9th Summer Research Program in Tsukuba

July 23- August 3, 2018

List of Laboratories
University of Tsukuba
Participating Laboratories

**Medical Sciences**

1. Shigeru Chiba - Hematology
2. Manabu Fujimoto - Dermatology
3. Koji Hisatake - Gene Regulation
4. Kiong Ho - Molecular Parasitology
5. Kenji Irie - Molecular Cell Biology
6. Mitsuyasu Kato - Experimental Pathology
7. Atsushi Kawaguchi - Infection Biology (Virology)
8. Makoto Kobayashi - Molecular and Developmental Biology
9. Yoshito Kumagai - Environmental Biology
10. Michael Lazarus - Systems Sleep Biology
11. Kazuya Morikawa - Infection Biology (Microbiology)
12. Masafumi Muratani - Genome Biology
13. Michio Nagata - Kidney and Vascular Pathology
14. Masayuki Noguchi - Diagnostic Surgical Pathology
15. Norihiko Ohbayashi - Physiological Chemistry
16. Osamu Ohneda - Regenerative Medicine and Stem Cell Biology
17. Akira Shibuya - Immunology
18. Hitoshi Shimano - Endocrinology and Metabolism
19. Fumihiro Sugiyama - Laboratory Animal Science
20. Satoru Takahashi - Anatomy and Embryology/ Laboratory Animal Resource Center
21. Peter ten Dijke - Cancer Signaling
22. Hiromi Yanagisawa - Matrix and Stem Cell Biology
23. Masashi Yanagisawa - Molecular Pharmacology

**Life and Environmental Sciences**

24. Shigeyuki Betsuyaku - Plant Immune Dynamics
25. Toshiharu Enomae - Paper device and eco-friendly materials
26. Hiroshi Ezura - Olericulture and Floriculture
27. Louis John Irving - Plant Ecophysiology
28. Yasuhiro Ishiga - Molecular Plant Pathology
29. Yooichi Kainoh - Applied Entomology and Zoology
30. Yutaka Kitamura - Food and Biomass Process Engineering
31. Yuichi Onda - Isotope Hydrogeomorphology and Radioecology
32. Sumiko Sugaya - Pomology
1. Hematology

Principal Investigator  Shigeru Chiba
E-mail address  schiba-tky@umin.net
URL  http://www.ketsunai.com

Other Faculty Members
Associate Professor, Yuichi Hasegawa
Associate Professor, Naoshi Obara
Associate Professor, Mamiko Sakata-Yanagimoto
Associate Professor, Hidekazu Nishikii
Assistant Professor, Yasuhiro Yokoyama
Assistant Professor, Naoki Kurita
Assistant Professor, Takayasu Kato
Assistant Professor, Manabu Kusakabe

Major Scientific Interests
Our research aim is to understand molecular mechanisms underlying hematologic malignancies and, on the bases of those, develop new clinical approaches in diagnostics and treatment. We are using patient-derived samples and genetically modified mice to analyze genetics, epigenetic, metabolism, cell biology, and disease biology. The results are sometimes directly translated in clinical trials in our hospital ward.

Projects for Regular Students in Doctoral or Master’s Programs
1) Analysis of molecular mechanisms in hematologic malignancies
2) Analysis of bone marrow stromal cells involved in normal and malignant hematopoiesis

Programs for Short Stay Students (one week ~ one trimester)
1) Training in hematopoietic cell culture, flow cytometry, and epigenetic approaches
2) Training in sequence procedure using a second generation sequencer
3) Training in immunostaining procedure

Recent Publications
2. Dermatology

Principal Investigator  Manabu Fujimoto
E-mail address  mfujimoto@md.tsukuba.ac.jp
URL  https://dermatology-tsukuba.org/

Other Faculty Members
Assistant Professor: Yasuhiro Fujisawa (fujisan@md.tsukuba.ac.jp)
Assistant Professor: Naoko Okiyama (naoko.okiyama@md.tsukuba.ac.jp)
Assistant Professor: Rei Watanabe (rwatanabe@md.tsukuba.ac.jp)
Assistant Professor: Yosuke Ishitsuka (yosuke.ishitsuka@md.tsukuba.ac.jp)
Assistant Professor: Yoshiyuki Nakamura (ynakamura-tuk@umin.ac.jp)

Major Scientific Interests
We are working on revealing the function of skin from the aspect of barrier and immune system through mouse models of inflammatory skin diseases and skin tumors, and actual human disease samples.

Projects for Regular Students in Doctoral or Master’s Programs
1) Research on immune reaction in inflammatory skin disorders
2) Research on immune reaction in malignant skin tumors

Study Programs for Short Stay Students (one week ~ one trimester)
1) Learn procedures for immunofluorescence analyses of human and mouse skin.
2) Learn procedures for flow cytometry analyses of human and mouse immune cells.

Recent Publications
3. Gene Regulation

Principal Investigator  Koji Hisatake
E-mail address  kojihisa@md.tsukuba.ac.jp
URL  http://www.md.tsukuba.ac.jp/basic-med/biochem/gene/

Major Scientific Interests
Our group studies the regulation of eukaryotic gene expression, focusing on how transcription regulates cell differentiation. In particular, we are studying the roles of transcription factors and epigenetic changes in regulating iPS cell induction and adipocyte differentiation.

Projects for Regular Students in Doctoral or Master’s Programs
1) Mechanistic analyses of the roles for Oct4, Sox2, Klf4 and c-myc during iPS cell induction.
2) Analyses of epigenetic mechanisms of iPS cell induction.
3) Identification and functional analyses of transcription factors involved in adipocyte commitment.
4) Role of non-coding RNA in epigenetic regulation during adipocyte differentiation.

Study Programs for Short Stay Students (one week ~ one trimester)
1) Analysis of transcriptional regulation during white and brown adipocyte differentiation.
2) Induction of iPS cells using a Sendai virus-based vector.

Recent Publications
4. Molecular Parasitology

Principal Investigator  Kiong Ho
E-mail address  kiongho@md.tsukuba.ac.jp
URL  http://www.md.tsukuba.ac.jp/basic-med/kiongho/Ho_Lab/Welcome.html

Major Scientific Interests
Our primary research interest is to understand the gene expression of eukaryotic parasites with a goal in identifying parasite-specific processes that can be exploited as targets for novel therapeutic interventions. We have focused on how messenger RNA acquire 5’ cap in the protozoan parasites that responsible for malaria and sleeping sickness. The structure and mechanism of protozoan capping enzyme is completely different from human host, and thus, capping is an attractive target for anti/protozoal drug discovery. We are also investigating the mechanism of RNA repair and recombination. RNA ligase is the key enzyme that joins the broken RNAs together. We are characterized three separate types of RNA ligases from various species and our immediate goal is to define how these ligases recognize the breaks in the RNA and to identify what types of RNA are repaired in the cell.

Projects for Graduate Students
1) Dissecting the mechanism of hypermethylated cap 4 synthesis in Trypanosoma brucei.
2) Characterization of T. brucei capping enzyme complex with transcription and RNA processing factors.
3) Defining the physiological targets for RNA ligase through genome wide screening.

Study Programs for Short Stay Students
1) Screening of small molecule inhibitor against malaria and sleeping sickness.
2) Regulation of gene expression by cytoplasmic mRNA recapping.
3) Defining the RNA targets for RNA ligase.

Selected Publications
5. Molecular Cell Biology

Principal Investigator  Kenji Irie
E-mail address  kirie@md.tsukuba.ac.jp
URL  http://www.md.tsukuba.ac.jp/public/basic-med/molcellbiol/index.html

Other Faculty Members
Assistant Professor Tomoaki Mizuno: mizuno@md.tsukuba.ac.jp
Assistant Professor Yasuyuki Suda: ysuda@md.tsukuba.ac.jp

Major Scientific Interests
- Post-transcriptional regulation of gene expression by RNA-binding proteins
- Molecular mechanism of mRNA localization and local translation regulating cell polarity, asymmetric cell division, and cell-fate
- Regulation of the endoplasmic reticulum stress response by protein kinases
- Prospore membrane formation by vesicle docking

Projects for Regular Students in Doctoral or Master’s Programs
1) Post-transcriptional regulation of gene expression by the Ccr4-Not complex in yeast.
2) Regulation of the endoplasmic reticulum stress response by protein kinases.
3) Roles of yeast Ataxin-2 ortholog, Ppb1, in the control of mRNA stability and translation.
4) Roles of decapping activators in the control of mRNA stability and translation.

Study Programs for Short Stay Students (one week ~ one trimester)
1) Yeast genetic approaches including the isolation and characterization of mutants, tetrad analysis, complementation, and mitotic recombination.
2) Molecular genetic techniques including yeast transformation, gene knockout, and generation of mutations in cloned genes.
3) Molecular biology and biochemistry techniques analyzing gene expression including Northern blotting, RT-PCR, and Western blotting.
4) Imaging yeast cells using indirect immunofluorescence and GFP-protein fusions.

Recent Publications
6) Li X, Ohmori T, Irie K, Kimura Y, Suda Y, Mizuno T, Irie K. Different Regulations of ROM2 and LRG1 Expression by Ccr4, Pop2, and Ddh1 in the Saccharomyces cerevisiae Cell Wall Integrity Pathway. mSphere. 2016 Sep 28;1(5).
6. Experimental Pathology

**Principal Investigator** Mitsuyasu Kato  
**E-mail address** mit-kato@md.tsukuba.ac.jp  
**URL** http://www.md.tsukuba.ac.jp/epatho/

**Other Faculty Members**  
Associate Professor Hiroyuki Suzuki: h-suzuki@md.tsukuba.ac.jp  
Assistant Professor Yuikihide Watanabe: y-watanabe@md.tsukuba.ac.jp  
Assistant Professor Yukari Okita: yukari-okita@md.tsukuba.ac.jp

**Major Scientific Interests**  
Experimental studies using cultured cells and murine models, for elucidation of the roles of transforming growth factor-β related molecules in stem cell biology and carcinogenesis. Our aim is to establish novel molecular targeting therapies useful for relapse-free therapy and prevention of cancer by targeting dormant cancer stem cells.

**Projects for Regular Students in Doctoral or Master’s Programs**  
1) Molecular mechanisms of TGF-β related molecules (TMEPAI, MafK, GPNMB etc.) in stem cell kinetics and carcinogenesis using gene-edited mice and cells with three dimensional histopathological analysis.  
2) Molecular mechanisms of TGF-β1 stimulated clone 22 related molecules (TSC22, THG-1) in squamous cell carcinoma development  
3) Establishment of Novel Anti-cancer drugs by using Macrocyclic peptide technologies

**Study Programs for Short Stay Students (one week ~ one trimester)**  
1) In vitro tumorigenic assays and gene expression (cell proliferation, sphere forming assay, matrigel invasion assay, and immunofluorescent staining, qPCR, Western blotting etc.)  
2) Pathological tissue preparation, Immunohistochemistry and 3D quantitative analysis

**Recent Publications**  
7. Infection Biology (Virology)

Principal Investigator  Atsushi Kawaguchi  
E-mail address ats-kawaguchi@md.tsukuba.ac.jp  
URL http://www.md.tsukuba.ac.jp/basic-med/infectionbiology/virology/index_english.html  

Other Faculty Members  
Associate Professor Mitsuru Okuwaki  
Assistant Professor Shoko Saito, Kohsuke Kato

Major Scientific Interests  
The research aim of this group is to understand the molecular mechanism of replication and pathogenicity of animal viruses such as influenza virus, adenovirus, etc. The structure and function of virus-encoded factors and host cell-derived factors involved in the above processes are being studied at the atomic, molecular, cellular, and body levels. In addition, we are particularly interested in clarifying the physiological function of identified host factors such as chromatin regulators, molecular chaperones, etc. as well as their roles in infection.

Projects for Regular Students in Doctoral or Master’s Programs  
1) Identification of novel factors in virus replication and host immune system.  
2) Control of virus diseases based on the knowledge of host defense systems, or through development of novel anti-viral drugs  
3) Regulatory mechanism for the structure and function of chromatin  
4) Leukemogenic mechanism by chromosomal translocation

Study Programs for Short Stay Students (one week ~ one trimester)  
1) Molecular mechanism of host factors involved in influenza virus replication  
2) Molecular mechanism of host inflammatory responses against influenza virus infection  
3) Action mechanism of an anti-virus drug

Selected Recent Publications  
8. Molecular and Developmental Biology

Principal Investigator  Makoto Kobayashi
E-mail address  makobayash@md.tsukuba.ac.jp
URL  http://www.md.tsukuba.ac.jp/MDBiology/mdbiol.index.html

Major Scientific Interests
- Epigenetic regulation in the cell-fate determination
- Stress response and gene regulation in the cellular defense system

Projects for Regular Students in Doctoral or Master’s Programs
1) Development of hematopoietic stem cells
2) Development of internal organs: liver, pancreas, gill, ...
3) Defense against a variety of stresses: oxidative stress, ER stress, autophagy defect, heavy metals, ...
4) Functional foods and healthy life expectancy

Study Programs for Short Stay Students (one week ~ one trimester)
1) Whole body expression analyses of anti-stress or hematopoietic genes in zebrafish
2) Investigation of hematopoietic stem cell generation using transgenic GFP zebrafish
3) Examination of toxicity/medicinal effects of active ingredients in foods or drugs using zebrafish

Recent Publications
9. Environmental Biology

**Principal Investigator** Yoshito Kumagai  
**E-mail address** yk-em-tu@md.tsukuba.ac.jp  
**URL** http://www.md.tsukuba.ac.jp/environmental_medicine/index-en.html  

**Other Faculty Members** Assistant Professors, Yasuhiro Shinkai, Yumi Abiko, and Masahiro Akiyama.

**Major Scientific Interests**  
We focus on preventive medicine through reduction of environmental risks and elucidation of signaling alterations by environmental electrophiles and regulatory mechanisms.

**Projects for Regular Students in Doctoral and Master’s Programs**
1) Elucidation of biological response systems elicited by environmental electrophiles and mechanisms underlying disruption of these systems.  
2) Elucidation of mechanisms regulating the threshold of redox signaling activated by environmental electrophiles.

**Study Programs for Short Stay Students**
1) Assays to evaluate existence of reactive sulfur species to capture environmental electrophiles.  
2) Analysis of S-modification of protein by electrophiles using UPLC-MS/MS

**Recent Publications**
10. Systems Sleep Biology

Principal Investigator  Michael Lazarus
E-mail address  lazarus.michael.ka@u.tsukuba.ac.jp
URL  https://www.wpiiiislazaruslab.org
Other Faculty Members
Assistant Professor Yo Oishi: oishi.yo.fu@u.tsukuba.ac.jp

Major Scientific Interests
The investigative focus of our laboratory is the cellular and synaptic basis by which the brain regulates sleep and wakeful consciousness. Our experiments seek to link the activity of defined sets of neurons with neurobehavioral and electroencephalographic outcomes in behaving animals by using innovative genetically or chemically engineered systems (optogenetics, chemogenetics or optopharmacology) in conjunction with recording of the electrical activity produced by the brain or in-vivo imaging (in-vivo electrophysiology or fiber-optic endomicroscopy).

Projects for Regular Students in Doctoral or Master’s Programs
1) Use of genetically engineered systems to dissect neural circuitry regulating sleep and wakefulness
2) Development of optopharmacologic tools to control sleep
3) Role of brainstem neurons in linking REM sleep to the consumption of weight promoting foods

Study Programs for Short Stay Students (one week ~ one trimester)
1) EEG/EMG electrode implantation and recording in mice
2) Engineering and production of adeno-associated viruses
3) Optogenetic and chemocogenetic modulation of neural circuitry by using stereotaxic microinjections of viral vectors
4) Immunohistochemistry and hybridization of brain tissue

Selected Publications
11. Infection Biology (Microbiology)

Principal Investigator  Kazuya Morikawa
E-mail address  morikawa.kazuya.ga@u.tsukuba.ac.jp
URL  http://www.md.tsukuba.ac.jp/basic-med/infectionbiology/microbiology/

Other Faculty Members
Associate Professor Shinji Saito: sinsaito@md.tsukuba.ac.jp
Associate Professor (National Taiwan University) Ryosuke Ohniwa: ohniwa@md.tsukuba.ac.jp

Major Scientific Interests
We are studying evolutionary/adaptation strategies of Gram-positive pathogens. Major research interests include the population heterogeneity, and the acquisition of antibiotics resistance. The main research target is the important human pathogen, *Staphylococcus aureus*, that inhabits in our nasal cavity but can cause a variety of diseases.

Projects for Regular Students in Doctoral or Master’s Programs
1) Natural genetic competence in gram positive pathogens
2) Population heterogeneity
3) Dynamics of cellular structures: nucleoid and membrane
4) Interaction of flora and nasal epithelial cells

Study Programs for Short Stay Students (one week ~ one trimester)
1) Molecular genetic and biochemical techniques in bacteria
2) Single molecule analysis using atomic force microscope

Selected Publications
12. Genome Biology

Principal Investigator  Masafumi Muratani
E-mail address  muratani@md.tsukuba.ac.jp
URL  http://www.md.tsukuba.ac.jp/basic-med/ genome/

Major Scientific Interests
We develop methods for genome and epigenome analysis of limited samples. Main area of application is characterization of clinical tissue samples from Tsukuba Human Tissue Bank. We try to link histopathological features of human diseases to regulatory status of the genome.

Projects for Regular Students in Doctoral or Master’s Programs
1) Clinical sample analysis using chromatin immunoprecipitation combined with 2nd generation sequencing (ChIPseq) and RNAseq, data analysis and validation of potential disease biomarkers.
2) Genomics and epigenomics analysis of human and experimental mouse samples at single-cell resolution.

Study Programs for Short Stay Students (one week ~ one trimester)
1) Access to genomics databases, integrative analysis of regulatory regions, gene expression and genetic variations.
2) Genomics and epigenomics assays, chromatin immunoprecipitation, RNA assays and genotyping.

Selected Publications
13. Kidney and Vascular Pathology

**Principal Investigator**  Michio Nagata  
**E-mail address**  nagatam@md.tsukuba.ac.jp  
**URL**  http://www.md.tsukuba.ac.jp/rvpatho

**Major Scientific Interests**
Kidney pathology is the main issue in our group.  
Current interests include podocyte pathology, pathophysiology of FSGS, systemic vasculitis (ANCA-related) and cystogenesis in polycystic kidney.  
Vascular pathology in chronic kidney disease is another focus in our group.

**Projects for Regular Students in Doctoral or Master’s Programs**
1) Pathophysiology and molecular mechanisms of focal segmental glomerulosclerosis from the view of podocyte and parietal cell transdifferentiation.  
2) Morphologic investigation in systemic vascular changes and kidney injury.

**Study Programs for Short Stay Students (one week ~ one trimester)**
1) Diagnosis of human kidney biopsy samples according to the specific interest.  
2) Immunohistochemistry and molecular biologic techniques using podocyte-specific transgenic animals.

**Recent Publications**
14. Diagnostic Surgical Pathology

Principal Investigator  Masayuki Noguchi
E-mail address  nmasayuk@md.tsukuba.ac.jp
URL  http://www.md.tsukuba.ac.jp/diagpatho/

Other Faculty Members
Associate Professor : Shingo Sakashita: sakashingo@hotmail.com
Assistant Professor Junko Kano: junkano@md.tsukuba.ac.jp
Assistant Professor Aya Shiba-Ishii: aya_shiba@md.tsukuba.ac.jp
Assistant Professor Noriaki Sakamoto: n.sakamoto@md.tsukuba.ac.jp

Major Scientific Interests
Molecular pathology of multistep carcinogenesis
Studies of the initial genetic alterations of precancerous lesions and early carcinoma
Studies of the interactions between cancer cells and interstitial cells

Projects for Regular Students in Doctoral or Master’s Programs
1) Analysis for the molecular mechanisms of pulmonary adenocarcinogenesis. Screening of
the differentially expressed genes and proteins between early adenocarcinoma of the lung
(in situ adenocarcinoma) and early advanced tumors.
2) Produce monoclonal antibodies against fetal swine to screen for specific antibodies against
human carcinomas.
3) In vitro and in vivo studies of the molecular mechanisms of the reproduction of liver tissue.

Study Programs for Short Stay Students (one week ~ one trimester)
1) Basic techniques of immunohistochemistry and FISH using human specimens. Statistical analysis
on those results and patients prognosis or clinicopathological features.
2) Basic techniques of tissue microdissection

Recent Publications
Heterotopic production of ceruloplasmin by lung adenocarcinoma is significantly correlated with
prognosis. Lung Cancer, in press.
Cyclophilin A expression and its prognostic significance in lung adenocarcinoma. Pathology
mir-3941: A novel microRNA that controls IGBP1 expression and is associated with malignant
4) Iyama S, Ono M, Kawai-Nakahara H, Husni RE, Dai T, Shiozaw T, Sakata A, Kohrogi H, Noguchi
M, Drebrin: A new oncofetal biomarker associated with prognosis of lung adenocarcinoma. Lung
Dimethylarginine dimethylaminohydrolase 2 promotes tumor angiogenesis in lung
M, Stratifin accelerates progression of lung adenocarcinoma at an early stage. Mol Cancer 14:142-
147, 2015.
15. Physiological Chemistry

Principal Investigator  Norihiko Ohbayashi
E-mail address  nohbayashi@md.tsukuba.ac.jp
URL  http://www.md.tsukuba.ac.jp/basic-med/biochem/kanaholab/index.html

Other Faculty Members
Professor emeritus, Yasunori Kanaho: ykanaho@md.tsukuba.ac.jp
Assistant Professor, Yuji Funakoshi: funa@md.tsukuba.ac.jp

Major Scientific Interest
Studies on regulatory mechanisms and physiological functions of membrane trafficking systems through small GTP-binding proteins such as Rab and Arf.

Projects for Regular Students in Doctoral or Master’s Programs
1) Physiological functions of the small GTP-binding proteins (Rabs and Arf6) and their regulators in tumorigenesis/metastasis, morphogenesis, and neural plasticity.
2) Regulatory mechanisms of ubiquitylation of cargo proteins in the recycling system.
3) Molecular mechanisms of biogenesis of melanin-containing organelles though Rab small GTP-binding proteins.
4) Development of specific agonists/antagonists for certain small GTP-binding proteins.

Study Programs for Short Stay Students (one week ~ one trimester)
1) Enzyme assay and imaging of molecules regulating membrane trafficking systems.
2) Assays for cell functions such as cell proliferation, cell motility, focal adhesion, secretion, endocytosis, exocytosis, recycling, etc.

Recent Publications:
16. Regenerative Medicine and Stem Cell Biology

Principal Investigator  Osamu Ohneda

E-mail address  oohneda@md.tsukuba.ac.jp

URL  http://www.md.tsukuba.ac.jp/basic-med/remed/

Other Faculty Members
Dr. Mami Matsuo Takasaki (Assistant Professor) mamimt@md.tsukuba.ac.jp
Dr. Toshiharu Yamashita (Assistant Professor) t-yama@md.tsukuba.ac.jp
Dr. Masumi Kuma Nagano (Assistant Professor) naganom@md.tsukuba.ac.jp

Major Scientific Interests
1) Identification and analyses of functional stem cells for cell therapy in human tissues
2) Hypoxic responses in stem cell development and tumor development

Projects for Regular Students in Doctoral or Master’s Programs:
1) Analysis of functional stem cells (MSC and EPC) for clinical application
2) Analysis of how hypoxic inducible factors (HIFs) are involved in stem cell development
3) Analysis of how HIFs are involved in tumor development (tumor and tumor endothelial cell)

Summer School Course (2016)
1) Analysis of Mesenchymal Stem Cells
2) Neural Differentiation of human iPS

Recent Publications:


17. Immunology

Principal Investigator  Akira Shibuya  
E-mail address  ashibuya@md.tsukuba.ac.jp  
URL  http://www.md.tsukuba.ac.jp/basic-med/immunology/immunol.index.html  

Other Faculty Members
Associate Professor Kazuko Shibuya, M.D., Ph.D (kazukos@md.tsukuba.ac.jp)  
Assistant Professors Satoko Tahara, Ph.D (tokothr@md.tsukuba.ac.jp)  
Chigusa Oda, M.D., Ph.D (chigusano@md.tsukuba.ac.jp)  
Tsukasa Nabekura, Ph.D. (t_cell_tsukasa@hotmail.com)  
Kazumasa Kanemaru, M.D., Ph.D. (kazukane.1987@gmail.com)  

Major Scientific Interests
The molecular mechanisms of tumor immunity, autoimmunity, infectious immunity and allergy and clinical applications of our basic research findings

Projects for Regular Students in Doctoral or Master’s Programs
1) In vivo and in vitro function of the immunoreceptors DNAM-1, Fca/mR, MAIR-I, MAIR-II, and Allergin-1, all of which were identified in our laboratory, in immune responses  
2) The pathophysiological roles of the immunoreceptors in tumors, autoimmune diseases, allergy and infectious disease

Study Programs for Short Stay Students (one week ~ one trimester)
1) Generation of monoclonal antibodies and their application for expression analyses by flow cytometry and immunohistochemistry  
2) Cell separation by sorting on flow cytometry or magnetic beads and analyses of cytokine production or proliferation upon antigen stimulation

Recent Publications
18. Endocrinology and Metabolism

Principal Investigator  Hitoshi Shimano
E-mail address  hshimano@md.tsukuba.ac.jp
URL  http://www.u-tsukuba-endocrinology.jp/
Other Faculty Members
Associate Professor: Yoshimi Nakagawa (yossy@md.tsukuba.ac.jp)
Associate Professor: Motohiro Sekiya (msekiya@md.tsukuba.ac.jp)
Associate Professor: Takashi Matsuzaka (t-matsuz@md.tsukuba.ac.jp)
Assistant Professor: Takafumi Miyamoto (takmi565@md.tsukuba.ac.jp)

Major Scientific Interests
We are working to understand the molecular mechanisms of energy metabolism using the newest technologies, such as molecular and cellular biology, gene-engineered animals, genome informatics, and metabolomics. We also extend our investigations to develop new therapeutic approaches for obesity, diabetes, and cardiovascular disease.

Projects for Regular Students in Doctoral or Master’s Programs
3) Research on the transcriptional regulation of energy metabolism and metabolic diseases.
4) Research on lipid metabolism and metabolic diseases.

Study Programs for Short Stay Students (one week – one trimester)
3) Learn procedures for analyzing the function of transcription factor.
4) Learn procedures for analyzing energy metabolism in cell and mouse models.
5) Learn procedures for visualization and manipulation of nutrients signaling dynamics.

Recent Publications
19. Laboratory Animal Science

**Principal Investigator** Fumihiro Sugiyama  
**E-mail address** bunbun@md.tsukuba.ac.jp  
**URL** [http://www.md.tsukuba.ac.jp/basic-med/lab-animal/](http://www.md.tsukuba.ac.jp/basic-med/lab-animal/)

**Other Faculty Members**  
Assistant Professor Seiya Mizuno: konezumi@md.tsukuba.ac.jp

**Major Scientific Interests**  
Laboratory animals are essential and important bio-resources for the advancement of medical sciences. Gene-modified animals are used very often to study *in vivo* function of genes and proteins in development, homeostasis and disease. In particular, we focus on 1) development of genome editing technology for developmental engineering and 2) creation of mouse models for elucidating biological function and human diseases.

**Projects for Regular Students in Doctoral or Master’s Programs**  
1) Elucidating biological function of genes leading to early embryonic lethality.  
2) Development of mouse models for *in vivo* imaging.  
3) Investigating the novel gene function in germ cell maintenance and maturation.

**Study Programs for Short Stay Students (one week ~ one trimester)**  
1) Mouse genome editing with the CRISPR/Cas9 system.  
2) Live Imaging of early embryonic development

**Recent Publications**  


20. Anatomy and Embryology/
Laboratory Animal Resource Center

Principal Investigator  Satoru Takahashi
E-mail address  satoruta@md.tsukuba.ac.jp
URL  http://www.md.tsukuba.ac.jp/basic-med/anatomy/embryology/index.html

Other Faculty Members

Major Scientific Interests
We are working on the functional analysis of transcription factors in the body by employing developmental engineering techniques such as the generation of transgenic mice.

Projects for Regular Students in Doctoral or Master’s Programs
Molecular mechanism of the development of organs. We are researching the molecular mechanisms of the development of organs by analyzing the function of the large Maf family of transcription factors. In both human and mouse, four large Maf transcription factors, MafA, MafB, c-Maf and Nrl, have been identified. We genetically manipulate mice about these genes and analyze their in vivo function.

Study Programs for Short Stay Students (one week ~ one trimester)
1) Histological analysis of genetically manipulated mice.
2) Handling skill for mouse embryos.

Recent Publications
21. Cancer Signaling

**Principal Investigator**  
Peter ten Dijke

**E-mail address**  
P.ten_Dijke@lumc.nl

**Other Faculty Member**  
Assistant Professor Christopher Hipolito: hipolito@md.tsukuba.ac.jp

**URL**  
https://www.lumc.nl/org/moleculaire-celbiologie/research/  
Aging-and-Signal-transduction/  
Laboratory-for-signal-transduction-mechanisms-of-TGF-b/

**Major Scientific Interests**

The ten Dijke laboratories, located in the Netherlands and Japan, are interested in the delineation of TGF-β signal transduction in development and disease states such as cancer. Our satellite laboratory at the University of Tsukuba employs platform technologies for the identification of high affinity ligands against key molecules involved in this signaling pathway, which grants us precise control over signaling (mis)regulation. Verified hits are then considered for the development of molecular probes or therapeutics.

**Projects for Regular Students in Doctoral or Master’s Programs**

1) Development of novel platform technologies for the identification of high affinity ligands  
2) *In vitro* selection of macrocyclic peptides against serine/threonine kinase receptors  
3) *In vitro* selection of macrocyclic peptides against “undruggable” intracellular protein-protein interactions

**Study Programs for Short Stay Students (one week ~ one trimester)**

1) Preparation and purification of ribozymes, mRNA, and tRNA  
2) *In vitro* translation of mRNA into macrocyclic peptides  
3) *In vitro* selection of functional ligands  
4) Chemical synthesis of macrocyclic peptide

**Recent Publications**

22. Matrix and Stem Cell Biology

Principle Investigator  Hiromi Yanagisawa
E-mail address  hkyanagisawa@tara.tsukuba.ac.jp
URL  http://saggymouse.tara.tsukuba.ac.jp/en
Other Faculty Members Yoshito Yamashiro and Aiko Sada

Major Scientific Interests:
The extracellular environment, which is comprised of extracellular matrices (ECM), ECM degrading enzymes, cytokines/growth factors, and physical factors, is crucial for normal development and cellular functions. The long-term goal of my laboratory is to elucidate how extracellular environment modulates intracellular signaling, cellular functions, and stem cell maintenance. In particular, we focus on the vessel wall and the skin. We aim to 1) identify novel ECM proteins and characterize their biochemical and physiological functions by taking molecular, biochemical, and genetic engineering approaches, and 2) elucidate the effects of alteration of ECM in maintenance of epidermal stem cell functions.

Projects for Regular Students in Doctoral or Master’s Programs
1) Molecular mechanism of aortic aneurysm
2) Identification of vascular and skin niche for stem/progenitor cells

Study Programs for Short Stay Students
1) Genetic and phenotypic identification of mutant mice with defective ECM
2) Preparation of histological sections and immunostaining

Recent Publications:
23. Molecular Pharmacology

Principal Investigator  Masashi Yanagisawa M.D., Ph.D.
E-mail address  yanagisawa.masa.fu@u.tsukuba.ac.jp
URL  http://sleepymouse.tsukuba.ac.jp/

Major Scientific Interests
1) Exploring genes regulating sleep/wake
2) Real-time visualization and manipulation of neuronal mechanisms controlling sleep/wake
3) Finding new drugs for sleep disorders

Projects for Regular Students in Doctoral or Master’s Programs
1) Large-scale, forward genetic screening of genes responsible for sleep/wake regulation in mutagenized mice
2) Screening for orexin receptor agonists
3) Analysis of sleep and wakefulness in genetically modified mice
4) In vivo real-time imaging of neuronal activities in hypothalamus and other deep brain structures in freely behaving mice

Study Programs for Short Stay Students (one week ~ one trimester)
1) EEG/EMG electrode implantation and recording in mice
2) patch clamp recording in mice and brain slices
3) imaging of nerve cell activities in brain slices

Recent Publications
24. Plant Immune Dynamics

Principal Investigator  Shigeyuki Betsuyaku
E-mail address  betsuyaku.shige.ge@u.tsukuba.ac.jp
     http://www.trios.tsukuba.ac.jp/en/researcher/0000003906

Other Faculty Members
Nomura ERATO Laboratory; Professor Nobuhiko Nomura
Associate Professor Andrew Utada, Assistant Professor Nozomu Obana

Major Scientific Interests
The aim of our group is to unravel the basic principles that govern the spatiotemporal regulation of plant immune responses. Upon microbial infections, plants mount a battery of defense responses around the infection sites. Recently, we have identified that, using intravital imaging, two phytohormone signaling pathways in a mutually inhibitory relationship are activated in distinct concentric domains around the infection foci in Arabidopsis, thus providing, for the first time, compelling evidence for the existence of a "plant immune field" around the infection site (Betsuyaku et al, in prep.). We are currently deepening our understanding of the plant immune field formation with the aid of multidiscipline approaches.

Projects for Regular Students in Doctoral or Master’s Programs
1) Functional analysis of the genes required for salicylic acid production during effector-triggered immunity (ETI)
2) Systems understanding of plant immunity through various single-cell technologies
3) Functional analysis of the negative regulators involved in “plant immune field” formation
4) Live imaging-based analysis of virulence-related genes of Pseudomonas syringae isolates

Study Programs for Short Stay Students
1) in planta live imaging analysis of defense-related promoter reporter activities in ETI
2) Live single-cell imaging analysis of defense-related promoter reporter activities upon stimuli

Selected Recent Publications
25. Paper device and eco-friendly materials

Principal Investigator  Toshiharu Enomae
E-mail address  t@enomae.com
URL  http://www.enomae.com/

Major Scientific Interests
For effective utilization of bio-materials and new technology derived from paper science, "super paper-application" is a promising field into the future. Paper is a simple and familiar material, and thus greatly expected to be applied to electronics, biosensors, and power generators. Technologies of papermaking processes can alter paper properties and provide superior performances. In addition, we proposed a simple method-immersion in salt water- for flood-damaged important books and documents to rescue them by inhibiting mold growth.

Projects for Regular Students in Doctoral or Master’s Programs
1) Power generator to convert from paper vibration by sound and noise to electricity
2) Nanocellulose-reinforced cellulosic adsorbent for copper recovery from agricultural water
3) Nanocellulose-reinforced cellulosic membrane to separate oil/water mixture in food waste
4) Comfortable feeling of toilet tissue and creation of comfortable paper for wearable devices

Study Programs for Short Stay Students
1) Pulp fiber geometry characterization and surface profile of paper
2) Paper mechatronics —Application of drying shrinkage to intentional shaping of paper
3) Fabrication of paper-based electronics with conductive ink by ink jet printing

Recent Publications
6) Srimongkon, T., Ishida, T., Igarashi, K., Enomae, T., "Development of a bacterial culture system using a paper platform to accommodate media and an ink-jet printing to dispense bacteria", Am. J. Biochem Biotechnol, 10, 81-87(2014).
26. Olericulture and Floriculture

Principal Investigator  Hiroshi Ezura
E-mail address  ezura@gene.tsukuba.ac.jp
URL  http://tsukuba-olericulture.org/

Other Faculty Member:
Professor  Chiaki Matsukura, Ph.D.,
Associate Professors  Naoya Fukuda, Ph.D., Kang Seungwon, Ph.D. Tohru Ariizumi, Ph.D.,
Kyoko Tanase-Hiwasu Ph.D.
Assistant Professors  Satoko Nonaka, Ph.D., Ken Hoshikawa, Ph.D., Ryoichi Yano Ph.D., Yoshihiro Okabe Ph.D.,
Naomichi Fujiuchi

Major Scientific Interests
Exploring genes regulating tomato fruit development
Analysis of the mechanism for sugar and GABA metabolism in tomato
Creation of genetic modified tomato accumulating functional materials benefit for human health
Innovating crop transgenic and genome editing technologies for crop breeding
Improving cultivation method for increasing sugar accumulation in tomato fruit
Development of advanced plant factory equipped with AI and robotics

Projects for Regular Students in Doctoral or Master’s Programs
1) Forward genetic screening of genes that influence fruit development in tomato
2) Reverse genetic screening of novel mutations that increase fruit shelf-life of tomato
3) Functional analysis of GABA metabolism genes in tomato

Study Programs for Short Stay Students (one week)
1) DNA/RNA purification from plants
2) DNA amplification by PCR reaction, digestion by restriction enzymes, and electrophoresis
3) cDNA synthesis and RT-PCR reaction

Recent Publications
27. Plant Ecophysiology

Principal Investigator  Louis John Irving
E-mail irving.louis.fb@u.tsukuba.ac.jp
URL

Major Scientific Interests
- Effect of parasitic plants on host growth and metabolism
- Allocation of carbon to roots in nutrient rich patches
- Cs uptake and allocation in rice
- Importance environmental factors controlling water uptake and seed germination rates

Projects for Regular Students in Doctoral or Master’s Programs
1) Factors determining the abstraction of C and N by parasitic plants
2) Environmental drivers of root growth, maintenance and death in grasses
3) Effects of nutrient status on Cs uptake and partitioning in rice
4) Environmental drivers of seed germination rate in wheat

Study Programs for Short Stay Students (one week)
1) Measuring nutrient abstraction from host plants using stable isotopes
2) Quantifying effects of nutrient status on plant leaf chemistry and photosynthesis
3) Determining nutrient uptake by plants using 15N as a tracer
4) Influence of NaCl / PEG in determining water uptake in wheat seeds

Recent Publications
28. Molecular Plant Pathology

Principal Investigator  Yasuhiro Ishiga
E-mail address   ishiga.yasuhiro.km@u.tsukuba.ac.jp
URL  http://yasuhiroishiga.wix.com/ishiga

Major Scientific Interests
The research aim of our group is to understand the molecular mechanisms of plant immunity and pathogenicity of plant pathogens in the interactions of plant and microbes. Our primary target pathosystem is soybean and soybean rust interactions. Soybean rust caused by Phakopsora pachyrhizi is one of the most devastating foliar diseases affecting soybean production worldwide. In addition, we are interested in bacterial pathosystem, such as Pseudomonas syringae-tomato interactions. By working on the molecular basis of plant-microbe interactions, we are trying to establish the sustainable disease control strategies.

Projects for Regular Students in Doctoral or Master’s Programs
1) Multi-omics approached to study host-resistance on soybean against soybean rust using Rpp near-isogenic lines (NILs)
2) Development of Host Induced Gene Silencing (HIGS) in the interactions of soybean and soybean rust towards crop protection
3) Functional analysis of retrograde signaling in plant immunity
4) Reactive Oxygen Species (ROS)-mediated plant-microbe interactions

Study Programs for Short Stay Students
1) Molecular mechanism of plant immunity against fungal and bacterial pathogens
2) Functional analysis of pathogenicity related genes in bacterial and fungal pathogens.

Selected Recent Publications
29. Applied Entomology and Zoology

Principal Investigator  Yooichi Kainoh
E-mail address  kainoh.yooichi.gf@u.tsukuba.ac.jp
Other Faculty Members
Professor DeMar Taylor: taylor.de.mar.ge@u.tsukuba.ac.jp
Associate Professor Seiichi Furukawa: furukawa.seiichi.ew@u.tsukuba.ac.jp

Major Scientific Interests
Experimental studies using insects, spiders and ticks for elucidation of behavioral and physiological mechanisms underlining host location behavior, physiology of reproduction and immunity, innate immune response to various infections, and molecular mechanisms inducing the release of plant volatiles from herbivore-infested plants.

Projects for Regular Students in Doctoral or Master’s Programs
1) Flight response of parasitic wasps to the plant infested by host insect.
2) Endocrinological and gene regulatory mechanisms of tick and spider ecdysis, reproduction and immunity.
3) Molecular mechanisms in the regulation of insect immunity.
4) Molecular mechanisms in the plant induction caused by herbivorous infestation.

Study Programs for Short Stay Students
1. Head space volatile collection from herbivore-infested plants and its chemical analysis.
2. Behavioral study of insect parasitoids responding to plant volatiles.
3. Measurement of insect immune activity against infection by molecular techniques.

Recent Publications:
30. Food and Biomass Process Engineering

Principal Investigator  Yutaka Kitamura  
E-mail address  kitamura.yutaka.fm@u.tsukuba.ac.jp  
URL  http://www.agbi.tsukuba.ac.jp/~kitamurafpe/  
Other Faculty Member  Assistant Professor Mito Kokawa

Major Scientific Interests
Focusing on agricultural products, food, unused resources and biomass as local biological materials, process development and characteristics for utilization and conversion of these resources are investigated to produce food, energy and industrial materials. By implementing the advanced technology for the local biological resources, we have the goal to contribute widely to the promotion of agriculture, energy conservation, environmental protection and industry creation in local and global view point.

Projects for Regular Students in Doctoral or Master’s Programs
1) Monitoring of beef aging with electrical impedance  
2) Processing of orange juice (Citrus sinensis) powder by micro wet milling and vacuum spray drying Process  
3) Processing of rice bread and rice pasta from rice gel  
4) Processing of fermented rice milk products  
5) Monitoring of fruit and vegetable freshness and ripening with the fluorescence fingerprint

Study Programs for Short Stay Students
1) Processing of rice milk and rice milk products  
2) Processing of rice gel products

Recent Publications
1) Dheni Mita Mala, Masatoshi Yoshimura, Susumu Kawasaki, Mizuki Tsuta, Mito Kokawa, Vipavee Trivittayasil, Junichi Sugiyama, Yutaka Kitamura, Fiber optics fluorescence fingerprint measurement for aerobic plate count prediction on sliced beef surface, LWT - Food Science and Technology, 68, 14-20, 2016  
3) Masaru Koyama, Yutaka Kitamura, Development of a new rice beverage by improving the physical stability of rice slurry, Journal of Food Engineering, 131, 89-95, 2014  
4) Kenji Takisawa, Kazuyo Kanemoto, Tatsuo Miyazaki, Yutaka Kitamura, Hydrolysis for direct esterification of lipids from wet microalgae, Bioresource Technology, 144, 38-43, 2013  
31. Isotope Hydrogeomorphology and Radioecology

Principal Investigator  Yuichi Onda
E-mail address onda@geoenv.tsukuba.ac.jp
URL  http://www.ies.life.tsukuba.ac.jp/~geodiagnostics/ONDA-enNew/
Other Faculty Member
Associate Professors Hiroaki Kato, kato.hiroaki.ka@u.tsukuba.ac.jp
Assistant Professor Junko Takahashi, takahashi.junko.ka@u.tsukuba.ac.jp

Major Scientific Interests
1) Transfer of radionuclides in terrestrial environment after the Fukushima Dai-ichi NPP accident
2) Interaction between subsurface water movement and sediment yield
3) Development of innovative technologies for increasing in watershed runoff and improving river environment by the management practice of devastated forest plantation

Projects for Regular Students in Doctoral or Master’s Programs
1) Monitoring and modeling radionuclides migrated with water and sediment
2) Transfer mechanism of radionuclides in the forest and soil
3) Estimation of surface soil erosion and sources of sediment production using radionuclides

Study Programs for Short Stay Students
1) Studying the method of Radiocesium analysis of water, soils and litter
2) Lab studies on physical and chemical properties of soil and water
3) Field work of monitoring and sampling of radiocesium in Fukushima
4) Experiencing hillslope hydrological monitoring in Tochigi

Recent Publications
4) Yoshimura, K., Onda, Y., Wakahara, T. (2016) Time dependence of the $^{137}$Cs concentration in particles discharged from rice paddies to freshwater bodies after the Fukushima Daiichi NPP accident, Environmental Science & Technology, DOI: 10.1021/acs.est.5b05513
32. Pomology

Principal Investigator  Sumiko Sugaya, Ph.D.
E-mail address sugaya.sumiko.fw@tsukuba.ac.jp
Other Faculty Member
Assistant Professor  Yoshihiko Sekozawa, Ph.D.

Major Scientific Interests
1) Molecular mechanism underlying fruit quality involving coloring, taste and flavor in fruit trees.
2) Mechanism of bud dormancy in deciduous trees and role of chilling in winter.
3) Postharvest physiology in fruits to develop technologies for prolonging shelf life.

Projects for Regular Students in Doctoral or Master’s Programs
1) Carbohydrate metabolism in dormancy of Japanese pear under mild winter condition.
2) Effects of the joint training system on phytohormone metabolism and flowering in fruit trees.
3) Effects of heat treatment on ripening and quality during storage of fruits.

Study Programs for Short Stay Students (one week)
1) Determination of fruit quality with sugar analysis in fruits.
2) Analysis of flavor compounds in fruits.
3) Extraction of DNA/RNA from fruits and amplification by PCR.

Recent Publications
4) Kondo, S., S. Sugaya, S. Sugawa, M. Ninomiya, M. Kittikorn, K. Okawa, H. Ohara, K. Ueno, Y. Todoroki,