Graduate School of Life Science, Hokkaido University

BIOSYSTEMS SCIENCE COURSE

Graduate School of Life Science

Laboratory Introduction

Laboratory of Plant Evolutionary & Developmental Biology

Fujita and Singh lab

https://keitai1.sci.hokudai.ac.jp/en.html/

Professor

Tomomichi Fujita

https://researchmap.jp/read0096750?lang=en

Assistant Professor

Prerna Singh

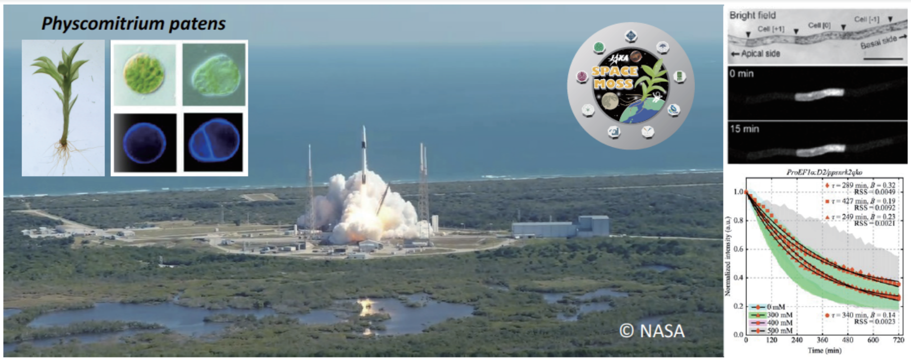
https://researchmap.jp/prernasingh12?lang=en

Study abstract

We use plants as powerful model systems to uncover the molecular logic behind their development, resilience, and evolutionary success. At the heart of our research is a simple but ambitious goal: to understand how plant cells grow, differentiate, and adapt - and how these processes have been shaped through evolution.To achieve this, we employ a range of model species: the basal land plant Physcomitrium patens (moss), other bryophytes, and flowering plants such as Arabidopsis thaliana. By combining these systems, we can explore both the conserved and unique strategies that plants have evolved to thrive in diverse environments. Our current research topics include:

1. Cell polarity and fate determination – elucidating the molecular basis of cell polarity, asymmetric cell division, and the mechanisms that determine cell fate.
2. Development–stress response crosstalk – investigating how plants integrate developmental programs with environmental stress responses, with the aim of developing crops and moss plants that can thrive even under extreme conditions.
3. Evolution of multicellularity – tracing the evolutionary trajectory of land plants by studying intercellular communication, such as the formation and regulation of plasmodesmata.
4. Mosses in extreme environments and terraforming – exploring how plants, particularly bryophytes, adapt and grow in environments such as outer space, with a long-term vision of contributing to future terraforming and sustainable life support on the Moon or Mars.

Our research integrates molecular genetics, cell biology, and evolutionary biology, linking fundamental discoveries in plant development with potential applications in agriculture, environmental restoration, and space exploration.



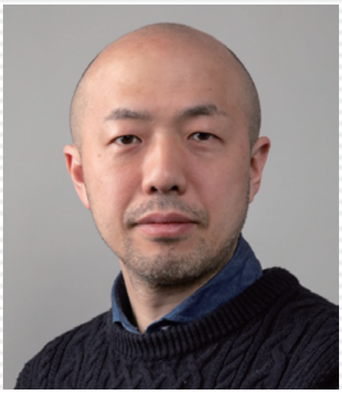
Keywords

abiotic stress, abscisic acid, asymmetric cell division, cell-cell communication, cell polarity, chloroplast division, eco-evo-devo, hypergravity, International Space Station (ISS), JAXA, mirogravity, organelle size determination, plant stem cell, plasmodesmata, polarotropic response, space biology, "Space Moss", stress adaptation, terraforming the Moon and Mars

Laboratory of Plant Evolutionary & Developmental Biology

Naramoto Lab

https://keitai1.sci.hokudai.ac.jp/en.html/



Associate Professor

Satoshi Naramoto

https://researchmap.jp/7000017796?lang=en

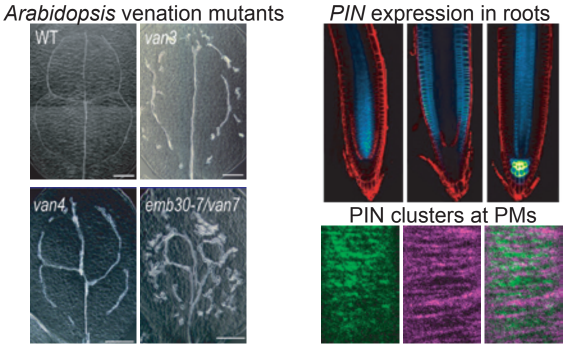
Study abstract

Plants show remarkable developmental plasticity, shaped by genetic programs and environmental cues. A central driver is polar auxin transport (PAT), mediated by PIN efflux carriers that generate auxin gradients to establish body axes, guide tropisms, and reorganize tissues during regeneration and clonal propagation. Equally important, cytokinin acts in concert with auxin, shaping meristem activity, tissue patterning, and regenerative responses.

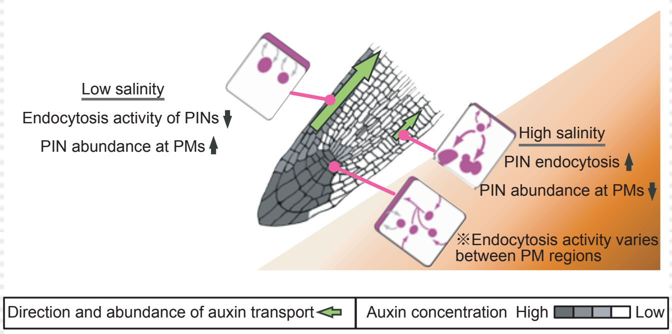
Our research focuses on the molecular mechanisms governing PIN polarity and its crosstalk with cytokinin signaling. By combining both hormonal perspectives, we aim to uncover how auxin–cytokinin interactions underlie regeneration, propagation, tropism, parasitism, and body plan formation.

Using live-cell imaging, molecular genetics, bioinformatics, and mathematical modeling, we investigate these processes across diverse species, from angiosperms and ferns to mosses and charophyte algae. We also investigate the mechanisms of plant–plant and plant–microbial interactions, such as parasitism, to understand how auxin and cytokinin regulation contributes to morphological diversification and the unique capacity of plants to rebuild and propagate.

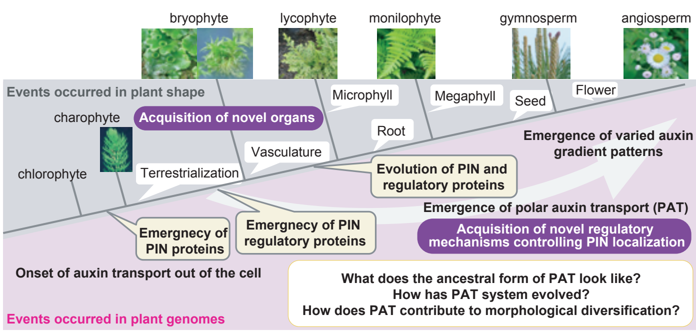
How are cell polarity and body axis established?

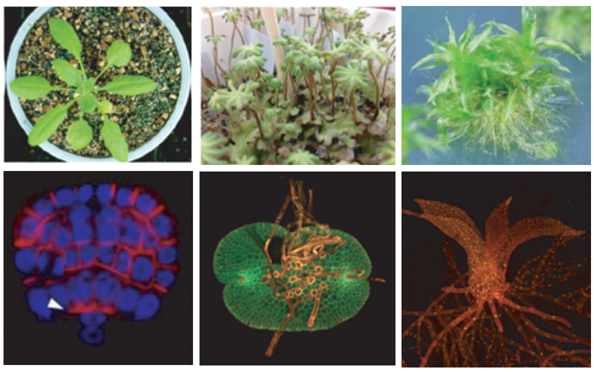


How do plants respond to environmental signals?



How does morphological diversification have occured?





Keywords

plant, development, evolution, environmental stress, regeneration, totipotency, tropism, parasitism, cell polarity, auxin, cytokinin, cell bioilogy, live-cell imaging, mathematical modeling

Laboratory of Plant Morphology & Gene Function Ib
Watahiki lab

https://www2.sci.hokudai.ac.jp/dept/bio/en/teacher/watahiki-masaaki

Associate Professor

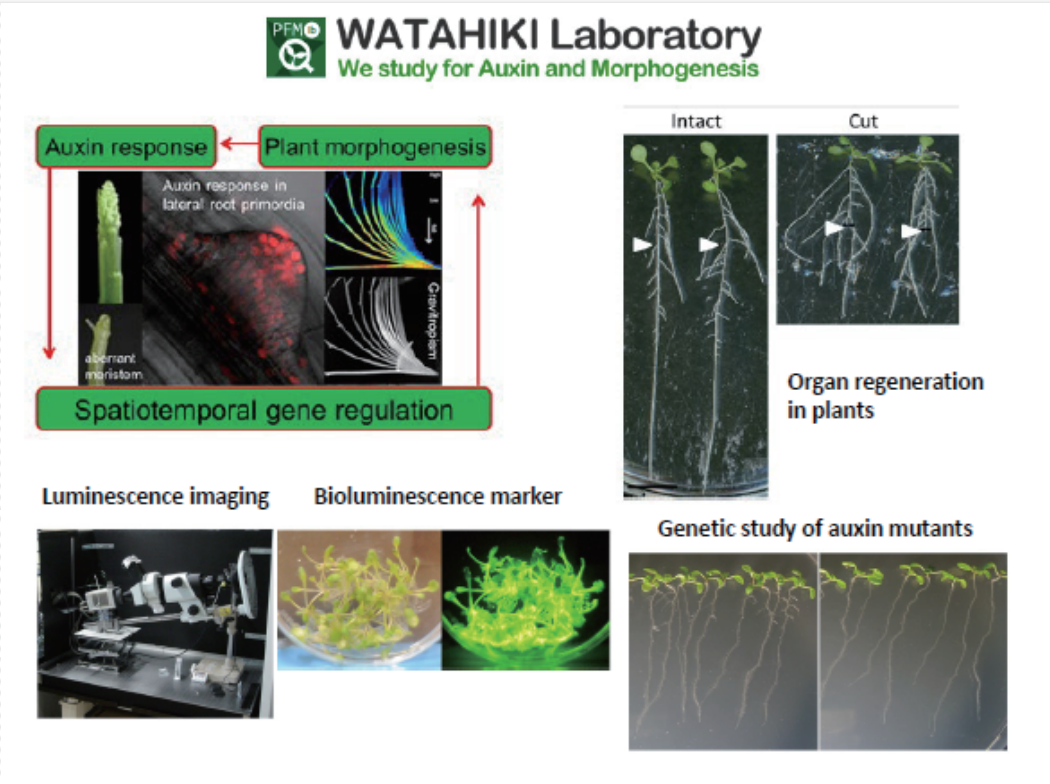
Masaaki K. Watahiki

https://researchmap.jp/watahiki

Study abstract

Plants are commonly considered inanimate objects and classified as 'still life'. However, we cannot perceive their movements within our own timeframe. Time-lapse photography reveals that plants are indeed very much alive, exhibiting dynamic movements and developments. The plant hormone auxin plays a central role in these movements and in plant morphogenesis.

The main focus of this laboratory is investigating the functional roles of auxin in organogenesis. We primarily use Arabidopsis as a model system for forward and reverse genetics.



Keywords

auxin, feedback regulation, gene expression, molecular biology, plant physiology, genetics, plants, Arabidopsis

Laboratory of Cell Function & Strcuture III
Ito lab

https://sgd.sci.hokudai.ac.jp/english-home.html

Associate Professor
Hidetaka Ito
https://researchmap.jp/read0150035

Study abstract

All organisms possess large amounts of information necessary to build and maintain their bodies. The portion of this information that is inherited across generations is called genetic information. Based on this information, biologically functional proteins are produced through gene expression. Genetic information is not always expressed; instead, it is switched on and off at appropriate times during the life span. Understanding the mechanisms of gene regulation is therefore essential for explaining how an organism is formed and how it functions.

In gene expression, genetic information is first transcribed into messenger RNA and subsequently translated into amino acids. Recent studies have revealed that gene expression is regulated not only by transcriptional and translational processes, but also by epigenetic modifications, including DNA methylation and histone modifications, as well as by various RNA molecules. Our research aims to elucidate the mechanisms of gene regulation using genetic and molecular approaches in plants.

Furthermore, it has become evident that environmental stresses strongly influence both gene expression and the activation of transposable elements. In nature, high copy numbers of transposons are conserved in many species, suggesting that they may have been repeatedly activated by stress, thereby altering the structure of host genomes. Transposition events can disrupt host genes, sometimes resulting in mutations that contribute to genome evolution and the generation of genetic diversity, enabling adaptation to new environments.

Our research focuses on the effects of environmental stress in plants, particularly on the regulatory mechanisms of stress-activated transposons. By analyzing the interactions between transposons and the host genome, we aim to clarify how genome plasticity contributes to adaptation and evolution.

Keywords
genes and environment, epigenetics,stress response, mobile genetic elements, plant adaptation

Laboratory of Cell Structure & Function

Sato and Takagi lab

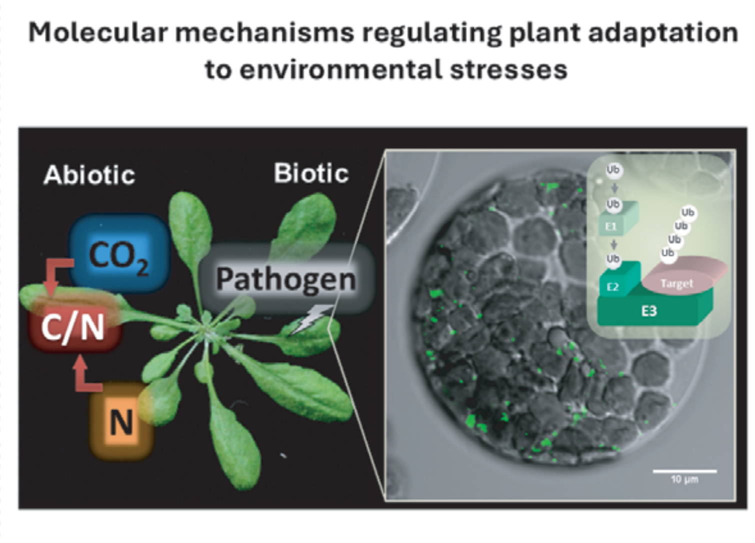
http://biol.sci.hokudai.ac.jp/en

Associate Professor
Takeo Sato
https://researchmap.jp/takeohp

Assistant Professor
Junpei Takagi
https://researchmap.jp/7000009908?lang=en

Study abstract

The ability to sense and respond to environmental stimuli is critical for the growth of all living organisms. Plants have developed sophisticated mechanisms to robustly monitor and appropriately respond to the dynamic changes of environment stresses due to their immobility. The main focus of our laboratory is to reveal the molecular mechanism of excellent environmental adaptation of plants. We are especially focusing on adaptation strategies against "nutrient stress" and "pathogen attack (plant immunity)", which have a great impact on plant growth and productivity. In addition to physiological analyses, we also perform genetics, cell biol ogy and biochemical analyses to elucidate the function of key signaling proteins and metabolic enzymes.



Keywords

environmental adaptation, nutrient stress responses, molecular biology, plant science, membrane trafficking, ubiquitin signals, kinase, metabolism, plant immunity, organelle, proteomics, live cell imaging

Laboratory of Cell Structure & Function II

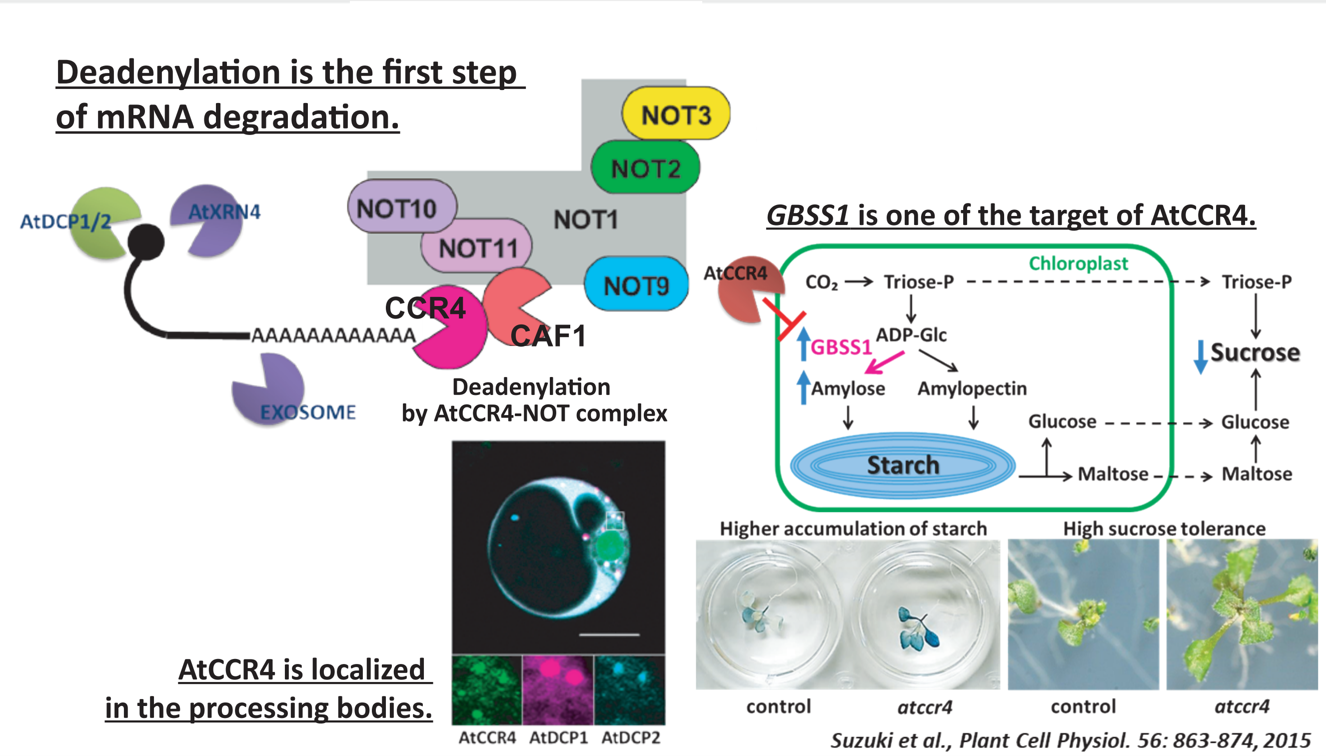
Chiba lab

https://chibalab.main.jp/lab/en/index.html

Professor
Yukako Chiba
https://researchmap.jp/ykiki

Study abstract

Research in gene expression control has been conducted across various species. Early studies primarily focused on transcriptional control; however, in recent decades, attention has shifted toward post-transcriptional control. This includes the discovery of functional RNA molecules such as ribozymes, riboswitches, and small RNAs. Furthermore, research on gene expression control has evolved from analyzing individual control steps to understanding how these steps are coordinated. Due to their sessile lifestyle, plants must respond quickly to various environmental stresses to survive in unfavorable conditions. Our goal is to clarify how gene expression control, particularly post-transcriptional control, relates to environmental responses in plants and how multiple control steps are coordinated at the molecular level.



Keywords
stress response, regulation of gene expression, mRNA degradation, translational regulation , AtCCR4-NOT complex, Arabidopsis, molecular biology

Plant and Microbial Molecular Ecology Laboratory
Nakano Lab

http://rtnakanolab.com/

Professor
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https://researchmap.jp/rtnakano

Assistant Professor
Tomohisa Shimasaki
https://researchmap.jp/tshimasaki

Study abstract

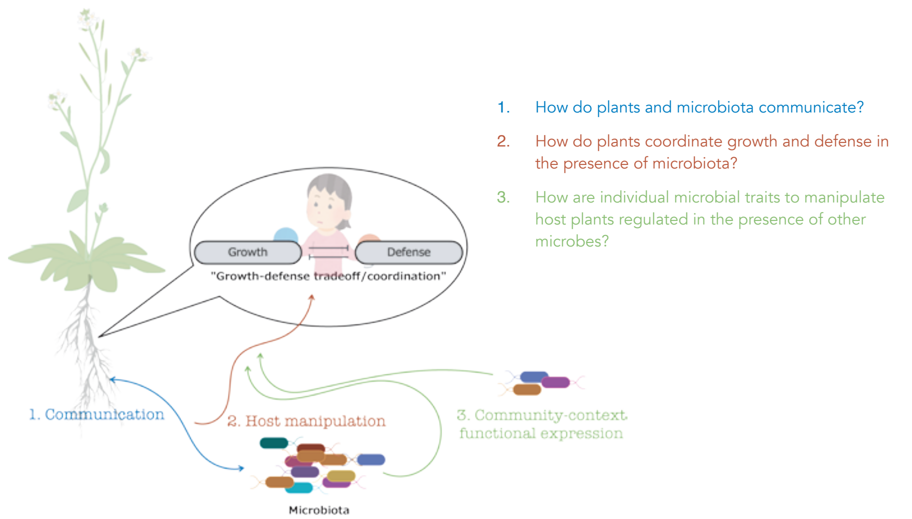
We are interested in how plants communicate with the associated microbial community, the plant microbiota. We employ plant and microbial genetics, multi-omics, and cell biology to address the molecular mechanisms by which root microbiota influence root growth-defence coordination. We are specifically focusing on the molecular mechanisms by which:

> root-associated commensal bacteria interfere with host growth-defense tradeoff and enables plants to achieve both defense and growth

> root-secreted metabolites shape the transcirpional landscape of rhizospheric microbes

> plants regulate their transcirpional responses to a wide range of root-associated microbes and discriminate commensals from detrimental pathogens

> plant-associated microbes mediate plant-insect-microbe interactions



Keywords

Plant microbiota, Root-associated bacteria, Rhizosphere, Plant immunity, *Arabidopsis thaliana*, Duckweed, Soybean, Tobacco

Laboratory of System Neurobiology

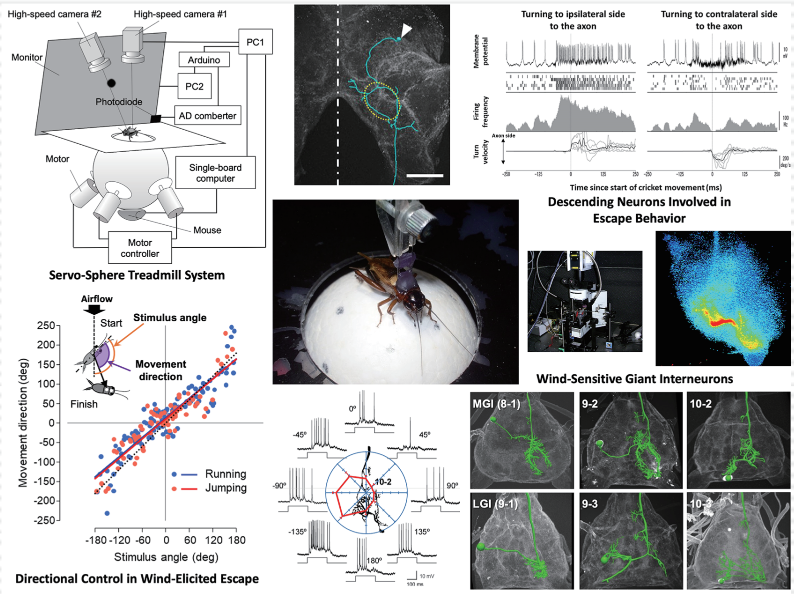
Ogawa and Fukutomi lab

https://ogawalab.sci.hokudai.ac.jp/English/

Professor
Hiroto Ogawa
https://researchmap.jp/hogawa

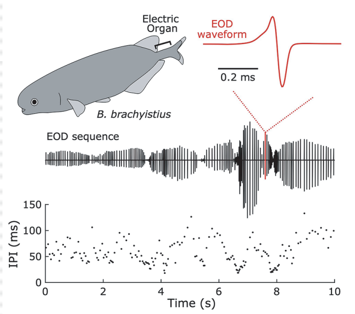
Assistant Professor
Matasaburo Fukutomi
https://researchmap.jp/matalab

Study abstract



(Ogawa group) Our laboratory aims to provide a complete description of the neural circuit "from the entrance to exit of the neural system" and its computational processes, using crickets' wind-elicited escape behavior as a model. Our research methods include quantitative behavioral measurements using treadmill system and high-speed camera, as well as physiological measurements obtained through electrophysiology and optical imaging. Optical imaging is a powerful technique for visualizing the local activity of single neurons and analyzing the spatiotemporal patterns of neural activity in the brain. In addition to these methods, we strive to elucidate the information processing and computational algorithms of the central nervous system by manipulating stimuli and environmental factors. We are also working on decoding neural activity through machine learning.

(Fukutomi group) Our group focuses on mormyrid electric fishes, which generate electric pulses for communication and navigation, and aims to understand the "electrosensory world" of these fishes. Recently, we have started new projects on the closely related fishes that do not have the ability to generate electricity, but do have an electric sense, and are studying the evolution of the electric sense through a comparative approach.



Keywords

(Ogawa group) insects, neuron, neural computation, sensory processing, motor control, electrophysiology, calcium imaging, escape behavior, decoding, threat response
(Fukutomi group) teleost, communication, active sensing, evolution of behavior, neural circuit, sensorimotor integration, corollary discharge, neuroethology, physiology

Laboratory of Behavior and Neurobiology

Soma lab

https://www2.sci.hokudai.ac.jp/dept/bio/en/teacher/soma-masayo

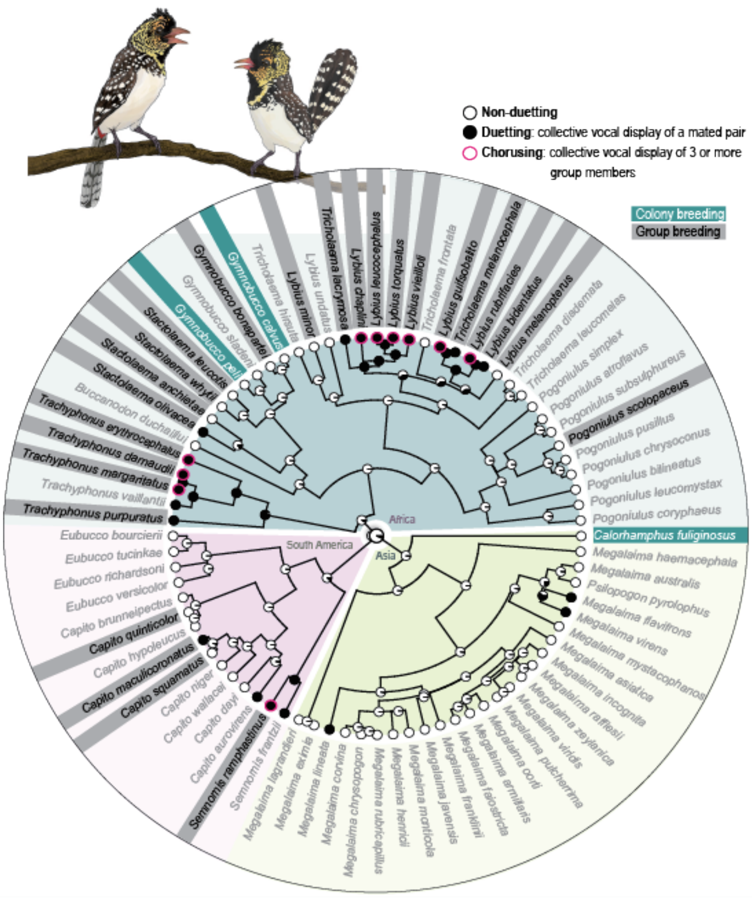
Professor

Masayo Soma

https://researchmap.jp/soma?lang=en

Study abstract

Our research incorporates both mechanistic and functional approaches to address the question why living things show such a great diversity in behaviors and their underlying cognitive functions. We focus primarily on the functional aspects of these behaviors by investigating the behavioral ecology of passerine birds (mainly Estrildid finches) with a particular interest in social communication; including courtships and parent-offspring interactions, reproduction, development and life history.



Keywords

songbird, social behavior, development, learning, courtship, cognition, ethology, behavioral ecology, evolution

Laboratory of Molecular Neuroethology

Wada &Toji lab

https://www.wada-lab.org/english-version/

Professor

Kazuhiro Wada

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Assistant Professor

Noriyuki Toji

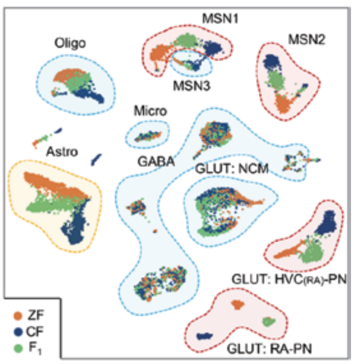
https://researchmap.jp/toji-noriyuki

Study abstract

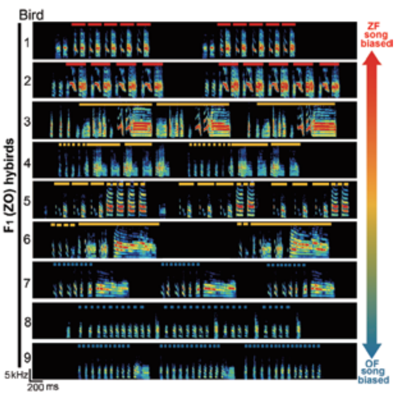
Animal behavior is influenced by both environmental and genetic factors. However, much remains to be learned regarding how and when the environmental and genetic factors act and how developing behavior itself affects the molecular basis in the neuronal substitute. The primary focus of our laboratory is to elucidate these questions by using songbirds as an animal model for vocal learning and to identify its critical period at molecular and genetic levels.

One of our research interests is to elucidate the evolution of vocal learning and vocal phenotype accompanied by advantageous gene evolution at transcriptional regulatory divergency that control species-specific regulation of genes. We are also focusing on the singing-induced genes which regulate neural plasticity during the critical period of vocal learning. Behavioral, developmental, and area-specific gene expressions should be regulated by various combinations of transcription factors via epigenetic modifications, such as histone modifications and DNA methylation.

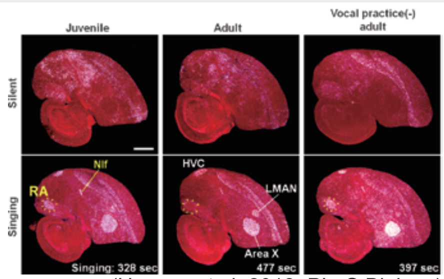
Individual experiences and surrounding environments on their life should leave epigenetic codes on their genomic DNA, which are also ruled by the species-specific genome sequences, including species-specific regulatory elements for gene expressions. Thus, the study of these transcriptional regulation mechanisms in songbirds will be significantly beneficial to elucidate molecular and genetic mechanisms underlying the critical periods for learning, individual behavior difference and species-specific behaviors, including human language.



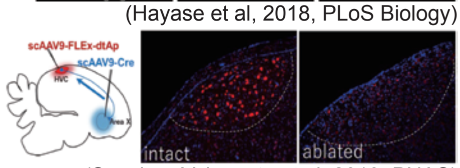
(Shibata et al, 2024, Science Advances)



(Toji, Sawai, Wang et al, 2024, PNAS)



(Hayase et al, 2018, PLoS Biology)



(Sanchez-Valpuesta et al, 2019, PNAS)

Keywords

Learning, critical period, species-specific behavior, individual difference, epigenetics, transcriptional regulation, stuttering, songbird, interspecies hybrids

Laboratory of Neuroecology
Takeuchi lab

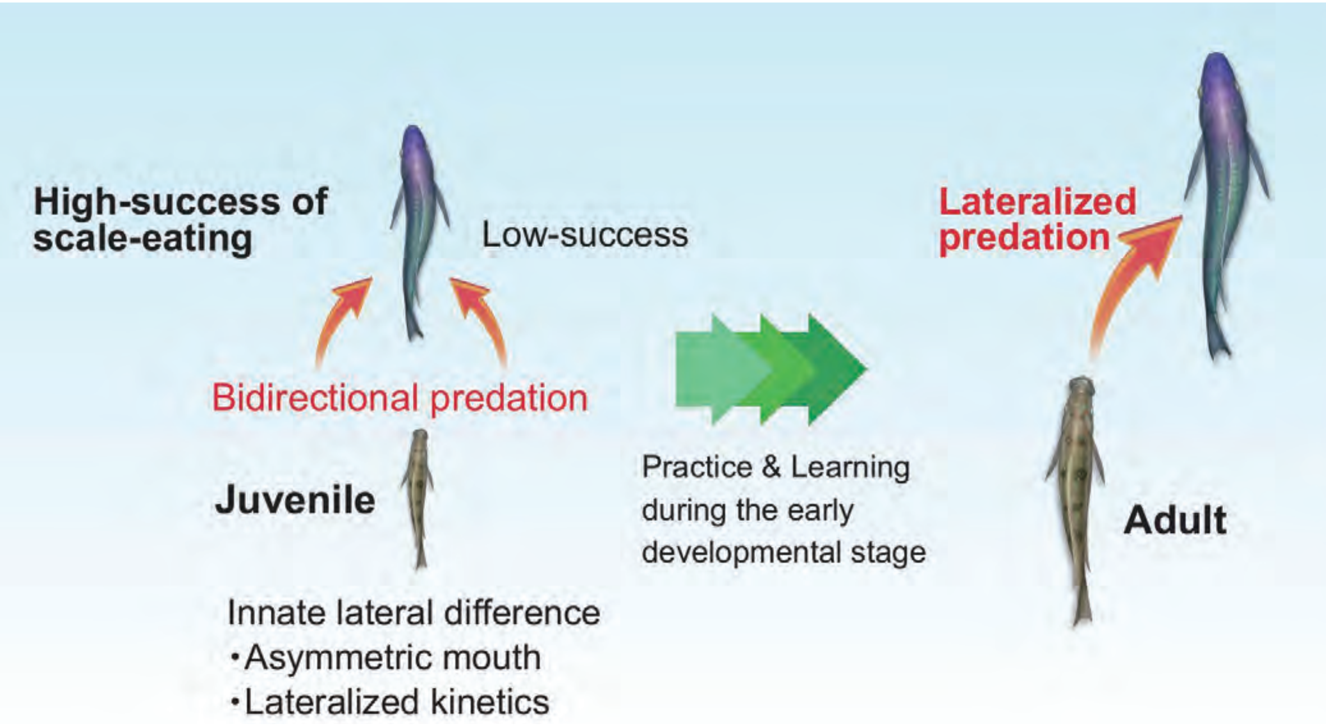
https://neuroecology.web-ac.jp/

Associate Professor
Yuichi Takeuchi
https://researchmap.jp/ran?lang=en

Study abstract

The underlying themes of my research program are the neuroethology and behavioral ecology. My current focus is the relation between ecological selection pressure and brain system. I am interested specifically in understanding of neural mechanisms, molecular genetics, developmental processes, ecological functions, and evolution of laterality in the scale-eating cichlid fish in Lake Tanganyika, Africa.

Many animals, not just humans, display laterality, or "right- or left-handedness." However, its mechanism and how it relates to the difference between the left and right sides of the brain still remains largely unknown. I am carrying out research to have a better understanding of the brain mechanism involved by focusing on a fish species that shows pronounced laterality.



Development of the attack side preference (lefty fish). The scale-eaters develop a clear preference for attacks on the dominant side as they gain scale-eating experience.

Keywords
laterality, brain asymmetry, learning, Plasticity, predator-prey interaction, fish evolution

Laboratory of Neurobiology

Tanaka, Nishino & Schleyer lab

https://sites.google.com/view/nktanakalab/home

https://www.es.hokudai.ac.jp/labo/nishino/research_english.html

http://www.schleyerlab.com

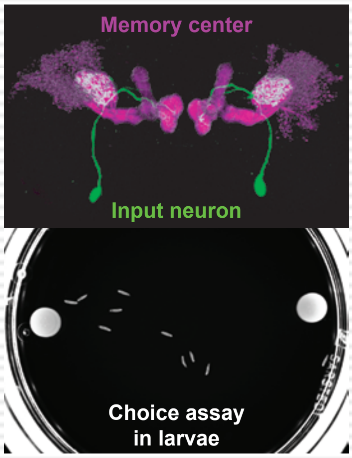
Associate Professor
Nobuaki Tanaka
https://researchmap.jp/nktanaka/?lang=en

Assistant Professor
Hiroshi Nishino
https://researchmap.jp/read0118403?lang=en

Assistant Professor
Michael Schleyer
https://researchmap.jp/mschleyer?lang=en

Study abstract

(Tanaka group) Our goal is to reveal (i) how neuronal circuits work as a system to process sensory inputs, and (ii) how this processing is modulated by a specific environment or by the mental state or the condition of the body. The answers to these questions will reveal how an animal displays adaptive behavior in response to a given situation that changes every moment or even develops intelligent behavior to cope with a difficult situation. To study these problems in our laboratory, we are utilizing invertebrate animals such as insects and cephalopods.
(Nishino group) We try to understand how sensory signals are processed in the central nervous system and converted to appropriate behavioral outputs in various insect species. Currently, we focus on spatial odor processing in cockroaches, light orientation behavior in moths, and auditory processing in orthopteran insects.
(Schleyer group) We try to understand how rather complex, adaptive behaviors can be achieved in a very small, simple brain. Using the larval stage of fruit flies as example, we combine optogenetic manipulations of single neurons and detailed behavioral analyses to understand the neuronal mechanisms of processes like associative learning and decision making.



Keywords

Drosophila melanogaster, squid, cockroach, moth, Orthoptera, sensory processing, motor control, learning & memory, decision making, electrophysiology, calcium imaging, optogenetics, behavioral studies, histology

Laboratory of Behavior and Neurobiology

Tsunematsu lab

https://www2.sci.hokudai.ac.jp/faculty/en/researcher/tomomi-tsunematsu

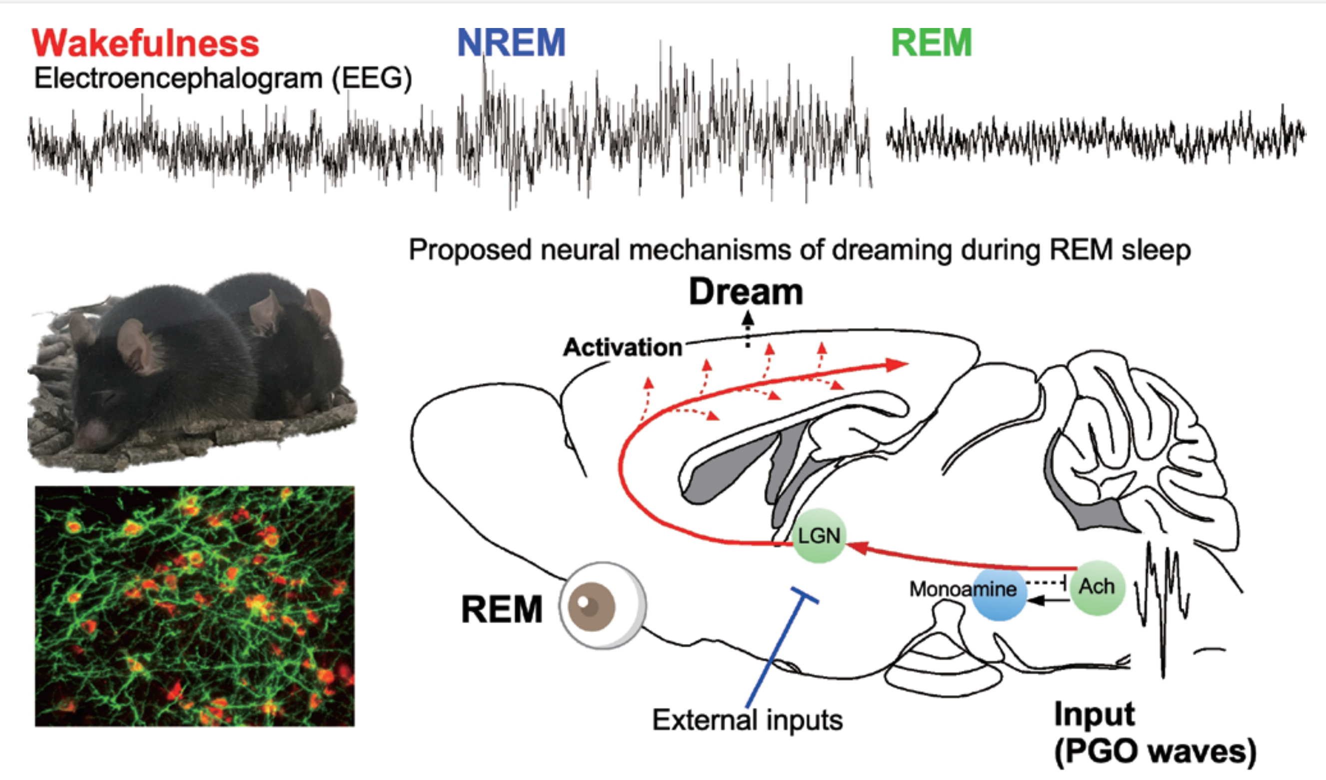
Associate Professor

Tomomi Tsunematsu

https://researchmap.jp/tsune?lang=en

Study abstract

If we sleep eight hours a day, we spend nearly one-third of our lives asleep. But why do we sleep? Why do we dream? And why does sleep consist of both rapid eye movement (REM) and non-REM (NREM) stages? Despite decades of research, these fundamental questions remain unanswered. In our laboratory, we use genetically engineered mice to investigate these mysteries, with a particular focus on uncovering the neural mechanisms and physiological functions of dreaming.



Keywords

sleep, dream, ponto-geniculo-occipital (PGO) wave,
neuron, memory, genetically engineered mice,
electrophysiology, optical imaging, optogenetics, programming

Laboratory of Reproductive and Developmental Biology

Ogiwara Lab

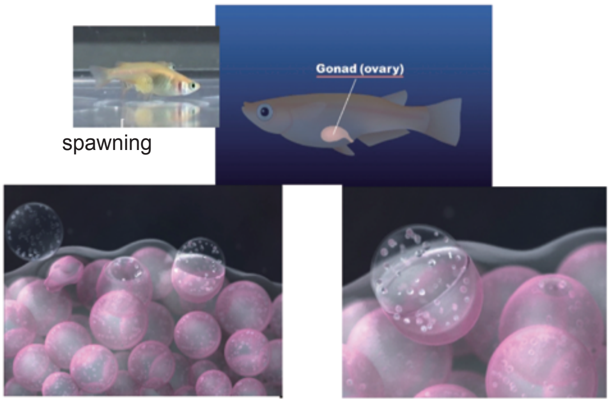
https://sites.google.com/view/hokudai-ogiwaralab-eng/home

Associate Professor
Katsueki Ogiwara
https://researchmap.jp/kogi?lang=en

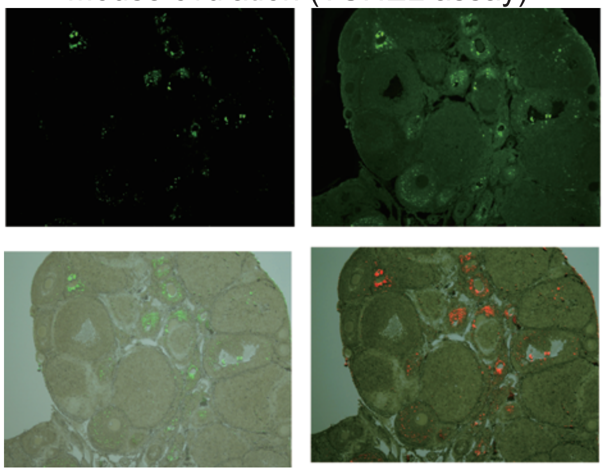
Study abstract

Our laboratory is interested in understanding the physiological roles of vertebrate reproductive organs, especially the ovary, at the molecular level. We focus on unknown ovarian functions. The following projects are ongoing, using mouse and medaka fish models: (1) Identification of ovulatory enzymes in mammals. (2) Studies on the mechanism of tissue repair after medaka ovulation. (3) Do follicle cells communicate with oocytes during ovulatory period? (4) Studies on the regulatory mechanism of medaka ovulation. (5) Study on the molecular mechanisms of mouse follicle selection.

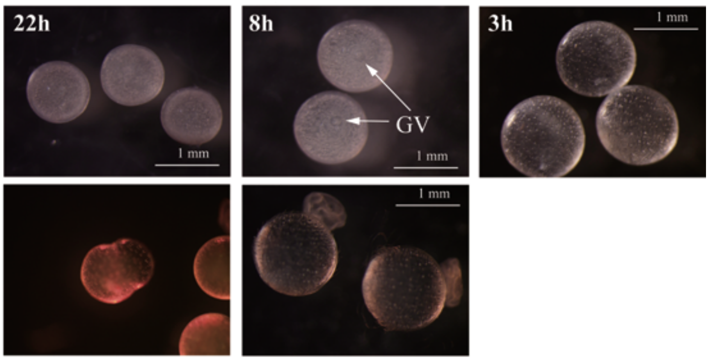
Medaka ovulation



Mouse ovulation (TUNEL assay)



Preovulatory follicles before ovulation



In the middle of ovulation
After ovulation

Keywords
mouse, medaka, ovary, ovulation, follicle selection, tissue repair

Laboratory of Reproductive and Developmental Biology

Katsu Lab

https://www.repdev-katsu.jp

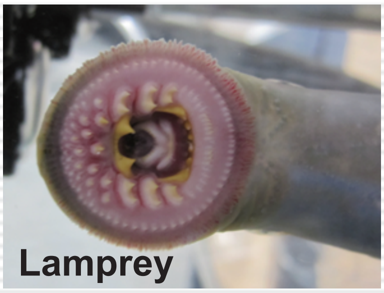
Professor

Yoshinao Katsu

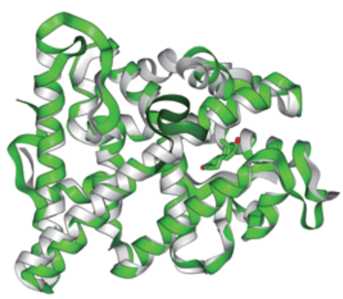
https://researchmap.jp/read0096782?lang=en

Study abstract

The objective of this study is to explore the emergence and establishment of the endocrine system as a regulatory mechanism for life activities during the course of biological evolution. In the present laboratory, research is being conducted on the subjects of "evolutionary endocrinology/comparative endocrinology" with the objective of elucidating the entire picture. Animals are distinguished by their reproductive organs, which facilitate the production of eggs and sperm, leading to the formation of offspring. Sex hormones, including estrogen (the female hormone) and androgen (the male hormone), play a pivotal role in the development of the reproductive organs, sex differentiation, and reproductive behavior. In addition, the secretion of carbohydrates, glucocorticoids, and mineralocorticoids from the adrenal cortex plays a crucial role in maintaining homeostasis and stress response. These are all fat-soluble, low-molecular-weight steroid hormones that interact with steroid hormone receptors, a family of nuclear receptors, to exert physiological effects. The steroid hormone receptor is a transcription factor that recognizes a specific gene sequence and controls transcription in a hormone-dependent manner. In the laboratory, hormone receptor genes from multiple species have been cloned, and research is underway to explore the foundational principles of life phenomena.



3D structure of estrogen receptor



Keywords

endocrinology, steroid hormone, nuclear receptor, evolution

Laboratory of Reproductive and Developmental Biology
Kuroiwa Lab

https://sites.google.com/view/kuroiwalabhp/home

Professor
Asato Kuroiwa
https://researchmap.jp/read0067267/?lang=en

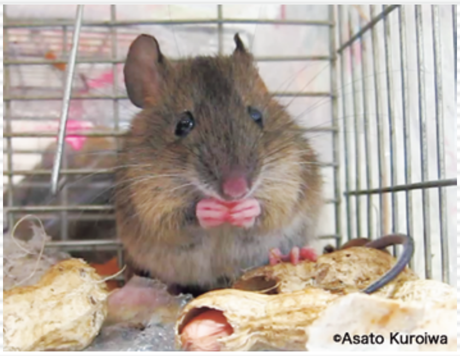
Study abstract

My research aims to shed light on the fascinating molecular mechanisms of sex determination in both mammals and birds.

In most mammals, sex is determined by the *SRY* gene on the Y chromosome, which drives testis development. The Amami spiny rat (*Tokudaia osimensis*), however, lacks both the Y chromosome and *SRY*, offering a rare natural model to investigate how new sex-determining systems evolve. My work focuses on uncovering why the Y chromosome disappeared and what alternative mechanism now governs sex determination.

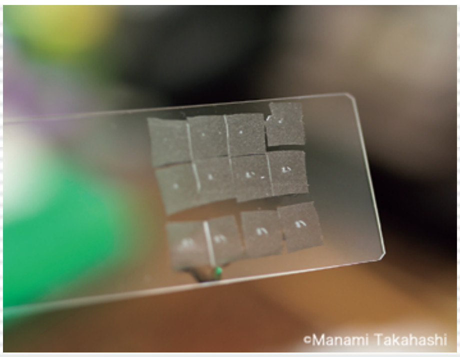
In birds, females are ZW and males ZZ. While *DMRT1* on the Z chromosome is known as a key testis gene, the W-linked gene responsible for ovary development has yet to be found. Using chicken, Japanese quail, and emu, I am working to identify novel W-linked candidates.

Through these studies, my goal is not only to unravel the diversity of sex-determining mechanisms in vertebrates but also to contribute to a deeper understanding of how genomes evolve and redefine such a fundamental biological process.

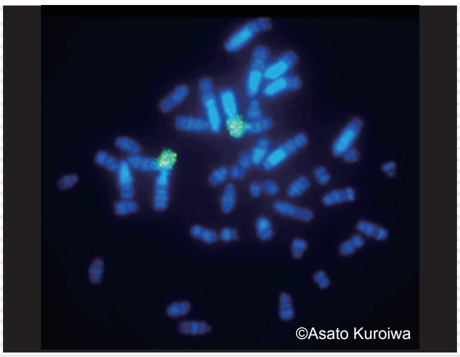


Juvenile Okinawa spiny rat

Our laboratory uses chicken, emu, and Japanese quail.



Sections of gonads



Zoo-FISH image: mouse chr11 painting probes are hybridized to the spiny rat neo-X and neo-Y.

Keywords

sex determination, reproduction, gene, sex chromosome, Y chromosome, X chromosome, gonad, mammal, bird, spiny rat, chicken, emu

Laboratory of Reproductive and Developmental Biology

Mizushima Lab

https://www2.sci.hokudai.ac.jp/faculty/en/researcher/shusei-mizushima

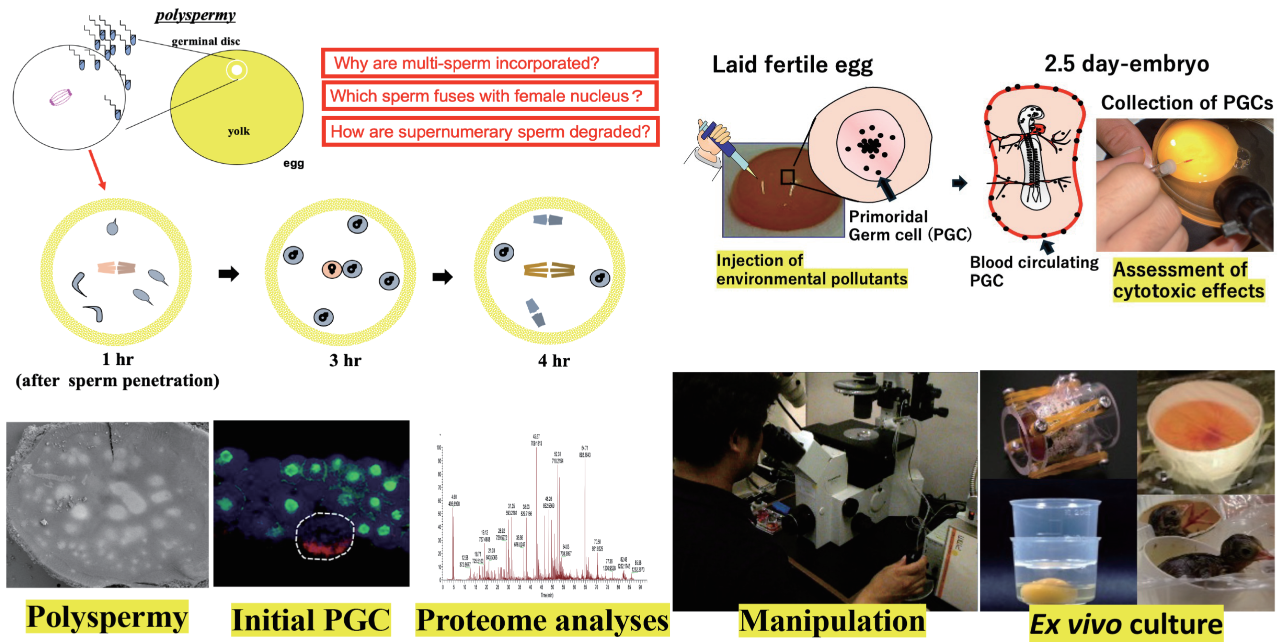
Associate Professor

Shusei Mizushima

https://researchmap.jp/mizushima-shusei?lang=en

Study abstract

The life of an organism begins at fertilization, and in the case of birds, primordial germ cells (PGCs), which are the precursor of germ cells, are formed just after fertilization. Fertilization in birds exhibits polyspermy, in which multiple sperm successively penetrate the egg at different points, whereas fusion with the female nucleus involves only one selected sperm nucleus. However, it has been shown that the ooplasm signaling generated by other supernumerary sperm in the egg plays a role in initial formation of PGCs. Our research group is conducting studies to elucidate the intracellular signaling. The effects of endocrine disrupting chemicals on early PGCs were also analyzed.



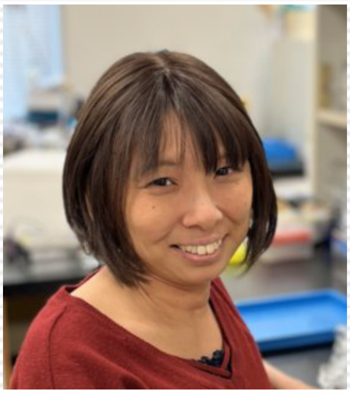
Keywords

Japanese quail, polyspermic fertilization, primordial germ cell, toxicity, cell biology, molecular biology

Laboratory of Reproductive and Developmental Biology
Kimura and Fujimori lab

https://apkimuralab.com/

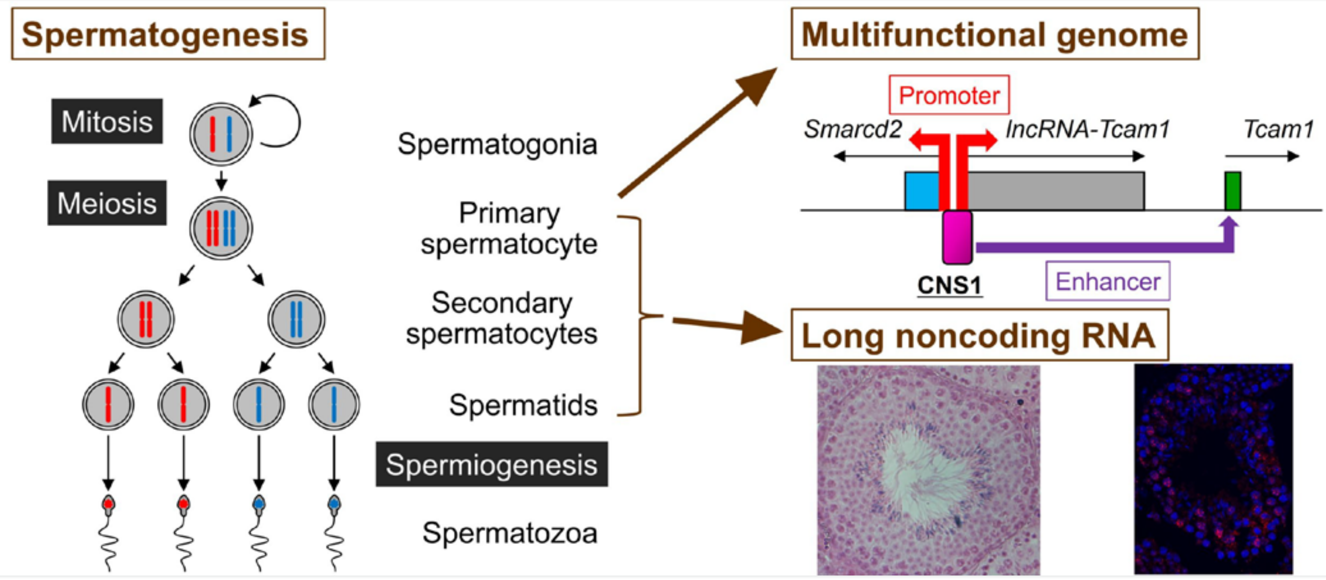
Professor
Atsushi P. Kimura
https://researchmap.jp/apkimura?lang=en



Assistant Professor
Chika Fujimori
http://researchmap.jp/c-fujimori?lang=en

Study abstract

We focus on the function of mammalian genome in reproduction. Our current main project is to reveal the function and action of long noncoding RNAs (lncRNAs) and multifunctional genome elements in the mouse testis. The testis expresses many genes and lncRNAs in different types of cells, and their physiological functions, regulation, and molecular mechanisms in spermatogenesis are our area of interest. Additionally, we are studying the reproductive regulation during vertebrate evolution, and the gene regulation in the ovary, the protease function in the ovary and placenta.



Keywords
molecular biology, reproductive biology, gene regulation, transcription, epigenetics, long noncoding RNA, multifunctional genome, dual promoter-enhancer, spermatogenesis, ovary, placenta, protease

Laboratory of Reproductive and Developmental Biology - Kotani Lab

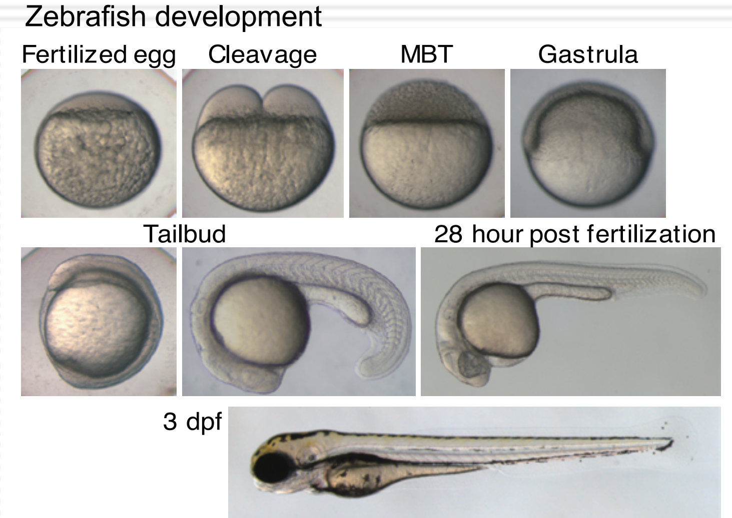
http://rep-dev.s2.weblife.me/pg36.html

Associate Professor
Tomoya Kotani
https://researchmap.jp/read0074110

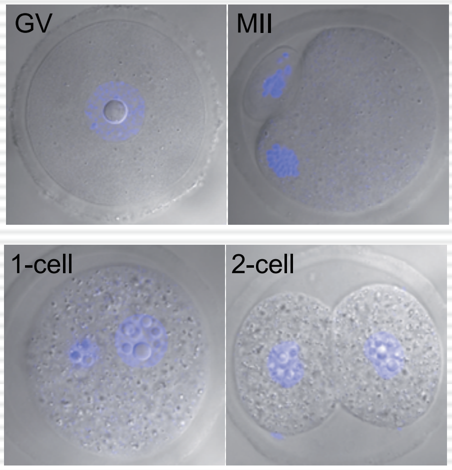
Study abstract

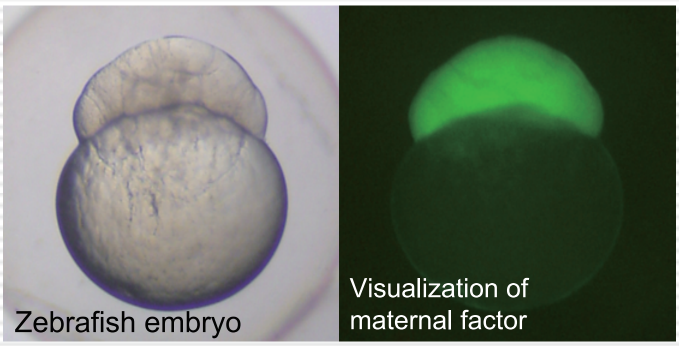
A multicellular organism begins with a single cell, the fertilized egg, and subsequently undergoes differentiation and morphogenesis to become an embryo. All cellular functions and patterning decisions that occur prior to the activation of the zygotic genome depend on maternal factors deposited in the egg during oogenesis, which become active after fertilization. By using zebrafish and mouse as model systems, we investigate the deposition of maternal factors in oocytes that promote developmental processes. Our aim is to identify novel mechanisms of oogenesis and developmental processes by isolating and analyzing maternal factors.

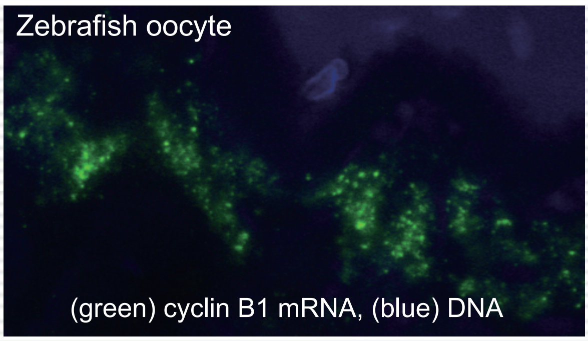
Zebrafish development



Mouse oocyte and development







Keywords

vertebrate, oocyte, egg, early development, maternal factor, cell biology, molecular biology, molecular genetics

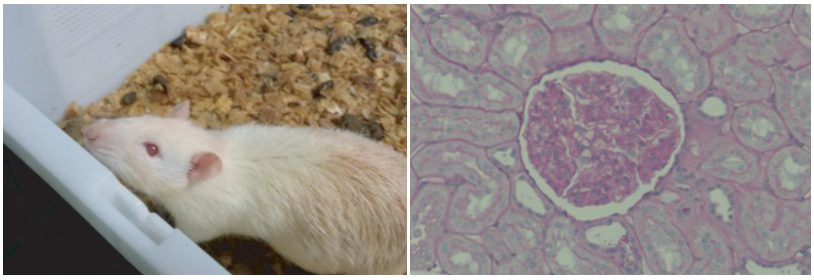
Laboratory of Animal Genetics
Kitada Lab

Associate Professor
Kazuhiro Kitada
https://researchmap.jp/read0200146?lang=en

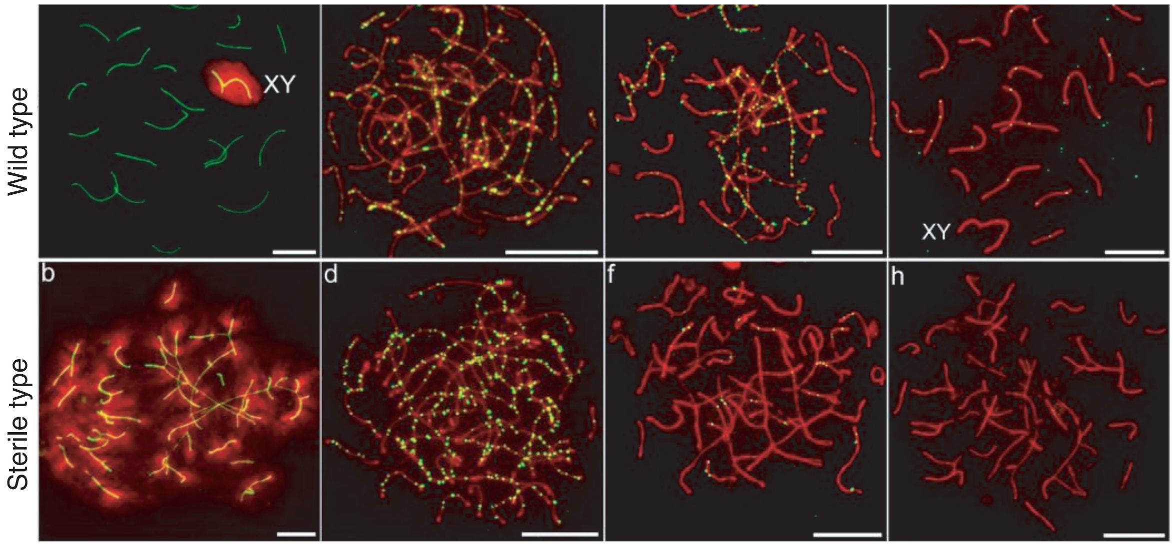
Study abstract

Completion of the genome sequence project and development of next-generation sequencing technique have dramatically changed the design of research strategy in biomedical science. However, functions of all genes in the whole genome are still not well understood even by now. We are elucidating the functions of disease-related genes by using gene-manipulated rats and mice generated in our laboratory.

Generation of genetically modified mice by microinjection.



A spontaneous diabetic rat (left) and its glomerulus of kidney that developed nephropathy (right).



Chromosome pairing in spermatocytes of wild rats (upper) and sterile mutant rats (lower) during meiosis.

Keywords
animal models for human diseases, gene manipulation, rat, mouse

TUITION FEES

	Undergraduate Students	Postgraduate Students	Research Students	Auditing Students
Tuition Fee	¥535,800 / year	¥535,800 / year	¥29,700 / month	¥14,800 / credit
Entrance Fee	¥282,000	¥282,000	¥84,600	¥28,200
Examination Fee	¥17,000	¥30,000	¥9,800	¥9,800

① At Hokkaido University, tuition is paid in two installments : May and November.

② Should tuition fees be revised during a student's period of enrollment, the new amount will become effective from that point on.

③ Students who fail to pay tuition fees for one term will not be allowed to continue.

④ Students enrolled in regular (degree-seeking) undergraduate and graduate courses who experience financial difficulty while maintaining excellent academic records may apply to receive a 100%, 50% or 25% tuition fee reduction.

⑤ Tuition Fees must be paid in yen.

TUITION FEE WAIVER PROGRAM

Q How easy is it to obtain a tuition fee waiver if I'm having financial difficulties?

A Each year, about 90% of applicants are successful in obtaining a tuition fee waiver of either 100%, 50% or 25%.

COST OF LIVING

How much money will I need?

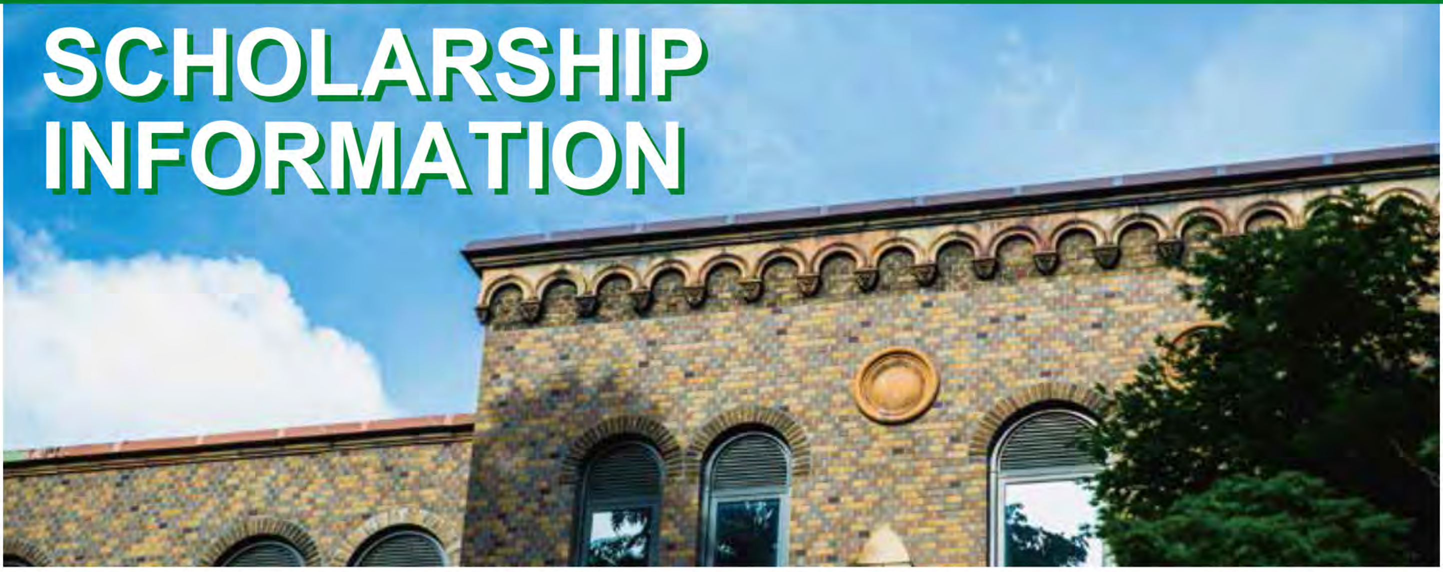
Housing ¥35,000～45,000	**Food** ¥20,000～35,000
Books ¥10,000～15,000	**Misc** ¥15,000～20,000

*The above are estimated costs and should be used as a guide only.

Budget
¥80,000~115,000 per month

Sapporo provides an excellent quality of life and a cost of living more reasonable compared with other major cities in Japan. Your budget will depend on the lifestyle you choose to lead (eating in restaurants or cooking at home, living in private accommodation or in University dormitories). Generally with tuition costs included, you should budget for ¥1,500,000 per year.

SCHOLARSHIP INFORMATION



Japanese Government

Japanese Government (Monbukagakusho) Scholarship

There are three methods to secure a "Monbukagakusho Scholarship":

① One method to apply for a scholarship is to receive a recommendation to MEXT from the Japanese Embassy or Consular Office in your country. To receive a recommendation, you need to pass a primary screening conducted by the local embassy with cooperation from your country's government. For more details, enquire at your local Japanese Embassy or Consular Office.

② Students coming to Hokkaido University can also apply through our University. Application is made through your prospective advisor. For details, visit our website.

③ Domestic Selection* : This category targets self-supported students currently studying in Japan.

*Japanese Government will not offer scholarships in this category from 2015 to 2024.

Hokkaido University

Special Grant Program for Self-Supported International Students

This program is for prospective international students seeking doctoral degrees or the international students selected for the "Program for Leading Graduate Schools" and equivalent programs. To obtain this special grant, applicants must have excellent academic records and be able to prove how their research can contribute internationally in their chosen field. International students selected for this program are hired as Research Assistants or receive a stipend and their tuition fees are waived.

Hokkaido University Frontier Fund Clark Scholarship

This scholarship is financed by donation, and for self-supported international students seeking doctoral degrees who have excellent academic records and need financial assistance.

For more detailed information, please refer to our website: https://www.oia.hokudai.ac.jp/cier/own-scholarship/

Private

Although highly competitive, there are a variety of scholarships that students can apply for after arriving in Japan.

Please refer to our website: https://www.oia.hokudai.ac.jp/cier/current/

Others

JASSO (Japan Student Service Organization)

This scholarship is open to undergraduate students taking the Examination for Japanese University Admission for International Students (EJU) or students who intend to enroll in a school/graduate school that offers pre-arrival admission. The monthly stipend is ¥48,000.

For details of pre-arrival scholarship, please visit: https://www.jasso.go.jp/en/ryugaku/scholarship_j/shoreihi/yoyaku_tonichimae.html

JICA (Japan International Cooperation Agency)

This scholarship is provided to JICA participants accepted by the University in order to support the development of human resources who will contribute to the development of their countries.

For more information, please refer to the JICA website: https://www.jica.go.jp/

STUDENT LIFE

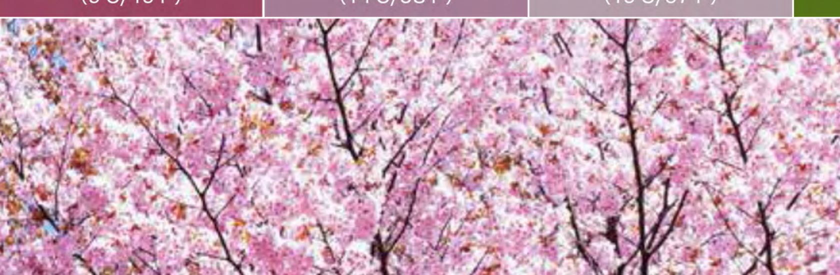
At Hokkaido University, there is more to student life than just lectures and tutorials. An abundance of opportunities awaits international students to become part of the many activities available on campus. There are approximately 50 cultural clubs and approximately 70 athletic clubs at Hokkaido University. If you wish to know Japan and get better acquainted with Japanese students, participation in club activities will prove to be extremely rewarding. The Student Support Division offers many kinds of cross-cultural events and cultural exchange opportunities which are open to international students, international researchers, their families, Japanese students, and University staff. Come by the Student Communication Station to find upcoming events on the message board or in the HU International Student Newsletter.

● Art ● Jazz ● Judo ● Rugby ● Ice Skating ● Dance ● Chorus ● Boating ● Track & Field ● Archery ● Curling ● Boxing ● Rakugo ● Cycling ● Yachting ● Handball ● Canoeing ● Volleyball ● Basketball ● Swimming ● Gymnastics ● Field Hockey ● Orienteering ● Cheerleading ● Cinema ● Photography ● Horseback Riding ● Mountaineering ● Skiing and many more.

CLIMATE IN SAPPORO CITY

*average daily temperatures

April	May	June	July	August	September
(9℃/49℉)	(14℃/58℉)	(19℃/67℉)	(24℃/75℉)	(27℃/80℉)	(22℃/71℉)



SPRING Pleasant temperatures with an abundance of colors

SUMMER Warm days full of sunshine with temperate mornings and evenings

ABOUT HOKKAIDO

Hokkaido is the northernmost region of Japan, consisting of one large island and more than 500 surrounding islands. Dotting the center of the main island are mountain ranges and impressive volcanoes surrounded by sweeping coastal plains. The islands' total land mass is 83,000km^2 which makes up 22% of the total land mass of Japan. Sapporo is known for its amazing food, unique history, natural beauty, and cosmopolitan character. With its fashionable restaurants, cafe culture, and relaxed atmosphere, it's often rated as one of the most desirable places to live in Japan. Sapporo offers a high quality lifestyle with its perfect blend of bustling city life and the natural peace of the great outdoors.

October	November	December	January	February	March
(13℃/56℉)	(7℃/44℉)	(-1℃/30℉)	(-4℃/24℉)	(-3℃/27℉)	(5℃/41℉)

AUTUMN All the beautiful colors of Autumn

WINTER Refreshing and invigorating days with sun and powdery snow

12 Research and Education Center for Brain Science
13 Institute for Genetic Medicine
14 Central Institute of Isotope Science
15 Frontier Research in Applied Sciences Bldg.
16 Environmental Preservation Center
17 Center for Language Learning
18 Center for Advanced Tourism Studies
19 The Open University of Japan; Hokkaido Study Center
20 Health Care Center

Research Institutes / Centers (North Campus Area)

1 Creative Research Institution (CRIS)
2 Center for Innovation and Business Promotion, Institute for the Promotion of Business-Regional Collaboration
3 Hokkaido Collaboration Center
4 Center for Food & Medical Innovataion, Institute for the Promotion of Business-Regional Collaboration
5 Shionogi Innovation Center for Drug Discovery
6 Platform for Research on Biofunctional Molecules (PRBM)
7 Frontier Research Center for Post-Genome Science and Technology
8 Arctic Research Center
9 Catalysis Research Center
10 Research Institute for Electronic Science
11 Green Nanotechnology Research Center
12 Research Center for Zoonosis Control
13 Institute of Low Temperature Science
14 Veterinary Teaching Hospital

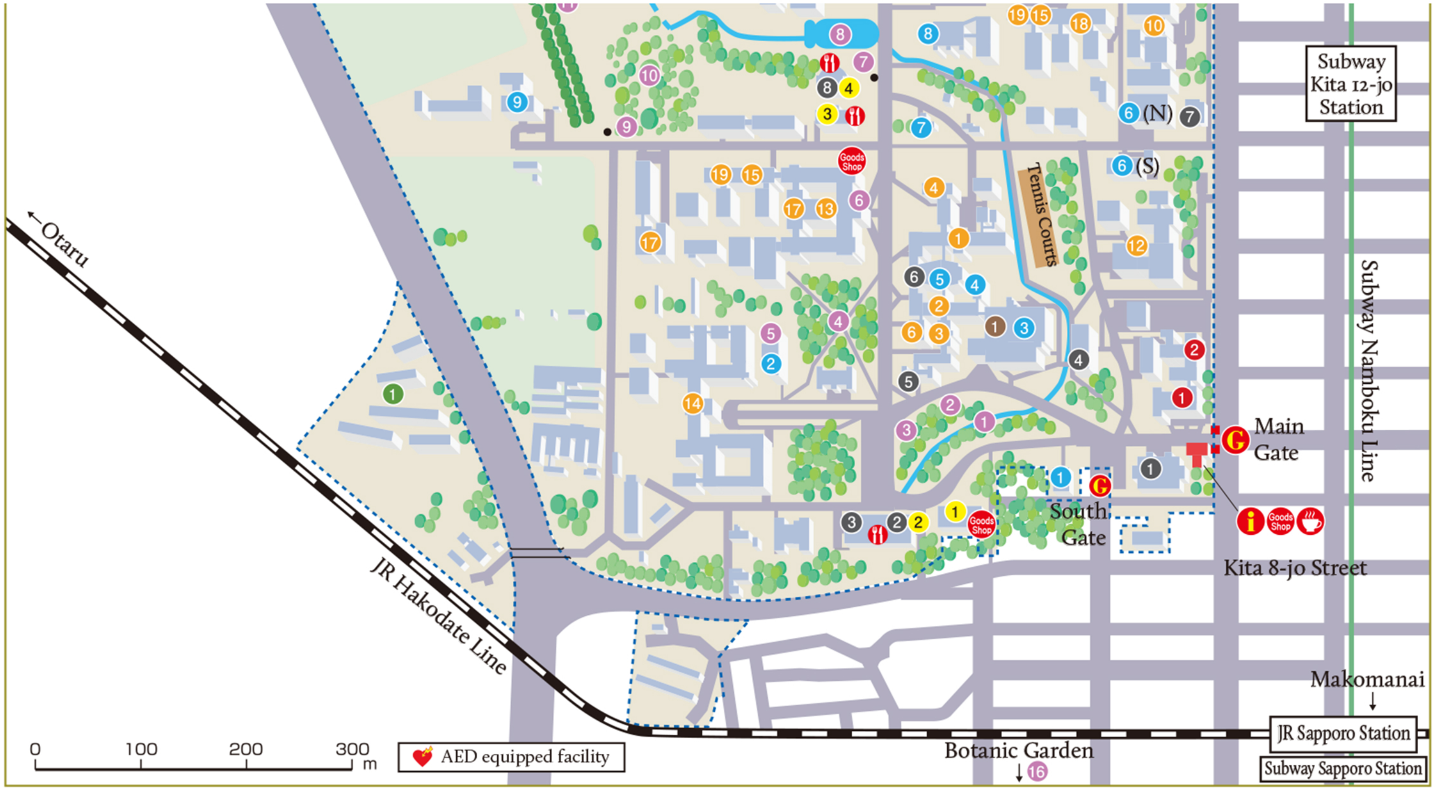
Facilities

1 Conference Hall
2 Clark Memorial Student Center
3 Career Center
4 Centennial Hall
5 Furukawa Hall
6 Humanities and Social Sciences Classroom Building
7 Kodomonosono Nursery
8 Faculty House Trillium
9 Experimental Farms
10 Student Services
11 Multimedia Education Building
12 Gym
13 Enyu Gakusha Community Hall
14 Sports Training Center

Libraries

1 University Library
2 North Library

Dorms



Hokkaido University Accommodations

1. Hokkaido University International House Kita 8 (Kita 8 Nishi 11)
2. ❤ Keiteki-Ryo Student Dormitory (Kita 18 Nishi 13)
3. Hokkaido University International House Kita 23 (Kita 23 Nishi 13)
4. Foreign Scholars' Accommodation (Kita 24 Nishi 12)

Tourist Spots

1. Sakushukotoni River
2. Central Lawn
3. Bust of Dr. William S. Clark
4. Elm Grove
5. Former School of Agriculture Library
6. ❤ The Hokkaido University Museum (Closed until July 2016)
7. Monument to First Artificial Snow Crystal
8. Ono Pond
9. Monument in Honor of Dr. Inazo Nitobe
10. Flowering Tree Garden
11. Poplar Avenue
12. Gingko Avenue
13. Heisei Poplar Avenue
14. Site of Old Village
15. Model Barn
16. ❤ Botanic Garden

Cafeterias / Restaurants / Stores

- i ❤ Information Center & Elm Forest Shop

1. Hokkaido University Co-op
2. Clark Cafeteria
3. ❤ Chuo Cafeteria, HU Co-op
4. Elm Restaurant
5. Restaurant Royal
6. ❤ Hokubu Cafeteria, HU Co-op
7. Restaurant Popular

University Organization

1. Administration Bureau
2. Front Office for Human Resource Education and Development
3. ❤ Hokkaido University Hospital
4. ❤ Dental Clinical Division of Hokkaido University Hospital
5. ❤ International Student Center
6. ❤ Office of International Affairs
7. Admission Center
8. ❤ Institute for the Advancement of Higher Education

Graduate Schools, Faculties and Schools

1. ❤ Graduate School of Letters
2. ❤ Graduate School of Law
3. ❤ Graduate School of Economics and Business Administration
4. Graduate School of Education
5. ❤ Graduate School of International Media, Communication and Tourism Studies
6. Graduate School of Public Policy
7. ❤ Graduate School of Medicine
8. ❤ Graduate School of Dental Medicine
9. ❤ Graduate School of Veterinary Medicine
10. ❤ Graduate School of Health Sciences
11. ❤ Graduate School of Information Science and Technology
12. ❤ Graduate School of Environmental Science
13. ❤ Graduate School of Science
14. ❤ Graduate School of Agriculture
15. Graduate School of Life Science
16. ❤ Graduate School of Engineering
17. ❤ Graduate School of Chemical Sciences and Engineering
18. ❤ Faculty of Pharmaceutical Sciences
19. Faculty of Advanced Life Science

＊The Graduate School of Fisheries Sciences is located on the Hakodate Campus

Research Institutes & Centers

1. ❤ Center for Ainu & Indigenous Studies
2. Center for Sustainability Science
3. Hokkaido University Archives
4. Slavic-Eurasian Research Center
5. Center for Experimental Research in Social Sciences
6. ❤ Information Initiative Center North / South Bldgs.
7. Archaeological Research Center
8. ❤ Center for Environmental and Health Sciences
9. ❤ Field Science Center for Northern Biosphere
10. ❤ Research Center for Integrated Quantum Electronics
11. Proton Beam Therapy Center

Getting to Sapporo Campus