10th Summer Research Program in Tsukuba

July 16- July 26, 2019

List of Laboratories
University of Tsukuba
Participating Laboratories

**Medical Sciences**

1. Shigeru Chiba – Hematology
2. Yasuhiro Fujisawa – 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
10. Kazuya Morikawa – Infection Biology (Microbiology)
11. Masafumi Muratani – Genome Biology
12. Norihiko Ohbayashi – Physiological Chemistry
13. Osamu Ohneda – Regenerative Medicine and Stem Cell Biology
14. Akira Shibuya – Immunology
15. Hitoshi Shimano – Endocrinology and Metabolism
16. Fumihiro Sugiyama – Laboratory Animal Science
17. Satoru Takahashi – Anatomy and Embryology/ Laboratory Animal Resource Center
18. Peter ten Dijke – Cancer Signaling
19. Masashi Yanagisawa – Molecular Pharmacology
20. Asako Takekuma Katsumata – Global Health Nursing
21. Kenji Suzuki – Artificial Intelligence
22. Itaru Kitahara – Computer Vision and Image Media

**Life and Environmental Sciences**

23. Hiroshi Ezura – Olericulture and Floriculture
24. Yasuhiro Ishiga – Molecular Plant Pathology
25. Yooichi Kainoh – Applied Entomology and Zoology
26. Yutaka Kitamura – Food and Biomass Process Engineering
27. Yuichi Onda – Isotope Hydrogeomorphology and Radioecology
28. Sumiko Sugaya – Pomology
29. Tofael Ahamed – Precision Agriculture and Remote Sensing Technologies
1. Hematology

- **Chairman:** Prof. Shigeru Chiba, MD, PhD  
  Clinical hematology  
  Molecular and cellular biology of hematologic malignancies  
  E-mail address: schiba-tyk@umin.net  
  URL: [http://www.ketsunai.com](http://www.ketsunai.com)

- **Other Faculty Members**
  Associate Professor Yuichi Hasegawa: Hematopoietic stem cell transplantation,
  Associate Professor Naoshi Obara: Pathophysiology in bone marrow failure syndrome
  Associate Professor Mamiko Sakata-Yanagimoto: Genetics and molecular mechanisms in malignant lymphomas
  Associate ProfessorHidekazu Nishikii: Hematopoietic stem cell biology, Megakaryopoiesis
  Assistant Professor Yasuhiyo Yokoyama: Adult chronic neutropenia, Acute promyelocytic leukemia
  Assistant Professor Naoki Kurita: Hematopoietic stem cell transplantation, Clinical studies on blood diseases
  Assistant Professor Takayasu Kato: Molecular mechanisms of acute myeloid leukemia
  Assistant Professor Manabu Kusakabe: Molecular and cellular research in malignant lymphomas

- **Major Clinical Activities**
  Diagnosis and Treatment of hematologic malignancies (leukemias, malignant lymphomas, etc.)
  Diagnosis and treatment of bone marrow failure syndromes (aplastic anemia, etc)
  Allogeneic and autologous hematopoietic stem cell transplantation for patients with above diseases; grafts are bone marrow cells, mobilized peripheral blood cells, and cord blood cells

- **Major Scientific Interests**
  1) Genetics and pathophysiology in hematologic malignancies (leukemias, malignant lymphomas, etc.; using both patient samples and mouse models)
  2) Microenvironment in bone marrow failure syndromes (using both patient samples and mouse models)
  3) Translational research on hematopoietic cell transplantation

- **Projects for Regular Students in Doctoral or Master’s Programs**
  1) Research on genetics and pathophysiology in hematologic malignancies
  2) Research on microenvironment in bone marrow failure syndromes

- **Programs for Short Stay Students (one week ~ one trimester)**
  1) Learn procedures for sorting progenitor cells from mouse bone marrow and fetal liver using a FACS sorter
  2) Learn cell transplantation in mouse model

- **Recent Publications**
2. Dermatology

Principal investigator
Yasuhiro Fujisawa
fujisan@md.tsukuba.ac.jp
https://dermatology-tsukuba.org/ (Japanese only)

Other Faculty Members
Assistant Professor: Naoko Okiyama, naoko.okiyama@md.tsukuba.ac.jp
Assistant Professor: Yosuke Ishitsuka, yosuke.ishitsuka@md.tsukuba.ac.jp
Assistant Professor: Rei Watanabe, rwatanabe@md.tsukuba.ac.jp
Clinical Lecturer: Yoshiyuki Nakamura, ynakamura-tuk@umin.ac.jp
Clinical Lecturer: Akimasa Saito, akisaitou-tuk@umin.ac.jp

Major Scientific Interests of the Group
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.
1. Immune response to skin cancer
2. Autoimmune mechanisms in mucocutaneous diseases and systemic collagen diseases
3. Skin resident memory T cell
4. Skin barrier
5. Skin tumor diagnosis using artificial intelligence

Projects for Regular Students in Doctoral or Master’s Programs
1) Characterization of immune cells in the skin cancer environments.
2) Development of new combination therapies for cancer cells using mouse models.
3) To investigate cellular biology in our graft-versus-host disease-like murine model developing dermatitis with lichenoid tissue reaction/interference dermatitis followed by scleroderma
4) To develop our original murine models of autoimmune myositis and interstitial pneumonia
5) To clarify how the programmed cell death-1 and the ligands axis works in a number of murine models of inflammatory disorders mimicking patients with immune-related adverse effects (irAEs) induced by immune checkpoint blockade
6) Skin resident memory T cells and cutaneous disorders

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.

Selected 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/  
**Other Faculty Members**  
Associate Professor: Aya Fukuda  
Associate Professor: Ken Nishimura

**Major Scientific Interests of the Group**

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) Functional analyses of transcription factors involved in adipocyte commitment.  
4) In vivo imaging and mechanistic analyses of beige adipocyte differentiation in mouse

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

1) Analysis of transcriptional regulation during adipocyte differentiation.  
2) Induction of iPS cells using a Sendai virus-based vector.

**Recent Publications**

5) Nakadai T, **Fukuda A**, Shimada M, **Nishimura K**, **Hisatake K**: The RNA binding complexes NF45-NF90 and NF45-NF110 associate dynamically with the c-fos gene and function as transcriptional coactivators. J. Biol. Chem. 290(44), 26832-26845 (2015).  
4. Molecular Parasitology

Principal Investigator  Kiong Ho  
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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 Trypanosome brucei.
2) Characterization of T.brucel 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
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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) Cell biology techniques analyzing protein and mRNA localization using indirect immunofluorescence and GFP-protein fusions.

Recent Publications
8) 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 Dhh1 in the Saccharomyces cerevisiae Cell Wall Integrity Pathway. mSphere. 2016 Sep 28;1(5).
6. Experimental Pathology

Principal Investigator  Mitsuyasu Kato
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Other Faculty Members
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Assistant Professor Yukihide Watanabe: y-watanabe@md.tsukuba.ac.jp
Assistant Professor Yukari Okita: yukari-okita@md.tsukuba.ac.jp
Assistant Professor Ling Zheng: zhengling8829@md.tsukuba.ac.jp

Major Scientific Interests
Biological significance and molecular mechanisms of “Stemness Induction” in cancer growth. Our ultimate goal is to establish 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, GPNMB, THG-1) in cancer stem cell kinetics and carcinogenesis using three dimensional cell culture and mice models
2) Molecular imaging and computational analysis of cancer stem cell kinetics using Bioluminescence-Resonance Energy Transfer probes and macrocyclic peptide probes using bioluminescence and fluorescence microscopy.
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 formation, organoid culture, and immunofluorescent staining, qPCR, Western blotting etc.)
2) Cancer stem cell imaging and computational cell kinetics 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  
Assistant Professor 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. 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

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/mbiol.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)  (select one or two)
• Genotyping of gene knockout zebrafish
• Genome editing of zebrafish by the CRISPR-Cas9 system
• Live imaging of GFP transgenic fish
• Functional analysis of food phytochemicals using zebrafish

Recent Publications
9. Systems Sleep Biology – Circuits of the waking, sleeping and dreaming brain

Principal Investigator  Michael Lazarus
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URL  https://www.wpiiiislazaruslab.org

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 chemogenetic modulation of neural circuitry by using stereotaxic microinjections of viral vectors
4) Immunohistochemistry and in-situ hybridization of brain tissue

Selected Publications
2) Takata Y, Oishi Y, Zhou XZ, Hasegawa E, Takahashi K, Cherasse Y, Sakurai T, Lazarus M. Sleep and wakefulness are controlled by ventral medial midbrain/pons GABAergic neurons in mice. J. Neurosci., 38(47):10080-10092, 2018
10. Infection Biology (Microbiology)

**Principal Investigator**  Kazuya Morikawa  
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**URL**  http://www.md.tsukuba.ac.jp/basic-med/infectionbiology/microbiology/  

**Other Faculty Members**  
Associate Professor Masatoshi Miyakoshi: mmiyakoshi@md.tsukuba.ac.jp  
Associate Professor Ryosuke Ohniwa (National Taiwan University): ohniwa@md.tsukuba.ac.jp

**Major Scientific Interests**  
We are studying infection, adaptation and evolution of Gram-positive and -negative bacteria. Major research interests include population heterogeneity, acquisition of antibiotics resistance and regulation of gene expression. The main research targets are the important human pathogens, *Staphylococcus aureus* and *Salmonella enterica*.

**Projects for Regular Students in Doctoral or Master’s Programs**  
1) Population heterogeneity of bacterial gene expression  
2) Natural genetic competence in Gram-positive pathogens  
3) Dynamics of cellular structures: nucleoid and membrane  
4) RNA-mediated posttranscriptional regulation in *Salmonella* and *E. coli*

**Study Programs for Short Stay Students (one week – one trimester)**  
Translational regulation of sigma factor H in subpopulation, a key step for horizontal gene transfer in staphylococci. (tentative plan for summer research program 2019)

**Selected Publications**  
11. 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
12. 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.

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:
13. 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/stemcell/index.html

Other Faculty Members
Dr. Toshiharu Yamashita (Assistant Professor) t-yama@md.tsukuba.ac.jp
Dr. Vuong Cat Khanh (Assistant Professor) vckhanh@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
3) Researching cancer relapse with cancer stem cells

Projects for Regular Students in Doctoral or Master’s Programs:
1) Analysis of functional stem cells (MSC and EPC) for clinical application
2) Investigating the molecular mechanism of HIFs in hypoxic stress
3) Interaction between cancer cells and stem cells

Summer School Course (2017)
1) Analysis of effects of aging on mesenchymal stem cells
2) Interaction between breast cancer cell and mesenchymal stem cells

Recent Publications:
14. Immunology

**Principal Investigator**  Akira Shibuya, M.D., Ph.D  
(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)
- **Lecturer:** Satoko Tahara, Ph.D  
  (tokothr@md.tsukuba.ac.jp)
- **Assistant Professors:** Chigusa Oda, M.D., Ph.D  
  (chigusano@md.tsukuba.ac.jp)
  Tsukasa Nabekura, Ph.D  
  (nabekura.tsukasa.fe@u.tsukuba.ac.jp)
  Kazumasa Kanemaru, M.D., Ph.D  
  (k-kanemaru@md.tsukuba.ac.jp)
  Kazuki Sato, Ph.D  
  (ksato@md.tsukuba.ac.jp)

**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**


15. Endocrinology and Metabolism

Principal Investigator  Hitoshi Shimano
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URL  http://www.u.tsukuba-endocrinology.jp/

Other Faculty Members
Associate Professor: Yoshihiko Nakagawa (yosshy@md.tsukuba.ac.jp)
Associate Professor: Motohiro Sekiya (m seksiya@md.tsukuba.ac.jp)
Associate Professor: Takashi Matsuzaka (t-matsuz@md.tsukuba.ac.jp)
Assistant Professor: Taka fumi Miyamoto (tak mi565@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
1) Research on the transcriptional regulation of energy metabolism and metabolic diseases.
2) Research on lipid metabolism and metabolic diseases.

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

Recent Publications
16. Laboratory Animal Science

**Principal Investigator** Fumihiro Sugiyama
**E-mail address** bunbun@md.tsukuba.ac.jp
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**Other Faculty Members**
Assistant Professor Seiya Mizuno: konezumi@md.tsukuba.ac.jp
Assistant Professor Kazuya Murata: kmurata@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**
17. Anatomy and Embryology/
Laboratory Animal Resource Center

Principal Investigator  Satoru Takahashi
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URL  http://www.md.tsukuba.ac.jp/basic-med/anatomy/embryology/index.html
Other Faculty Members

Major Scientific Interests of the Group
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
1) Molecular mechanism of the development of pancreatic endocrine cells and macrophages.
   We are researching the molecular mechanisms of the development of pancreatic endocrine cells
   and macrophages 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.
2) Analysis about in vivo functions of sugar chains on molecules. In addition to these themes, we
   are also analyzing functions of sugar chains on molecules in vivo by using genetically manipulated
   mice.

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
   Kodama T, Yoshimura A. Mafb prevents excess inflammation after ischemic stroke by
2) Hamada M, Nakamura M, Tran MT, Moriguchi T, Hong C, Ohsumi T, Dinh TT, Kusakabe M,
   M, Shimano H, Miyazaki T, Tontonz P, Takahashi S. MafB promotes atherosclerosis by
   S. Mafb plays a protective role in diabetic nephropathy through slt-diaphragm proteins, anti-
   oxidative enzymes and Notch pathways of podocytes. J Am Soc Nephrol. 25, 2546-2557,
   2014.
4) Kudo T, Sato T, Hagiwara K, Kozuma Y, Yamagami T, Ikehara Y, Hamada M, Matsumoto
   K, Ema M, Murata S, Ohkohchi N, Narimatsu H, Takahashi S. C1galt1-deficient mice
   exhibit thrombocytopenia due to abnormal terminal differentiation of megakaryocytes.
   Mochizuki H, Ishitobi H, Takano S, Uchida K, Takahashi S. Ema M. Genome-wide
   identification of vascular endothelial- specific genes during development in the mouse.
   Blood. 120, 914-923, 2012.
6) Kusakabe M, Hasegawa K, Hamada M, Nakamura M, Ohsumi T, Suzuki H, Kudo T,
   Uchida K, Ninomiya H, Chiba S, Takahashi S, c-Maf is indispensable for the
   microenvironment of definitive erythropoiesis as it forms erythroblastic islands in fetal liver.
   Yamaguchi A, Owen MJ, Takahashi S, Takayanagi H. Maf mediates the age-related
18. Cancer Signaling

Principal Investigator  Peter ten Dijke
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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

19. Molecular Pharmacology

**Principal Investigator**  Masashi Yanagisawa M.D., Ph.D.

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**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 cells and brain slices
3. imaging of nerve cell activities in brain slices

**Recent Publications**


20. Global Health Nursing

Principal Investigator  Professor Asako Takekuma Katsumata
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Other Faculty Members
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Assistant Professor Togoobaatar Ganchimeg: ganchimeg-t@md.tsukuba.ac.jp
Assistant Professor Rieko Kishi Fukuzawa: rkishi1@md.tsukuba.ac.jp

Major Scientific Interests of the Group
Clinical Nurse Leader, Respectful maternity care, Primary Health Care

Projects for Regular Students in Doctoral or Master’s Programs
1. Nursing Leadership
2. Safety and Quality of care; Process improvement
3. Palliative Care
4. Postpartum depression; Posttraumatic stress
5. Respectful maternity care; “WHO recommendations: intrapartum care for a positive childbirth experience”
6. Nursing support for foreign patients; cultural competency

Study Programs for Short Stay Students (one week – one trimester)
1. Global health leadership program for nurses

Selected Publications
21. Cybernics and Artificial Intelligence

Principal Investigator  Kenji Suzuki
E-mail address  kenji@ccr.tsukuba.ac.jp
URL  http://www.ai.iit.tsukuba.ac.jp/

Other Faculty Members
Assistant Professor Hideki Kadone, Faculty of Medicine

Major Scientific Interests
Cybernics technology brings out latent human capabilities and potential abilities of people. AI for bridging between human neural systems and machine. The research interests include artificial intelligence, Cybernics, wearable robotics and devices, affective computing, social robotics and assistive robotics with a particular emphasis on machine learning, pattern classification and dynamical modeling approaches. A special emphasis is laid on the design of empowering people, particularly for elderly, adults and children with special needs. Robotics, sensing, and IoT (Internet of Human)/IoT technology to support human actions are applied to in medicine and special education.

Projects for Regular Students in Doctoral or Master’s Programs
3) A novel personal mobility vehicle is developed for supporting and assisting people with disabled lower limbs such as elderly, and/or people with SCI (Spinal Cord Injury) or CP (Cerebral Palsy).
4) A lower-limb exoskeleton robot control and gait analysis based on body synergies by using a robot suit HAL, including a study on voluntary initiation of movement.
5) AI/IoH wearable device for measuring swallowing activities to prevent or minimize aspiration.

Study Programs for Short Stay Students (one week ~ one trimester)
4) Clinical data analysis related to clinical studies such as gait pattern and swallowing
5) Behavior data analysis related to facial expression, emotional behavior and whole body motion

Selected Recent Publications
22. 3D Virtual Surgical Navigation

Principal Investigator  Itaru Kitahara
E-mail address  kitahara@ccs.tsukuba.ac.jp
URL  http://trios.tsukuba.ac.jp/en/researcher/0000001021

Other Faculty Members
Assistant Professor Hidehiko Shishido

Major Scientific Interests
With the lack of surgeons and drastically improvement of medical technology, attention has focused on VR surgery using ICT technology. As the results, some achievements such as “tailor-made human body CG model”, “preoperative planning, intraoperative guidance, postoperative confirmation using CG data”, are realized. On the other hand, the realization of "surgical navigation" to properly guide the surgeons in accordance with the progress of surgical operation is still on the development. Our laboratory conducts on researches of surgical navigation aiming to realize (1) 3D sensing for surgical situation, (2) visualization of surgical information using sensing results, (3) accurate AR (Augmented Reality) navigation according to the surgical situation, (4) constructing practical navigation system.

Projects for Regular Students in Doctoral or Master’s Programs
6) 3D computer vision using laparoscopic video (3D shape reconstruction, Camera tracking and Scene understanding).
7) Developing AR navigation interface according to the surgical situation.

Study Programs for Short Stay Students (one week ~ one trimester)
6) 3D shape reconstruction of organs using laparoscopic video.
7) Image segmentation of useful regions for scene understanding such as surgical instruments and organs.

Selected Recent Publications
23. 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).
24. Olericulture and Floriculture

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

Other Faculty Members:
Professor  Chiaki Matsukura, Ph.D.,
Associate Professors Naoya Fukuda, Ph.D., Kang Seungwon, Ph.D. Tohru Ariizumi, Ph.D.,
Kyoko Tanase-Hiwasa 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 benefit 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
25. Molecular Plant Pathology

Principal Investigator   Yasuhiro Ishiga  
E-mail address   ishiga.yasuhiro.km@u.tsukuba.ac.jp  
URL   http://yasuhiroishiga.wix.com/ishiga-lab  
http://scholar.google.co.jp/citations?user=eLoso-EAAAAJ&hl=ja&oi=ao  

Other Faculty Members  
Plant Parasitic Mycology Laboratory; Professor Yuichi Yamaoka; Associate Professor Izumi Okane; Assistant Professor Junichi P Abe

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
26. 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:**
27. 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
28. 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 Members**
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**
29. Pomology

**Principal Investigator**  Sumiko Sugaya, Ph.D.
**E-mail address** sugaya.sumiko.fw@tsukuba.ac.jp
**Other Faculty Member**  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**
30. Agricultural and Environmental Engineering. 
Biomass and Bioenergy

Principal Investigator  Ryozo Noguchi, Ph.D.
E-mail address  noguchi.ryozo.gm@u.tsukuba.ac.jp
URL  http://noguchiryozo.web.fc2.com/
       https://trios.tsukuba.ac.jp/en/researcher/0000001230

Major Scientific Interests
My research concentrated on Biomass energy, Agricultural machinery and power, Oil separation and recycling system. Research and Technology in rural area contributing to “Prosumer (Producer × consumers)” advocated by Alvin Toffler is my lab’s philosophy and mission to extract and solve the technical problem, ethical issues of food and bio-resources. For solving the issues in the 21st century as like environmental problems, food and energy security, and re-forming to a new lifestyle, utilization of biomass resources can bring the solution. Meanwhile, in Southeast Asia, increasing production of palm oil brings environmental destruction of tropical rainforests. Utilizing state-of-the-art technologies, we aim to solve technical problems for designing a sustainable rural community by utilizing biomass resources for better living.

Projects for Regular Students in Doctoral or Master’s Programs
1) LCA for Microalgae Oil Production from Upstream to Downstream stages for Bioenergy
2) Separation Engineering for Wastewater Treatment
3) Informatics and Systems System Dynamics Modeling
4) Optimization and Decision Support System for Agricultural Production System

Study Programs for Short Stay Students (one week)
1) Systems Dynamics Modeling
2) Biomass conversion and HTL process

Recent Publications
31. Agricultural Machinery Sensing System and Precision Agriculture

Principal Investigator  Tofael Ahamed  
E-mail address  tofael.ahamed.jp@u.tsukuba.ac.jp  

Major Scientific Interests
I perform research in the field of precision agriculture technology, agricultural robotics and decision support systems using GIS and satellite remote sensing. In the sensing system development, smart application of IoT-AI in agriculture is concentrated, where crop production varies spatially and temporally within the field boundaries depending on the soil and environmental conditions.

Projects for Regular Students in Doctoral or Master’s Programs
1) Machine Learning Systems for Agricultural Unmanned Ground and Aerial Vehicles
2) Multiple Sensors Data Acquisition System from Unmanned Aerial Vehicle and Coordination of Leader-Follower Systems.
3) Data Analytical Systems for Yield Prediction of Crops using Satellite Remote Sensing and GIS.

Study Programs for Short Stay Students (one week)
1) Unmanned Aerial Vehicle (UAV) data processing and image analysis.
2) IoT-based micro controller development for temperature, humidity and light intensity measurements
3) Satellite remote sensing data processing and analyzing in GIS environment

Recent Publications