechanism of autophagosome formation by live imaging and quantitative analysis of microscopic images. (2) The autophagosome fuses with the vacuole, to become an autophagic body. The cytoplasmic components to be degraded are sequestered from the hydrolytic enzymes in the vacuolar lumen by the autophagic body membrane. Thus, degradation of the autophagic body membrane is necessary for proteolytic enzymes to access the cargoes of the autophagic body. We are trying to elucidate the molecular mechanism of autophagic body membrane degradation by biochemical analysis. (3) Nucleolus is a membraneless organelle that has been known for a long time. Recently, membraneless organelles have become known not only in the cell nucleus but also in the cytoplasm. However, no comprehensive screening has been performed so far. We have screened novel membraneless organelles from a unique viewpoint. We have been analyzing the obtained candidates using bioimaging techniques. (4) Phospholipid is a main component of biological membranes. Recent studies have shown that phospholipids dynamically traffic between membrane organelles via membrane contact sites. We are analyzing phospholipid dynamics using a fluorescent probe which we have found and biochemical methods. Our ultimate goal is to draw a comprehensive map for phospholipid dynamics in eukaryotic cells.	Autophagy; Cell biology; Live imaging; Membrane organelle; Membraneless organelle	(1) Live imaging of autophagosome formation by fluorescence microscopy. (2) Analysis of phospholipid transfer from the endoplasmic reticulum to autophagosome membranes by FRAP (fluorescence recovery after photobleaching) analysis. (3) Analysis of the autophagosome formation process by deep learning. (4) Morphological classification of autophagosome formation by multivariate analysis of high-dimensional morphometric data. (5) Molecular analysis of domains of the yeast vacuolar phospholipase Atg15. (6) Live imaging of autophagic body degradation by fluorescence microscopy. (7) Biochemical analysis of autophagic body degradation by biochemistry. (8) Live imaging of membraneless organelles by fluorescence microscopy. (9) Regulation of the formation of membraneless organelles by chemical reagents and temperature changes. (10) Live imaging of lipid dynamics using a fluorescent probe. (11) Analysis of phospholipid dynamics by thin-layer chromatography.

Laboratory of Bioresource Regulation	Assoc. Prof. SUZUKI Masataka	Despite the tremendous diversity of sex-determination mechanisms, the output itself - producing males and females - remains the same. This means that the renewal from the old system to the new system is smooth. To clarify how this happens, we are conducting studies using the spongy moth because this species has different types of sex-determining genes among local populations. We expect to be able to capture the process by which new sex-determination systems emerge using spongy moths. Symbiont hijacks the host sex-determination mechanism, resulting in a bias in the sex ratio. Sex determination mechanisms may have diversified as a strategy against sexual hijacking by symbiots. We have found a male-killing type of spiroplasma from the spongy moth. We are investigating relationship between diverse sex-determining genotypes found in the spongy moth and spiroplasma resistance. We found that hybrids of spongy moths occur at a frequency that can cause speciation inversions by field studies. Interestingly, when there were differences in sex-determining genotypes between species, hybridization between the two species resulted in sex reversal and female lethality. We hypothesize that diversification of sex-determining genes has adaptive significance in suppressing speciation reversal and maintaining species identity, and are conducting research to test this hypothesis.	Sex determination; Sex determining gene; Reproductive isolation; Speciation; Spongy moth	We have previously demonstrated that the copy number of LdMasc-W, one of the female determination genes identified in the spongy moth, varies between subspecies and closely related species of the spongy moth. Furthermore, we found that offspring resulting from crosses between spongy moth species (Lymantria dispar japonica) possessing LdMasc-W and another spongy moth species (Lymantria umbrosa) lacking LdMasc-W exhibit female to male sex reversal and female-specific lethality. This suggests that differences in sex-determining genes may contribute to reproductive isolation. In this program, to order to verify this possibility, students estimate the copy numbers of sex-determining genes (Fet-W, LdMasc-W, LdMasc) in spongy moth populations collected from approximately 30 locations in Hokkaido using qPCR, and clarified whether interpopulation differences exist in the copy numbers of these sex-determining genes. And also, students will determine whether a correlation exists between genetic distance between populations and differences in copy numbers of sex-determining genes. Integrating these results, students will verify whether the observed diversity in sex-determining genes can function as reproductive isolation.
Laboratory of Innovational Biology	Assoc. Prof. KOJIMA Tesuya	Living organisms adapt to their environments by evolving their shapes and forms in a wide variety of ways. Our research focuses on the mechanisms underlying the formation of various life forms, such as how shapes are formed, how differences in shapes arise, and how shapes evolve. While we have a deep understanding of the mechanisms by which cell properties are determined during development, how these fate-determined cells establish the final shape remains a mystery. One of our primary subjects of study is the formation of adult leg shapes in the fruit fly, Drosophila. Using live imaging techniques to continuously observe cell dynamics during the final shape formation process of the leg, we recently discovered that the final shape is achieved through surprising morphological changes, the transient formation of unexpected structures which we named the "Parthenon"-like structure, and unique interactions between cells and the apical and basal extracellular matrices. Through such research, we aim to understand the molecular mechanisms that underlie the shaping of organisms.	Shape formation; Live imaging; Fruit fly; Leg	The project we are planning involves observing the process of adult leg shape formation in wild-type flies as well as flies with knocked down or artificially expressed presumptive important genes. We will use flies expressing proteins labeled with fluorescent markers and conduct live imaging with a confocal laser scanning microscope. Once we have obtained the live imaging data, we will analyze it on a PC using image analysis software to assess the functions of these genes and understand the shaping processes. By conducting this project, we aim to deepen our understanding of the mechanisms behind adult leg shape formation. By participating in this project, you will learn how to handle fruit flies, prepare samples for live imaging, operate the confocal laser scanning microscope, acquire and analyze live imaging data, and more.
Molecular Recognition Laboratory	Prof. NAGATA Shinji	Our research interest is to elucidate the instinctive behaviors in insects. We are particularly interested in nutritionally selective feeding by the ommivorous characteristics observed in both carnivores and herbivores. To explore the mechanisms of host preference and feeding motivation observed in insects, we focus on the endocrine and metabolic control. In the lights of biology, biochemistry, molecular biology, and chemical biology, we run our projects to address the insect's innate behavioral motivation.	Insect; Innate behavior; Endocrine factors; Knockdown, Metabolism	【Experimental projects】Using crickets Gryllus bimaculatus, program students will experience to perform the functional analyses of endocrine factors or metabolism-related molecules possibly influencing innate feeding behavior and/or metabolisms. 【Experience during UTSIP activity】RNA interference (RNAi) to reduce the transcripts of interest. RT-PCR, quantitative RT-PCR, GC-MS, MALDI-TOF MS, and general techniques of molecular biology and chemical biology, and behavioral analyses using crickets.

Division of Biosciences

Department of Computational Biology and Medical Sciences

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Frith Laboratory	Prof. FRITH Martin	We look for interesting information in genetic sequences, and develop algorithmic and mathematical methods to do that. For example, we found animal DNA segments that have been conserved since the Precambrian ancestors of most animals: these segments control gene expression for embryonic development. This reveals a control system for animal development conserved since the common ancestors of humans and corals. In another project, we discovered the oldest ever "protein fossils", segments of formerly protein-coding DNA, by sensitive probability-based analysis. This revealed a great diversity of transposable elements in vertebrate ancestors of the Paleozoic Era. We also found the oldest ever virus fossils: relics of viral DNA inserted into host genomes. In addition, we collaborate with medical geneticists to understand complex chromosome rearrangements, tandem repeat expansions/contractions, and viral DNA insertions that cause disease. We discovered the cause of neuronal intranuclear inclusion disease: a tandem repeat expansion in a human-specific gene. Another project found significant non-existence of sequences in genomes and proteomes, providing clues about immune recognition and pathogen/host adaption. Finally, we developed a mathematically-optimal way to sample a subset of positions in a sequence, for fast analysis of big sequence data.	Genome; Evolution; Probability; Algorithms	Students are encouraged to pursue their own ideas on analyzing genetic sequences. There are broadly two types of project: biological investigation, and method development. Examples of biological investigation: discover "fossils" (e.g. viral) in genome sequences; survey the evolution of gene structure by gain or loss of splice sites, frameshifting, gene fusion or fission, etc; compare the evolution of mitochondrial versus plastid genomes; compare genome evolution to major body-form evolution (e.g. snakes, whales). Examples of method development: make a sensitive probabilistic model for finding distantly-related DNA sequences; devise a beautiful way to visualize complex sequence rearrangements; develop a way to extract specific rearrangement events from pair-wise alignments of long sequences (e.g. long DNA reads or whole genomes).

Division of Environmental Studies

Department of Environment Systems

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Akizuki Laboratory	Assoc. Prof. AKIZUKI Makoto	"Supercritical water" refers to water whose temperature and pressure are above the critical point. Water near and above the critical point offers dramatic physical changes depending on the operating conditions. In particular, the ionic and dielectric constants of water change significantly with temperature and/or pressure. As a result, it becomes possible to conduct desireble reactions depending on the purpose: from an ionic atmosphere suitable for acid/base reactions to one that implements the dissolution of organics, which is equivalent to a non-polar solvent. Taking advantage of these properties, it is expected that this new, inexpensive, environmentally friendly reaction medium will replace conventional organic solvents. Our laboratory has many research goals covering a wide range of topics: Organic synthesis without catalyst or with solid catalysts, waste decomposition by supercritical oxidation reaction, and synthesis of metal oxide nanoparticles. In all of these areas, through the design, analysis, and control of reactions based on the study of chemical reaction kinetics and reaction engineering, we are advancing extensive research, from fundamental research related to chemical reactions in subcritical and supercritical water to the development of new engineering applications.	Supercritical Water; Reaction Engineering; Organic Synthesis; Catalysis; Nanoparticle synthesis	Supercritical water is a promising reaction medium for organic synthetic reactions and inorganic nanoparticles synthesis. Because its solvent properties can be varied with temperature and pressure, these properties affect the reaction kinetics and mechanisms. In this project, we will investigate how the reactions in supercritical water can be controlled by changing the temperature and pressure of supercritical water and how this reaction control affects the yield and properties of the products. The theme of the summer program will be determined by considering both the research themes currently underway in the laboratory and your interests, and you will primarily engage in experimental research.

Division of Environmental Studies

Department of Human and Engineered Environmental Studies

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Kotani & Shimba Laboratory (Mathematical Biology and Bioengineering)	Prof. KOTANI Kiyoshi	Recent advances of experimental and analytical techniques have shown that biological systems are far more precise in achieving various functions than we have previously imagined. Our laboratory explores a wide range of projects spanning from fundamental research into life phenomena to the development of life-supporting technologies. Biological systems are organized into a hierarchical structure from molecules and cells to organs and individuals enabling them to perform diverse functions. The essence of life phenomena can be understood through mathematical analysis and modeling that integrates data from various levels of biological systems, leveraging nanotechnology and multimodal measurement. Within this overall laboratory direction, this internship focuses primarily on macroscopic human measurement and analysis, as well as mathematical modelling and analysis.	Brain Computer Interface; Computational Neuroscience; Medical ultrasound imaging; Nonlinear dynamics; Brain dynamics,	Applicants are required to carry out one project during the internship term. This project will focus on a subject of interest from areas such as brain-machine interfaces, medical ultrasound measurement support devices, and computational neuroscience, while taking into account the current situation of the laboratory. Examples of specific projects include (1) Experimental research for reliable Brain-Computer Interfaces, (2) Analysis of non-linear and collective dynamics and functions of biologically plausible neuronal models, (3) Improving the quality of medical ultrasound imaging for health management outside hospitals. Please note that English is okay for communication and research during the internship.
Simulation of Complex Systems Laboratory	Prof. CHEN Yu	A wide range of research topics are studied in our lab, including modeling and analysis of social-economics, complex fluids, and biological systems. There are three main research directions: (1) Multi-agent cooperative evolutionary games for modeling and simulations of financial markets; (2) Discrete kinetic models for simulation of complex fluids; (3) Cellular automata and heterogeneous stochastic agent models for simulations of cancer and aging.	Complex systems; Agent-based modeling; Stock price; Aging; Tumorigenesis	As part of the program, a student will be assigned a small project, involving model construction and computer simulation. The specific complex system for study will depend on the student's interest. A financial market, a solution containing colloid, or a growing tumor could be the target of study. Apart from research, visits to related laboratories at other universities, and/or scenic sites surrounding Tokyo, etc., will also be scheduled.
Laboratory for Intelligent Systems Design	Prof. HIEKATA Kazuo	Societies and industries can be thought as a system of people, technology, and institutions. Although these social and industrial systems have evolved and met the high expectations of humans, the mechanisms of the systems have become more complex, giving rise to difficult problems to solve, such as global warming and aging populations. This laboratory is engaged in research that contributes to solving such problems by supporting human intellectual activities such as decision-making related to systems with simulation, sensing, and data analysis technologies.	Climate change adaptation; Flood risk management; System dynamics; Agent simulation; Policy making	In our laboratory, we are working on the construction of a simulation model to examine appropriate adaptation measures that take into account multi-sectoral synergies and trade-offs in response to the effects of climate change, such as an increase in flood risk. Based on the simulation model we constructed for Japanese local area, the internship student will customize and develop the model so that it can be used to approach issues in their home country, or desired region. This research will be conducted with Dr. Takuya Nakashima, an assistant professor at the Hiekata Laboratory.

Division of Environmental Studies

Department of International Studies

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Onuki Lab	Assoc. Prof. ONUKI Motoharu	My academic background is in urban environmental engineering, with a research focus on water environmental engineering and environmental microbiology. My first research theme was the microbial community analysis of biological wastewater treatment systems, particularly those involving biological phosphorus removal. From there, my interests expanded into environmental education, sustainability education, and the creation of the field of sustainability science. I was involved in the establishment and management of the Graduate Program in Sustainability Science (GPSS) at the University of Tokyo. Currently, I belong to the Department of International Studies (DOIS), where I also continue to work with GPSS. My research and teaching focus on building sustainable societies, education for sustainability, and engineering for disaster resilience.	Rulal revitalization; Dual residency; Multi-cultural co-existance; Inner intenationalizataion; Gentrificatio	In rural regions of Japan, population decline and rapid aging have become serious challenges. As one of the responses, dual residency (two-location living) and the creation of “related populations”—people who engage with a region without fully relocating—have drawn growing attention. Recently, inbound tourism and the inflow of foreign capital have also been seen as potential drivers that could accelerate these trends. However, at the same time, concerns have been raised about possible negative impacts, such as: gentrification, which may push out existing residents, and a shift toward exclusionary or anti-immigrant attitudes within local communities. For this reason, there is an ongoing search for ways to promote "internationalization in Japan" that benefits both local communities and incoming people and investment. In this context, UTSIP students will conduct field research in selected rural areas, which have already had substantial experience in international exchange. Their goal is to generate insights that can help design new models linking regional revitalization with international exchange.
Honda Lab	Prof. HONDA Riki	Our society is exposed to various types of risks including natural disasters. Preparation for such risks is essential, but no countermeasure can provide perfect protection against severe disasters. In the presence of various threats such as climate change, huge earthquakes and tsunamis, society needs to be endowed with capability of adaptation and resilience. In our group, mechanism of collective behavior observed in the society coping with the situation with severe uncertainty is discussed from the viewpoints of social networks, game theory, adaptive systems theory, etc. Innovative mathematical approach for uncertainty management, such as financial problems is also in our scope. Development and management of infrastructure systems, advanced design methods, asset management and international technology transfer are also of our interest.	Infrastructure; Community resilience; Disaster management; Information theory; Deep learning	(1) Statistical analysis of survey data to discuss community's attitude for disasters, using Bayesian approach or social network analysis. (2) Methodologies for seismic design/infrastructure maintenance, based on deep learning and information theory.

Division of Environmental Studies

Graduate Program in Sustainability Science

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Sustainable Society Design Center	Project Lecturer SIOEN Giles Bruno	My current project focuses on scenarios of our global environment, particularly through the lenses of food, water, and environmental sustainability. Gathering existing scenarios and comparing them may indicate directions for further research. One of our most ambitious initiatives involves co-designing a scenario to imagine what an ideal Earth could look like 100 years from now. This is a unique opportunity to contribute to groundbreaking research that aims to shape a sustainable and thriving future for our planet.	Planetary Health; Urban and Landscape Systems; and Climate Change Adaptation	You will have the opportunity to contribute to a literature review and case study analysis on Green Infrastructure and Nature-Based Solutions and its role in disaster preparedness and recovery especially in Asia. The aim of this study is to gather lessons from Asia to support post-disaster/post-conflict recovery processes in Ukrainian cities.