Research Center
for Integrative Evolutionary Science

Program of Integrative Evolutionary Science

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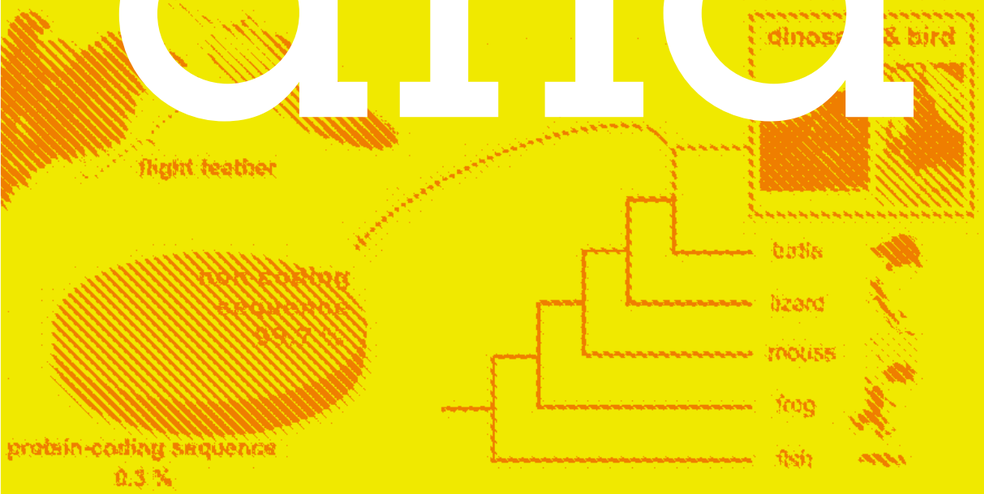
Research Center for Integrative Evolutionary Science
Program of Integrative Evolutionary Science,
Department of Advanced Studies

Marvels of our past and future



Contents

Program of Integrative Evolutionary Science, Department of Advanced Studies

Program Outline

Integrative Evolutionary Science is a new academic field that aims not only for the development of biology but also for elucidating the nature of human beings and solving social issues, through a comprehensive understanding of the change of living organisms, transition of human activities, and progression of global issues from an evolutionary perspective. The Program of Integrative Evolutionary Science, in collaboration with the Research Center for Integrative Evolutionary Science, aims to pursue and share truths with society, produce future leaders in this field, and to contribute broadly to the development of science and society.

This program consists of two programs: a five-year doctoral program for students with a bachelor's degree and a three-year doctoral program for students with a master's degree. Students in this program will conduct their studies and research activities at the Research Center for Integrative Evolutionary Science, located in Hayama, Kanagawa Prefecture.

Message from the Chair

What fuels our research? It is because we want to know more, because we are genuinely interested, because curiosity drives us, because we are on a mission to crack unsolved problems, and because we dream of making groundbreaking discoveries. Although the driving forces are different for everyone, we all share the same passion for research. Research is hard work, and often, it does not proceed as smoothly as planned and desired, with outcomes that may not align with our expectations. Nevertheless, we continue with our work, driven by the passion for the subjects and themes we study, as well as the routine that characterizes the work of a researcher. Lately, I have been pondering upon this aspect.

Program of Integrative Evolutionary Science is a new course that was introduced in 2023 at the Department of Evolutionary Studies of Biosystems, formerly known as the Institute of the Integrative Evolutionary Science Program. Numerous individuals have earned their PhDs from this prestigious institute. A graduate-level degree will be offered for this new course, providing education in a pioneering direction rooted in the founding principles of the Department of Evolutionary Studies of Biosystems. I look forward to working with students who harbor a profound enthusiasm for evolution, science, and their societal implications.

Chair of the Program

Nobuyuki Kutsukake

Petaurista leucogenys

Betta brownorum

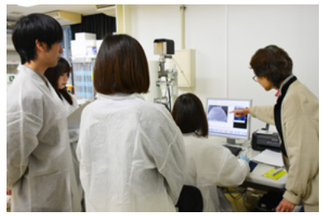
Annual Schedule

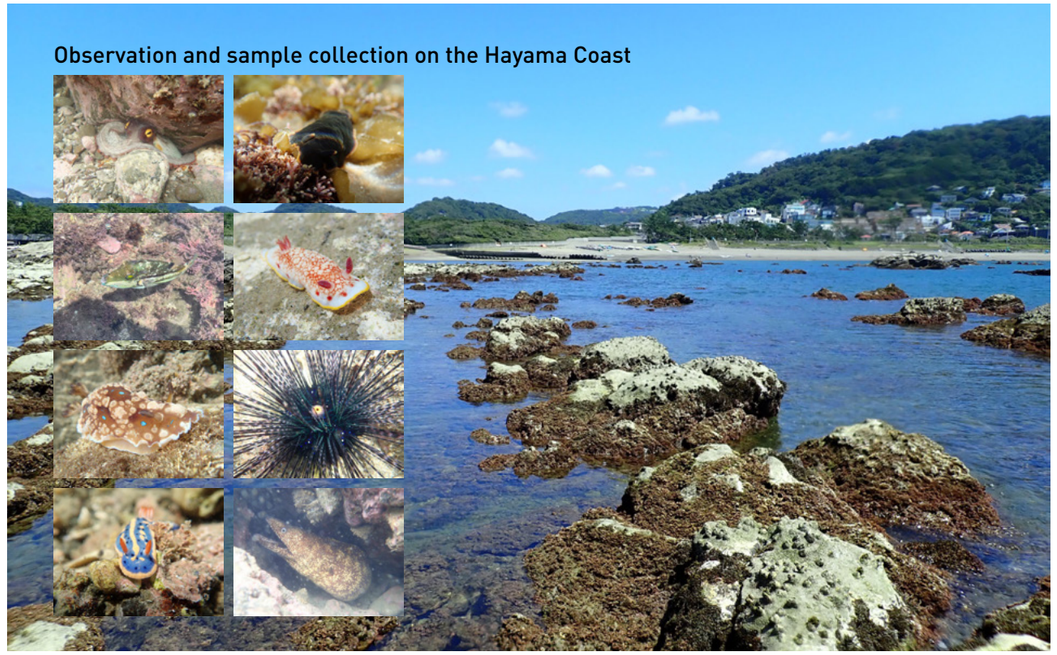
Entrance ceremony

SOKENDAI's entrance ceremonies are held in spring (April) and autumn (October). New students from all programs meet together at the Hayama Campus.

Laboratory of Basic Biology

The Laboratory of Basic Biology course aims to provide students with a comprehensive view of experimental biology through direct experiences with the knowledge and techniques of important and fundamental experimental methods that have contributed to the development of biology. The main practical training topics include molecular biology experiments, cell histology experiments, neurophysiology experiments, scanning/ transmission electron microscopy, programming and field training. Students learn not only the techniques of each experiment, but also report-writing skills.





April — May — June — July — August — September — October

Students enrolled in April

Students graduating in September

Briefing for entrance admission

Progress Report

Summer entrance admission

Degree conferment ceremony

Freshman Course

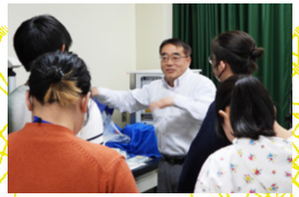
The Freshman Course is an intensive course mainly for new students. The Freshman Course has two main objectives. Firstly, it teaches the skills and objectives that every future researcher should acquire and think about. Secondly, it builds connections with people from different fields through exposure to the intellectual breadth that only SOKENDAI can offer. The Freshman Course consists of three sessions: 'Exploring Academia', 'Researchers and Society' and 'Communicative Skills for Researchers'. The Freshman Course is held twice a year in Japanese and English. The course content is the same in Japanese (starting in April) and English (starting in October) courses. Both courses are offered at the Hayama Campus (three days and two nights) in person and on-demand, and students must attend all classes to receive credit.

Open campus

At the Open Campus, entrance admissions and research in the Center are introduced through presentations and laboratory tours. In addition, attendants can learn about the research of the faculties and students through posters, obtain information, and discuss research by talking to the members in person.

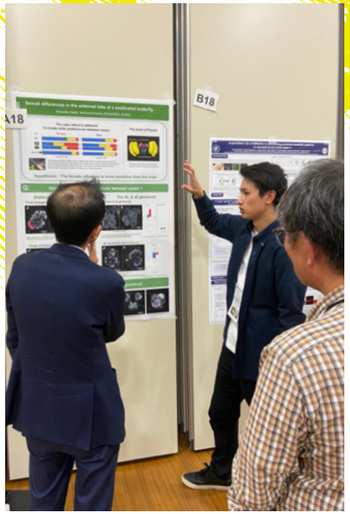
Briefing for entrance admissions

The Program of Integrated Evolutionary Science usually holds entrance admissions in summer and winter, with briefing sessions held in conjunction with these admissions. The main contents are lectures by several faculty members and an explanation of the course entrance admission. Attendants can talk with the faculty members at the venue.



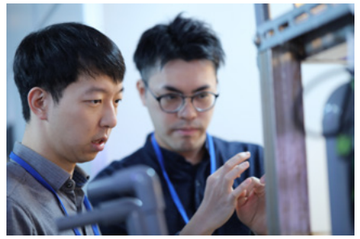
Life Sciences Retreat

This is a student-led academic exchange course that brings together SOKENDAI students and faculties engaged in life sciences research across program boundaries. The course aims to familiarize students with the life sciences through personal interactions. Various events are organized, including poster presentations, lectures by established researchers, and socializing events unique to the venue.



Students Collaboration with the University of Tokyo Misaki Marine Biological Station

The Research Centre for Integrated Evolutionary Science and the University of Tokyo Misaki Marine Biological Station organize a meeting event to promote student exchange and collaborative research. The main contents of this meeting are oral and poster presentations, tours of the research facilities of the two institutions, and socializing. It aims for intellectual exchanges between the two institutions that will continue in the future and lead to new research activities, such as the development of collaborative research.

October
- Students graduating in March
- Students enrolled in October
- Entrance ceremony
- Freshman course

November
- Briefing for entrance admission

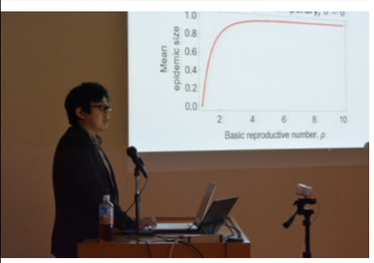
December

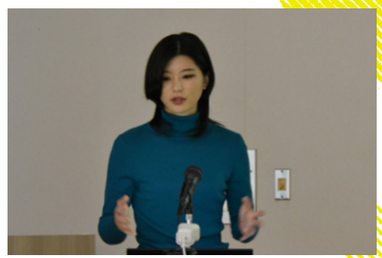
January
- Open campus

February
- Winter entrance admission

March

April



Integrative Evolutionary Science Progress Report

Integrative Evolutionary Science Progress Report

Twice a year, the Integrated Evolutionary Science Course holds a student research progress conference entitled Integrative Evolutionary Science Progress Report. The first-year students mainly present their research plans, and second-year students are assessed for progression.

Students in the third year and above are required to present their work in English. The review of the sub-thesis and the preliminary examination of the doctoral thesis also take place at this course. Faculty members, students, and researchers from the Research Center for Integrated Evolutionary Science participate in this important event, which is followed by an enthusiastic question-and-answer session.

Degree conferment ceremony

The SOKENDAI degree conferment ceremony is held on the Hayama Campus. The ceremony is held twice a year, in spring and autumn. We wish all graduates the best of luck in their future endeavors!

Omedetou gozaimasu!!!

Faculties

Kaori Iida

Associate Professor

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Expertise history of science and technology
Keywords history of biology/genetics, breeding studies, radiation

I have been interested in how genetics interacted with society in 20th century Japan. I have explored topics such as genetics and breeding, genetics and radiation, and genetics and eugenics. Currently, I am interested in analyzing some of the dynamics through the lens of transnational knowledge flow and science diplomacy. While it is often assumed that science is "international," not all knowledge flows equally and freely across borders. To understand the "friction" in the flow requires a transnational perspective. For far too long, the historiography of science in Asia, especially during the Cold War, has been heavily influenced by a US-centered narrative. To counteract this imbalance, we have established a research group to reexamine science and technology in Cold War Asia from a trans-Asian perspective and are working on a diverse set of cases.

Selected publications

Iida K (2020) Peaceful atoms in Japan: Radioisotopes as shared technical and sociopolitical resources for the Atomic Bomb Casualty Commission and the Japanese scientific community in the 1950s. *Stud Hist Philos Biol Biomed Sci* 80:101240.

Naoki Irie

Professor

Lab. for Developmental Evolution

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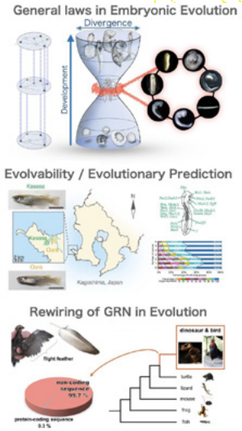
Expertise Developmental Evolution
Keywords Animal Evolution, law in embryonic evolution, prediction of phenotypic evolution



The evolution of organismal characteristics (phenotypes) is not entirely unrestricted; some traits are more prone to change throughout evolution than others. How do such differences arise? It may simply be due to differences in the selection pressures exerted by natural selection. On the other hand, there might be features that inherently generate less phenotypic variation, serving as a limited foundation for diversification. While the latter idea is not new, recent studies are increasingly providing empirical support for it.

So, what mechanisms lead to the difficulty in generating the foundational variations that contribute to diversification? In our research lab, we are tackling this question by employing various methods, including experiments on animals and large-scale information analyses. Ultimately, our aim is to contribute to transforming evolutionary studies from a discipline primarily focused on historical aspects into a field with predictive theories regarding which phenotypes are more likely to evolve.

Selected publications

Hu H et al. (2017) Constrained vertebrate evolution by pleiotropic genes. *Nat Ecol Evol* 1:1722–1730.

Uchida Y et al. (2023) Stability in gene expression and body-plan development leads to evolutionary conservation. *EvoDevo* 14:4.

Hideki Innan

Professor

Population Genetics and Genome Evolution

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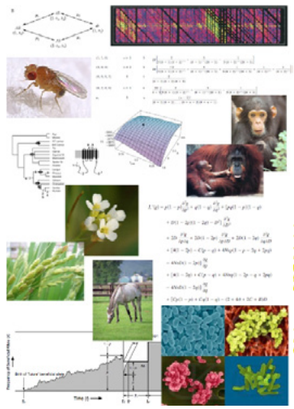
Expertise Population Genetics・Genome Evolution

Keywords Evolution・Genetics・Theory

Evolution of organisms is understood through the evolution of its blueprint, the genome. Our aim is to theoretically elucidate the universal laws underlying this process. Because genetic laws are fundamentally the same across species, it becomes possible to construct highly generalizable theories. In some cases, this involves advanced mathematical research incorporating natural selection and stochastic factors. Additionally, we conduct genome data analysis using theoretical frameworks and verify our theories through empirical data analysis.



Selected publications

Innan H and Kondrashov F (2010) The evolution of gene duplications: classifying and distinguishing between models. *Nat Rev Genet* 11: 97-108.

Innan H and Sakamoto T (2021) Multi-dimensional diffusion process of allele frequencies in population genetics. *Proc Jpn Acad* Ser B 97:134-143.

Tatsuya Ota

Associate Professor

Molecular Evolution Lab.

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Expertise Molecular Evolution

Keywords Molecular Evolution, Immunity, Plant domestication

The main aim of our research is to understand the evolution of complex biological systems though the knowledge of molecular evolution and population genetics. With analyzing ever accumulating genomic and transcriptomic data, the evolutionary processes of genes and/or genomes involved in the following biological systems or processes have been investigated.

1. Evolution of vertebrate immune systems
   Research to identify and characterize immunological molecules among various vertebrate genomes, such as of lungfish, coelacanth, spotted gar, and bowfin shed light on the significant functional roles of immunological genes, and their unique evolutionary patterns illustrate the importance of various evolutionary forces to sustain living organisms.
2. Domestication process of cultivated plants
   Domestication of wild plants is one of important steps for human being to be able to maintain the food (energy) sources for their survival. Artificial selection, whether it is conscious or unconscious, has certainly operated on the establishment of cultivated plants, and many features associated with the processes, often called as domestication syndrome, are intriguing materials to study evolutionary processes.

Selected publications

Fawcett JA, Takeshima R et al. (2023) Genome sequencing reveals the genetic architecture of heterostyly and domestication history of common buckwheat. *Nat Plants* 9:1236–1251.

Thompson AW et al. (2021) The bowfin genome illuminates the developmental evolution of ray-finned fishes. *Nat Genet* 53:1373-1384.

Hisashi Ohtsuki

Associate Professor

Mathematical Biology Laboratory

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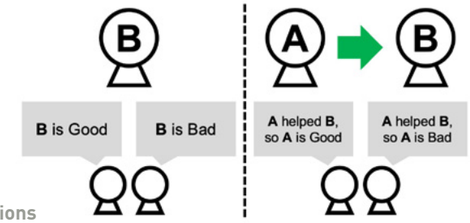
Expertise Mathematical Biology

Keywords Sociobiology, Evolutionary Ecology, Evolutionary Studies of Human Behavior

I study various questions of biological phenomena by using mathematics and computers. I am interested in both micro- and macroscopic phenomena. I have so far studied following themes.
(1) Emergence and maintenance of sociality in various organisms: Kin discrimination and collective cooperation by microbes, Evolution of division of labor and reproductive schedule in social insects, Evolution of altruistic behavior and punishment in spatially structured populations,
(2) Evolutionary ecology: Mechanisms of mutualism between rhizobia and legumes, Biodiversity of tropical rainforests,
(3) Human behavior from evolutionary perspectives: Evolution of indirect reciprocity, Cumulative evolution of culture, Evolution of menopause, and
(4) Diseases: Epidemiological dynamics of infectious diseases, Evolution of cancer, Statistical analysis of human infertility.
My goal is to reveal the mechanism of how evolution produces adaptation and diversity, to give explanations to past and future biological phenomena, and to predict future, through combining methodologies in evolutionary studies, genetics, and ecology. I also develop theoretical tools including evolutionary game theory and adaptive dynamics theory.



Selected publications

Fujimoto Y and Ohtsuki H (2023) Evolutionary stability of cooperation in indirect reciprocity under noisy and private assessment. *Proc Natl Acad Sci* USA 120:e2300544120.

(In Japanese) Hasegawa T, Hasegawa M and Ohtsuki H (2022) Evolution and Human Behavior, 2nd Edition, University of Tokyo Press.

Yukinori Oonishi

Lecturer

Philosophy of Science

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Expertise Philosophy of science

Keywords scientific realism debate, problem of demarcation, confirmation theory, scientific representation, natural kinds, machine learning

Philosophy of science studies various aspects of science, including its method, concepts, or its social aspects. It also studies the world view that particular scientific theories may imply. Among these, my interests are mainly in the epistemological issues of science. In particular, I have been working on projects related to the scientific realism debate, scientific representation, and the problem of confirmation. Recently, I'm also interested in a new type of research practice using emerging technologies such as deep learning or data assimilation.

Selected publications

Bueno O and Onishi Y (2020) The likelihood ratio measure and the logicality requirement. *Erkenntnis* 87: 459–475.

Onishi Y (2017) Defending the selective confirmation strategy. *Stud Hist Philos Sci* Part A 64: 1–10.

Michiyo Kinoshita

Associate Professor

Behavioral Neuroscience (Neurothology)

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Expertise Neuroethology, Visual ecology, Sensory physiology, Cognitive science, Comparative physiology

Keywords Insect, Flower foraging behavior, Target recognition

I am interested in how animals perceive this world. Unfortunately, we never experience the world as animals perceive. This is just because the sensory systems of humans and animals are not the same. However, we may predict their world by measuring their cognitive abilities by behavioural assays and investigating their nervous system. Neuroethology or behavioral neuroscience is the field to investigate how the brain controls behaviour and aims to "understand" their world as realistically as possible.

My research group investigated the spectral organization of the compound eyes of swallowtail butterflies, measured their visual abilities by flower-visiting behaviour, and clarified the relationship between visual abilities and the system of the compound eyes. Currently, we are investigating 1) the encoding of spectral and polarized light information in the brain, 2) the integration of vision and olfaction in flower-visiting behaviour, and 3) flower species visited by swallowtail butterflies in the field. In the future, we would like to study the 'flower-insect relationship' and the 'evolution of vision and its cognitive abilities in lepidopteran insects.

Selected publications

Kinoshita M and Arikawa K (2023) 'Color' processing in the butterfly visual system. *Trends in Neuroscience* 46:338-340.

Kinoshita M et al. (2017) Multisensory integration in Lepidoptera: insight into flower-visitor interactions. *Bioessays* 39:1600086.

Nobuyuki Kutsukake

professor

Animal Behaviour

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Expertise Animal Behaviour, Behavioral Ecology, Evolutionary Biology, Primatology

Keywords animals, behaviour, society

The observation of animals leads to questions such as "How do they live?" "What are they thinking?" "What do they know and understand?" and so on. My goal is to analyze the behavior and ecology of animals and to answer those questions from a standpoint of adaptive evolution. I have been studying vertebrates, mainly mammals, but also birds and fish. I stay in the field where wild animals live, identify and name each individual, and record their behaviour every day. A good way to understand animals is to observe the study subject so closely that the subjects appear in your dreams. On the other hand, an efficient strategy to understand animals is to think about patterns and theories common to many animals. I hope to work with graduate students and young researchers who have strong interests in animals.

Selected publications

Yamakawa M et al. (2024) Helping syndrome is partially confirmed in the eusocial naked mole-rat. *Anim Behav* 210:289-301.

Jun Gojobori

Lecturer

Human Evolutionary Genetics Lab.

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Expertise Physical Anthropology, Molecular Evolution, Population Genetics

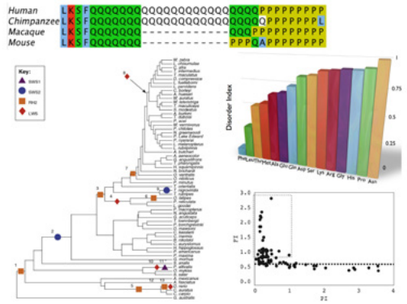
Keywords Human, Genetics, Population

We explore how organisms evolve at the molecular level. The major focus is on the population process, where new mutations arise which are subsequently subject to selection and random genetic drift. We mainly use a theoretical approach to understand the evolutionary mechanisms behind inter- and intra-specific DNA variation under a wide range of evolutionary forces, such as adaptive selection, balancing selection, speciation, gene duplication. The accumulation of these studies promises to provide profound insights into the overarching principles governing molecular evolution.

Selected publications

Gojobori J et al. (2024) Japanese wolves are most closely related to dogs and share DNA with East Eurasian dogs. *Nat Commun* 15:1680.

Mizuno F, Gojobori J et al. (2021) Population dynamics in the Japanese Archipelago since the Pleistocene revealed by the complete mitochondrial genome sequences. *Scientific reports* 11:12018-12018.



Akira Sasaki

Professor

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Expertise Mathematical Biology, Evolutionary Biology, Ecology

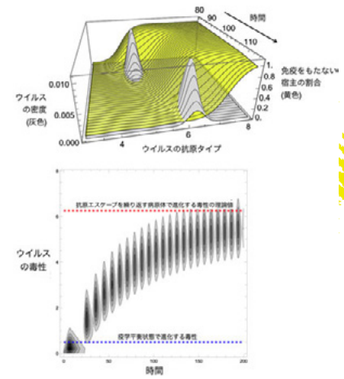
Keywords Mathematical models, Evolution, Ecology, Behavior

I study, by using mathematical models, topics such as how complex behaviors and sophisticated strategies of organisms have evolved, in what direction interspecies interaction evolves, and how to predict and the spread and evolution of pathogens, pests and invading species. Examples of recent findings of our theoretical studies include: the inevitable emergence of 'living fossils' in the peripheral niches of a taxonomic group as a consequence of Darwin-Darlington flow of species from central to peripheral niches; the evolution of greater virulence in pathogens such as SARS-CoV2 and influenza A viruses that repeated escape host immunity by mutation; and a greater risk of evolutionary breakdown of interspecific relationship in mutualistic systems than in parasitic systems.

Selected publications

Ito HC and Sasaki A (2023) The adaptation front equation explains innovation-driven taxonomic turnovers and living fossilization. *Am Nat* 202:E163-E180.

Sasaki A et al. (2022) Antigenic escape selects for the evolution of higher pathogen transmission and virulence. *Nat Ecol Evol* 6: 51-62.



Yoko Satta

Professor

Evolutionary Physiology

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Expertise Genomic population genetics・Human evolution

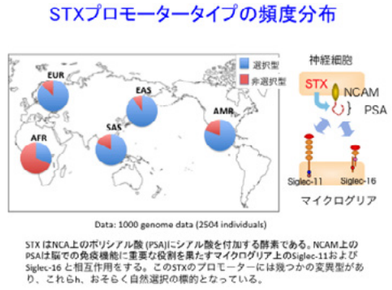
Keywords introgression・ancestral polymorphism・computer simulation・pseudogene・natural selection

Human beings, who have enjoyed unprecedented prosperity through the development of science and technology, are now facing a variety of problems. One of the root causes of these problems is that "man" does not fully recognize his own existence as a living being. To recognize our existence as an organism, it is essential to understand how we have evolved in the natural environment. In other words, phenotypic evolution, which includes morphological and physiological traits, has been driven by natural selection. This process involves the adaptation of individuals to their environment at a given time, resulting in the production of offspring and their subsequent survival. The existence of "man" is a consequence of such adaptation to the present environment including cultures. Our research goals are to elucidate environmental adaptations inscribed in the genome and to determine what "human beings as organisms" are.

Selected publications

Lau Q et al. (2015) A limit to the divergent allele advantage model supported by variable pathogen recognition across HLA-DRB1 allele lineages. *Tissue Antigens* 86:343-52.

Satta Y et al. (2019) Two-dimensional site frequency spectrum for detecting, classifying and dating incomplete selective sweeps. *Genes Gen Syst* 94:283-300.



Hideyuki Tanabe

Associate Professor

Laboratory of Chromosome Biology

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Expertise Molecular Cytogenetics, Chromosome Biology

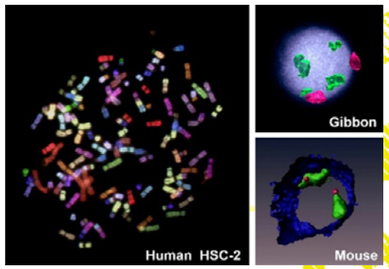
Keywords Chromosome territories, FISH techniques, Karyotypic evolution

Focusing on chromosomes in the cell nucleus, I am investigating how the spatial arrangement of chromosome territories and genes is regulated within the cell nucleus by molecular cytogenetic approaches, mainly fluorescence in situ hybridization (FISH) techniques using a great deal of cultured cells derived from various species. In the nuclear architecture there are hierarchical structures from DNA to chromosome territories such as A/B compartments, Topologically Associating Domains (TADs), and chromatin loop structures. The dynamics and regulation of their spatial arrangement as well as their relationship to karyotypic evolution remain largely unknown. Therefore, I am aiming to elucidate the molecular basis of nuclear architecture of chromosome territories and their hierarchical structures by using multicolor 2D-/3D-FISH techniques and combined other methods. Also I am trying to construct the catalogue of whole chromosomes and karyotypes of all living species through organizing cellular resources of various species.

Selected publications

Kimura A et al. (2021) Identification of chromosome 17 trisomy in a cynomolgus monkey (Macaca fascicularis) by multicolor FISH techniques. *Cytogenet Genome Res* 161: 243-248.

Tanabe H et al. (2002) Evolutionary conservation of chromosome territory arrangements in cell nuclei from higher primates. *Proc Natl Acad Sci* USA 99: 4424-4429.



Takumi Tsutaya

Assistant Professor

Lab of Biological Anthropology

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Expertise Biological anthropology, Primatology, Bioarchaeology, Paleontology

Keywords Palaeoproteomics, Stable isotope analysis, Orangutan

We investigate lived experiences, life history, and evolution of Hominidae. In particular, we use protein and isotopic analyses to retrospectively reconstruct evolution and life phenomena that cannot be determined from DNA analysis. Our recent focus includes the following theme, and we employ various methodologies from the field to the laboratory.

- Applying palaeoproteomics to archaeology to investigate the history of disease, the relationship between humans and animals, and gender in the past.
- Reconstructing the phylogeny, evolutionary history, and extinction of extinct animals, including hominins, by molecular analysis of paleontological specimens.
- Managing a research site for wild Bornean orangutans and conducting research related to primate ecology, human evolution, and zoonosis.

Selected publications

Uchida-Fukuhara Y et al. (2024) Palaeoproteomic investigation of an ancient human skeleton with abnormal deposition of dental calculus. *Sci Rep* 14:5938.

Tsutaya T et al. (2021) Faecal proteomics as a novel method to study mammalian behaviour and physiology. *Mol Ecol Resour* 21:1808–1819.

Yohey Terai

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Expertise Adaptation・speciation・ancient genome

Keywords Local adaptation・vision・macaque・lichen・dog/wolf

The earth is home to many "species" of organisms, generating biodiversity. Biodiversity has been achieved through a process of "speciation," in which one species is divided into two species, and through a process of "adaptation," in which organisms survive in their habitat. We focus on the following four research areas to elucidate the mechanisms of adaptation and speciation in organisms. [Speciation]: the speciation of seven macaque species endemic to Sulawesi and corals based on genome analysis. [Adaptation via symbiosis]: the mechanism of adaptation to a new environment through symbiosis using the lichen. [Adaptation to the human environment]: the origin of dogs and how dogs have adapted to their living environment with humans based on the ancient genomes of Japanese wolves and ancient dogs. [Adaptation of vision to light environments]: how organisms have adapted their vision to different light environments in the water using fish and reptiles.

Selected publications

Gojobori J et al. (2024) The Japanese wolf is most closely related to modern dogs and its ancestral genome has been widely inherited by dogs throughout East Eurasia. *Nature Communications* 15:1680.

Yohey Terai (2018) Exploring the Mystery of Biodiversity DOJIN

Bioarchaeology

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Zooarchaeology

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Expertise Zooarchaeology
Keywords Neolithic, Neolithization, Domestication, Faunal Remains, Southwest Asia, East Asia

My research concerns the relationship between humans and the environment, especially in the aspect of resource exploitation that shaped the socio-economic and cultural changes in human history. Neolithization resulted in one of the most drastic shift in the life of humankind. I have been carrying out fieldworks to collect data of animal bone remains excavated from early Neolithic sites in West Asia to investigate emergence of sedentary settlements about 15000 years ago and the process of domestication of plants and animals that eventually facilitated the development of complex societies. Sedentism and domestication also led to increasing manipulation of the ecosystem by humans, which was the beginning of the global environmental crisis today. We need both biological and sociocultural points of view to understand the coevolutionary process of humans and animals or plants in the course of domestication. For this I promote integrative cooperation of researchers of various related fields, such as archaeology, ancient genome analysis, environmental sciences, behavioral ecology, and anthropology.

Selected publications

Hongo H et al. (2021) Beginning of pig management in Neolithic China: Comparison of domestication processes between northern and southern regions. *Animal Frontiers* 11:30-42.

Ervynck A et al. (2001) Born Free? New Evidence for the Status of Sus scrofa at Neolithic Çayönü Tepesi (Southeastern Anatolia, Turkey). *Paléorient* 27: 47-73.

Evo-devo Neurobiology

Takayuki Watanabe

Assistant Professor

Laboratory of Evolutionary Developmental Neurobiology

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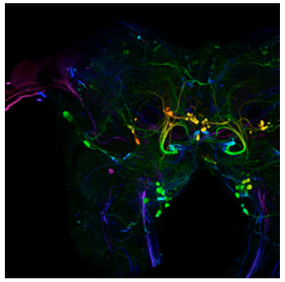
Expertise neuroethology, molecular evolution
Keywords neurogenetics, insect social behavior, behavioral development, cricket

Many animals, including insects, dynamically change their body plans on their way to adulthood through a developmental process called metamorphosis. The acquisition of a new body plan through metamorphosis requires the reorganization of the nervous system that controls the body after metamorphosis. The brain of holometabolous insects show drastic morphological changes during pupa, which are required to prepare for adult-specific behaviors. On the other hand, hemimetabolous insects, which do not have a pupal stage, become adults without remarkable structural reorganization of their nervous systems but exhibit adult-specific behaviors like courtship that they did not exhibit during nymphal stages. We are using the two-spotted cricket *Gryllus bimaculatus* as an experimental model to understand the molecular mechanisms and functional significance of the neural circuit reorganization that may accompany metamorphosis. Using neurogenetic techniques (i.e., transgenesis and genome editing), we are investigating the molecular and neural basis and developmental mechanisms of adult-specific and sex-specific social behaviors such as male aggression and courtship behaviors.

Selected publications

Watanabe T (2019) Evolution of the neural sex-determination system in insects: does *fruitless* homolog regulate neural sexual dimorphism in basal insects? *Insect Mol Biol* 28:807-827.

Watanabe T et al. (2018) Immediate-early promoter-driven transgenic reporter system for neuroethological researches in a hemimetabolous insect. *eNeuro* 5:e0061-18.2018.



Marine Ecology

Yuuki Watanabe

Professor

Marie Ecology Lab

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Expertise Ecology, Marine Biology
Keywords Biologging, Marine Predators

We investigate the ecology of large fishes and marine mammals using the “bio-logging” technique, in which measuring instruments are attached to the animal’s body. By using state-of-the-art equipment, we measure not only the behavior of animals, but also their surrounding environment and internal states (body temperature, heart rate, etc.). We also attach video cameras to the backs of animals to record “animal-eye” footages and examine what the animals are doing in the ocean. Our primary approach is to analyze the data collected by biologging from fieldwork combined with data from the literature or those obtained by other research methods, to explore the ecological significance (ultimate causes) that have driven the evolution of the behavior or physiology of the species in question. Our research currently focuses on sharks, other large fishes, and seals. We conduct fieldwork in Kanagawa (Sagami Bay near SOKENDAI's Hayama campus), Kochi, and Okinawa in Japan, and in Taiwan, Canada, Australia, and Norway outside Japan.

Selected publications

Watanabe YY and Papastamatiou YP (2023) Biologging and biotelemetry: tools for understanding the lives and environments of marine animals. *Annu Rev Anim Biosci* 11:247-267.

Watanabe YY et al. (2020) Ultrahigh foraging rates of Baikal seals make tiny endemic amphipods profitable in Lake Baikal. *Proc Natl Acad Sci* USA 117:31242-31248.

Atsuko Matsushita

Lecturer

Academic and Research Support group

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As a research hub for Integrated Evolutionary Science, we will promote RCIES in various aspects.

Joint Use of Research Facilities

We support the use of:Confocal laser microscopes (Nikon, Zeiss), Scanning Electron Microscope (JEOL), and Transmission Electron Microscope (Hitachi)

Obtaining research funds

We support for preparing research grant applications.

PR

We keep appealing activities of RCIES.

Mediating Collaboration

We mediate collaborative research especially on evolution.

Environmental safety

We take safety measures for research environments such as laboratories, manage chemical substances and experimental equipment, and report on environmental safety management to surrounding areas.

Class

Laboratory of Basic Biology Macro Biology

Hitomi Hongo Associate Professor

Comparing animal characteristics based on bone morphology

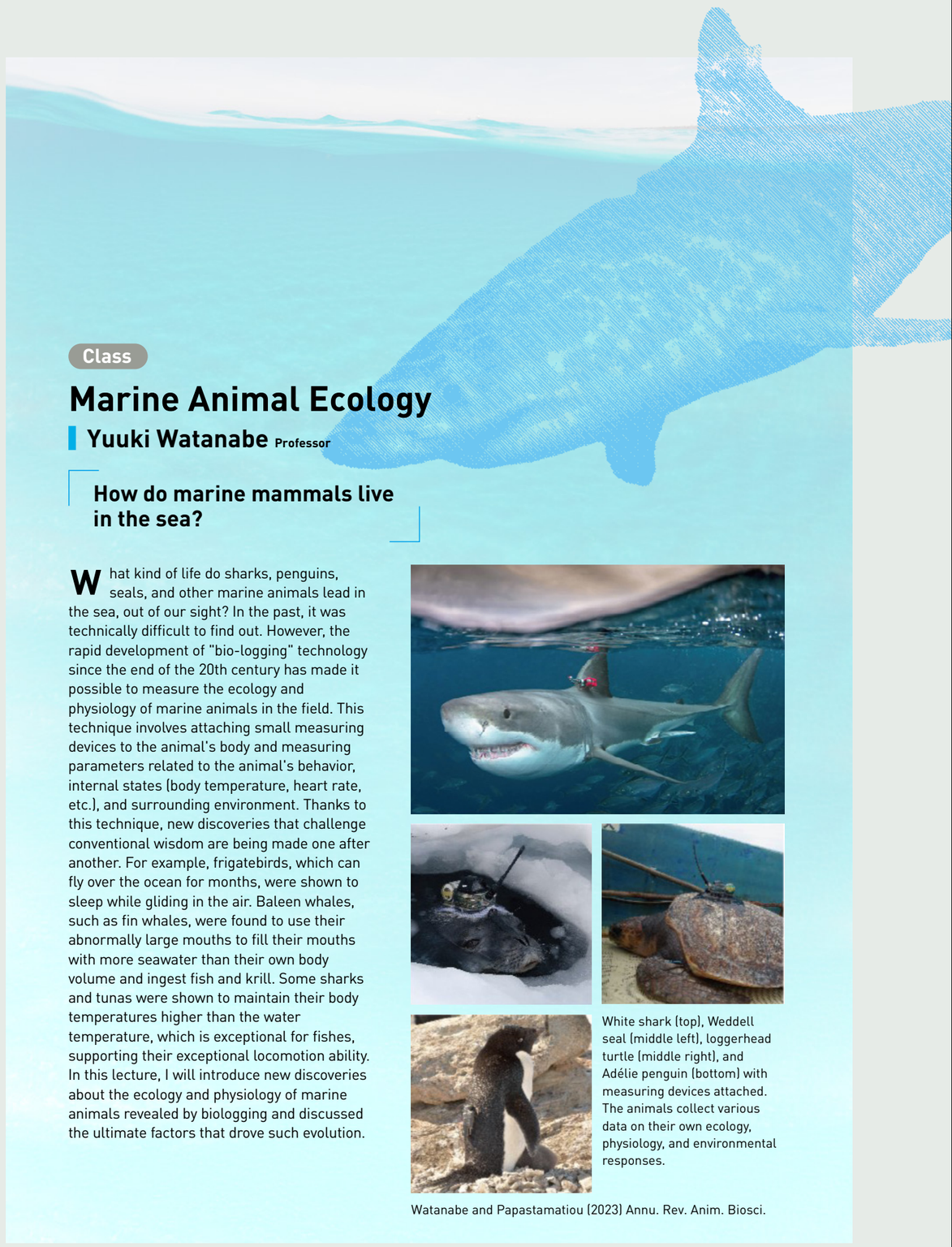
We use the collection of various animal skeletons, both modern and archaeological, as well as cast models of humans and rare species, housed in the Hongo Lab. Students compare the shape of each skeletal element in general and some of the unique morphological characteristics that can be used to differentiate species.

Macro Biology lecture covers human evolution over 6 million years, mainly based on the morphological changes. Casts of fossil hominid skeletons are used to see the differences in Australopithecines, Homo sp. and anatomically modern humans.

In the Laboratory of Basic Biology, we compare postcranial skeletons and teeth of different groups of mammals, such as primates, carnivores, herbivores, omnivores, and rodents, noting the differences that are related to the animals' diet and locomotion. We also compare bird and fish skeletons with mammals. Students will be given a bag of archaeological animal bone remains to experience identification of fragmented bones.

Hasankeyf Höyük site, Tigris River basin, Turkey (11,500 years ago).

Mixed herds of grazing sheep and goats in modern Turkey.



Class

Marine Animal Ecology

Yuuki Watanabe Professor

How do marine mammals live in the sea?

What kind of life do sharks, penguins, seals, and other marine animals lead in the sea, out of our sight? In the past, it was technically difficult to find out. However, the rapid development of "bio-logging" technology since the end of the 20th century has made it possible to measure the ecology and physiology of marine animals in the field. This technique involves attaching small measuring devices to the animal's body and measuring parameters related to the animal's behavior, internal states (body temperature, heart rate, etc.), and surrounding environment. Thanks to this technique, new discoveries that challenge conventional wisdom are being made one after another. For example, frigatebirds, which can fly over the ocean for months, were shown to sleep while gliding in the air. Baleen whales, such as fin whales, were found to use their abnormally large mouths to fill their mouths with more seawater than their own body volume and ingest fish and krill. Some sharks and tunas were shown to maintain their body temperatures higher than the water temperature, which is exceptional for fishes, supporting their exceptional locomotion ability. In this lecture, I will introduce new discoveries about the ecology and physiology of marine animals revealed by biologging and discussed the ultimate factors that drove such evolution.

White shark (top), Weddell seal (middle left), loggerhead turtle (middle right), and Adélie penguin (bottom) with measuring devices attached. The animals collect various data on their own ecology, physiology, and environmental responses.

Watanabe and Papastamatiou (2023) Annu. Rev. Anim. Biosci.

Graduate life and course work

Student A, field research (zooarchaeology)

Courses

By obtaining the main credits in my first and second years, I was able to concentrate more on my research from my third year afterwards.

First year 22 credits

[First semester] 10 credits

Freshman Course
Micro- and Macro-scopic Biology
Laboratory of Basic Biology
Introduction to the "Biological Science" Sub-thesis
Biostatistics
Evolutionary Behavioral Ecology

[Second semester] 3 credits

Science, Technology and Society I
(Present: Introduction to Philosophy of Science)
Academic English (Basic) I (Present: Integrative Evolutionary Science Academic English (Basic) 1)

[Full year] 9 credits

Special Seminar Series I (Present: Integrative Evolutionary Science Special Seminar Series I)
Progress Report I (Present: Integrative Evolutionary Science Progress Report IA & IB)
Specific Research I (Present: Dissertation Work in Advanced Studies IA•IB)

Second year 11 credits

[First semester]

Nothing

[Second semester] 3 credits

Science Academic English (Advance)(Present: Integrative Evolutionary Science Academic English (Advance) 1)
Integrative Anthropology
Advanced Course X (Present: Genome Biology)

[Full year] 8 credits

Special Seminar Series II (Present: Integrative Evolutionary Science Special Seminar Series II)
Progress Report II (Present: Integrative Evolutionary Science Progress Report IIA & IIB)
Specific Research II (Present: Dissertation Work in Advanced Studies IIA•IIB)

I have a liberal arts background and was unfamiliar with biology. However, this was taken into account and I had no problems earning my credits.

Third year 10 credits

[First semester]

Nothing

[Second semester] 2 credits

Science, Technology and Society II
(Present: Science, Technology and Society)
Environmental Archaeology

[Full year] 8 credits

Special Seminar Series III (Present: Integrative Evolutionary Science Special Seminar Series III)
Progress Report III (Present: Integrative Evolutionary Science Progress Report IIIA & IIIB)
Specific Research III (Present: Dissertation Work in Advanced Studies IIIA•IIIB)

Fourth year 7 credits

[First semester] 1 credits

Advanced Course XIX (Present: Biological Anthropology)

[Second semester]

Nothing

[Full year] 6 credits

Progress Report IV (Present: Integrative Evolutionary Science Progress Report IVA & IVB)
Specific Research IV (Present: Dissertation Work in Advanced Studies IVA•IVB)

Fifth year 10 credits

[First semester]

Nothing

[Second semester]

Nothing

[Full year] 10 credits

Progress Report IV (Present: Integrative Evolutionary Science Progress Report IVA & IVB)
Specific Research IV (Present: Dissertation Work in Advanced Studies IVA•IVB)
Specific Research for Sub-thesis

Total of 60 credits over 5 years

Student life

What are your hobbies?

Watching videos, walking

How do you spend your days off?

Meeting with friends or just lazing around at home.

Do you have a part-time job?

I sometimes work for curating cultural properties or take part in excavations.

Do you live alone? Or do you live at your parent's home or in a shared house?

I live alone.

Where do you do your research?

I do my research at the Okinawa Prefecture Archaeological Center and analyze the collected data on campus. Basically, not much work is done at home.

What kind of research do you do?

The ancient use of wild boar in prehistoric periods by analyzing archaeological materials excavated from Okinawa.

Time schedule

8:00	Wake up
9:00	Commute to the campus (by train and bus), about 30 minutes
10:00	
11:00	Seminar (occasional)
12:00	Lunch
13:00	Data analysis
14:00	
15:00	
16:00	Writing papers
17:00	
18:00	
19:00	Go back home
20:00	Arrival, then dinner
21:00	Bathing
22:00	Prepare for tomorrow
23:00	
0:00	Bedtime

Graduate life and course work

Student B, field research (marine ecology)

Courses

Third year 12 credits

[First semester] 5 credits

Laboratory of Basic Biology
Dissertation Work in Advanced Studies IIIA
Integrative Evolutionary Science Progress Report IIIA

[Second semester] 5 credits

Integrative Evolutionary Science Academic English (Advance) 1
Life Science & Society
Dissertation Work in Advanced Studies IIIB
Integrative Evolutionary Science Progress Report IIIB

I also took courses that were not mandatory (e.g., Integrative Evolutionary Science Academic English). I chose these courses that were within my comfort zone, because it would be nonsense if I could not devote enough time to my research.

[Full year] 2 credits

Integrative Evolutionary Science Special Seminar Series III

Fourth year 11 credits

[First semester] 3 credits

Dissertation Work in Advanced Studies IVA
Integrative Evolutionary Science Progress Report IVA

[Second semester] 8 credits

Dissertation Work in Advanced Studies IVB
Integrative Evolutionary Science Progress Report IVB
Science, Technology and Society
Specific Research for Sub-thesis

The system was very helpful in providing alternative arrangements when I had to do fieldwork.

Fifth year 6 credits

[First semester] 3 credits

Dissertation Work in Advanced Studies VA
Integrative Evolutionary Science Progress Report VA

[Second semester] 3 credits

Dissertation Work in Advanced Studies VB
Integrative Evolutionary Science Progress Report VB

Total of 29 credits over 3 years

Student life

What are your hobbies?

Table tennis, scuba diving (occasionally), watching martial arts

How do you spend your days off?

I refresh myself by playing games and meeting with friends.

Do you have a part-time job?

Research Assistant only

Do you live alone? Or do you live at your parent's home or in a shared house?

I live alone.

Where do you do your research?

I can usually do research as long as I have a PC, so I do my research at home or in a cafe as well as at the campus.

What kind of research do you do?

The ecology of wild sharks by attaching behavior recording devices (video cameras, etc.) to them.

Time schedule (normal)

8:00	Wake up
9:00	Commute to the campus by bicycle or bus, 1 hour
10:00	Seminar (once a week)
11:00	
12:00	Lunch
13:00	Data analysis, writing papers, etc.
14:00	
15:00	
16:00	
17:00	
18:00	Table tennis with colleagues
19:00	
20:00	Go back home
21:00	Dinner, bath
22:00	Reading, etc.
23:00	
0:00	Bedtime

Time schedule (fieldwork)

23:00	Wake up and prepare for boarding
0:00	Boarding
0:30	Sleep until morning
8:00	Installation of recording devices on sharks (onboard)
9:00	
10:00	
11:00	
12:00	Return to port
13:00	Lunch
14:00	Break
15:00	
16:00	Setup of recording devices
17:00	
18:00	Dinner
19:00	
20:00	Bedtime
21:00	
22:00	

Graduate life and course work

Student C, lab research based on experiments and data analysis

Courses

I actively participated in the courses when it suited my schedule. Faculties arranged the contents of courses for non-experts, so I didn't have problems.

First year 24 credits

[First semester] 11 credits

Freshman Course
Micro- and Macro-scopic Biology
Laboratory of Basic Biology
Introduction to the "Biological Science" Sub-thesis
Introduction to Science and Technology Studies
Evolutionary Game Theory
Advanced Course X (Present: Population Ecology)
Advanced Course XVI (Present: Biological Anthropology)

[Second semester] 5 credits

Human Genetics
Molecular Evolution
Evolutionary Behavioral Ecology
Advanced Course X (Present: Genome Biology)
Advanced Course XVI

It is easier to concentrate on research because there are many intensive short-term courses, so the number of class days is small.

[Full year] 8 credits

Special Seminar Series I (Present: Integrative Evolutionary Science Special Seminar Series I)
Progress Report I (Present: Integrative Evolutionary Science Progress Report IA & IB)
Specific Research I (Present: Dissertation Work in Advanced Studies IA•IB)

Second year 12 credits

I took more courses in the first and second years to prepare for the busy research schedule in the upper grades.

[First semester]

Nothing

[Second semester] 4 credits

Science, Technology and Society I (Present: Introduction to Philosophy of Science)
Science, Technology and Society II (Present: Science, Technology and Society)
Academic English (Basic) I (Present: Integrative Evolutionary Science Academic English (Basic) 1)
Advanced Course XX (Present: Evolutionary Developmental Neurobiology)

[Full year] 8 credits

Special Seminar Series II (Present: Integrative Evolutionary Science Special Seminar Series II)
Progress Report II (Present: Integrative Evolutionary Science Progress Report IIA & IIB)
Specific Research II (Present: Dissertation Work in Advanced Studies IIA•IIB)

Third year 10 credits

[First semester] 3 credits

Dissertation Work in Advanced Studies IIIA
Integrative Evolutionary Science Progress Report IIIA

[Second semester] 5 credits

Environmental Archaeology
Biodiversity
Dissertation Work in Advanced Studies IIIB
Integrative Evolutionary Science Progress Report IIIB

[Full year] 2 credits

Integrative Evolutionary Science Special Seminar Series III

Fourth year (plan) 12 credits

[First semester] 3 credits

Dissertation Work in Advanced Studies IVA
Integrative Evolutionary Science Progress Report IVA

[Second semester] 9 credits

Dissertation Work in Advanced Studies IVB
Integrative Evolutionary Science Progress Report IVB
Science, Technology and Society (Past: Science, Technology and Society II)
Integrative Evolutionary Science Academic English (Basic) 1 (Past: Academic English (Basic) I)
Specific Research for Sub-thesis

Fifth year (plan) 6 credits

[First semester] 3 credits

Dissertation Work in Advanced Studies VA
Integrative Evolutionary Science Progress Report VA

[Second semester] 3 credits

Dissertation Work in Advanced Studies VB
Integrative Evolutionary Science Progress Report VB

Total of 64 credits over 5 years

Student life

What are your hobbies?

Shogi, Mahjong, visiting aquariums

How do you spend your days off?

I often work part-time on Saturdays and go out to meet with friends on Sundays.

Do you have a part-time job?

I work as an instructor at a laboratory class for elementary school students.

Do you live alone? Or do you live at your parent's home or in a shared house?

I am married, so I live with my husband.

Where do you do your research?

Mostly I work at the campus for experiments. Sometimes I do data analysis and write papers at home.

What kind of research do you do?

The evolution of vision in fish from a molecular biological perspective.

Time schedule

8:00	Wake up, breakfast, and preparations
9:00	Commute to the campus (train, bus), 1 hour
10:00	
11:00	Seminar (once a week)
12:00	Lunch
13:00	Start experiments
14:00	
15:00	
16:00	
17:00	End experiment
18:00	Paperwork, writing papers, etc.
19:00	Go back home
20:00	Arrival home, dinner
21:00	Checking papers while watching cartoon videos, etc.
22:00	Hobby time
23:00	
0:00	Bathing, prepare for tomorrow
0:30	Bedtime

Graduate life and course work

Student D, research in science, technology and society

Courses

First year 16 credits

[First semester] 9 credits

Freshman Course
Laboratory of Basic Biology
Introduction to the "Biological Science" Sub-thesis
Dissertation Work in Advanced Studies IA
Integrative Evolutionary Science Progress Report IA

I took basic courses as early as possible so that I could broaden my perspective before starting my Ph.D. research.

[Second semester] 5 credits

STS and History of Science 1
Introduction to Philosophy of Science
Dissertation Work in Advanced Studies IB
Integrative Evolutionary Science Progress Report IB

[Full year] 2 credits

Integrative Evolutionary Science Special Seminar Series I

Second year 14 credits

[First semester] 5 credits

I also took biology courses to obtain basic knowledge.

Biostatistics
Dissertation Work in Advanced Studies IIA
Integrative Evolutionary Science Progress Report IIA

[Second semester] 7 credits

STS and History of Science 2
Life Science & Society
Science, Technology and Society
Integrative Evolutionary Science Academic English (Basic) 1
Dissertation Work in Advanced Studies IIB
Integrative Evolutionary Science Progress Report IIB

[Full year] 2 credits

Integrative Evolutionary Science Special Seminar Series II

Third year 11 credits

[First semester] 4 credits

Molecular Evolution
Dissertation Work in Advanced Studies IIIA
Integrative Evolutionary Science Progress Report IIIA

[Second semester] 5 credits

Integrative Evolutionary Science Academic English (Advance) 1
STS and History of Science 3
Dissertation Work in Advanced Studies IIIB
Integrative Evolutionary Science Progress Report IIIB

[Full year] 2 credits

Integrative Evolutionary Science Special Seminar Series III

Fourth year 11 credits

[First semester] 4 credits

I took an international internship to obtain international experience.

International Internship
Dissertation Work in Advanced Studies IVA
Integrative Evolutionary Science Progress Report IVA

[Second semester] 5 credits

Dissertation Work in Advanced Studies IVB
Integrative Evolutionary Science Progress Report IVB
Specific Research for Sub-thesis

Fifth year 6 credits

[First semester] 3 credits

Dissertation Work in Advanced Studies VA
Integrative Evolutionary Science Progress Report VA

[Second semester] 3 credits

Dissertation Work in Advanced Studies VB
Integrative Evolutionary Science Progress Report VB

Total of 58 credits over 5 years

What are your hobbies?

Student life

What are your hobbies?

Running

How do you spend your days off?

Visiting bookstores and cafes

Do you have a part-time job?

I worked as a cram school teacher until I received a JSPS fellowship.

Do you live alone? Or do you live at your parent's home or in a shared house?

Living alone

Where do you do your research?

I do my research in different places such as cafes, libraries, and student rooms, because I keep doing the same work such as reading and writing.

What kind of research do you do?

The possibilities of scientific explanations in research using machine learning.

Time schedule

7:00	Wake up, breakfast, preparation
8:00	Commute to the campus
9:00	Reading literature
10:00	
11:00	
12:00	Lunch
13:00	Writing reports
14:00	
15:00	Seminar (once a week)
16:00	Break
17:00	Reading group
18:00	Go back home and dinner
19:00	Break
20:00	Paper reading for seminar
21:00	
22:00	Free time
23:00	
0:00	Bedtime

Student Aids

Both SOKENDAI and Integrative Evolutionary Science Program offer extensive support systems for students' daily lives and research activities.

1.
Integrative Evolutionary Science Program Research Assistant (RA)

This support is designed to encourage outstanding students to participate in educational and research projects conducted at the Hayama Campus as research assistants to promote effective educational and research activities and to cultivate the ability to conduct research as emerging scholars.

Upon appointment, the RA will work as a part-time employee of SOKENDAI for a maximum of 7 hours per day, not exceeding 20 hours per week.

In the Integrative Evolutionary Science Program, the upper limit is 335 hours per year at 1,600 yen per hour in FY2023, with the intention to provide students with financial support equivalent to the annual tuition fee to ensure that it does not hinder their academic pursuits. Basically, all new SOKENDAI students are eligible.

Reference URL:
https://ies.soken.ac.jp/en_life.html

2.
SOKENDAI Student Dispatch Program

This program encourages SOKENDAI students to seek a short-term research opportunity abroad and/or a long-term collaborative research project in and outside Japan that may lead to their career in the future. The program follows the educational goals of SOKENDAI, "advanced specialties and expertise," "broad perspective," and "international competitiveness," and intends to financially support such research opportunities for SOKENDAI students.

Reference URL:
https://www.soken.ac.jp/education/dispatch/sokendai_studentdispatchprogram/

3.
Student Mobility Support in the Integrative Evolutionary Science Program

The purpose of the student mobility support in the Integrative Evolutionary Science Program is to provide students with advanced specialized knowledge and abilities that will enable them to play a leading role internationally and to foster researchers with broad perspectives and advanced research capabilities that can be harnessed both domestically and internationally. This covers travel costs for presenting the results of a student's own research at domestic or international conferences, conducting research activities or collecting materials necessary for studies including doctoral dissertation research at a research institution, etc.

Reference URL:
https://ies.soken.ac.jp/en_life.html

4.
Student Travel Expense Subsidies

Travel expense subsidies cover activities for regular courses that promote educational and research activities beyond the framework of SOKENDAI's programs and contribute to SOKENDAI's philosophy of fostering researchers with internationally-recognized and advanced research qualities and broad perspectives in fundamental academic fields. SOKENDAI will provide subsidies for all or part of expenses in accordance with SOKENDAI regulations based on applications from the students registered in the course. Based on applications from the students, subsidies will be paid to the SOKENDAI regular students.

Reference URL:
https://www.soken.ac.jp/en/education/dispatch/trv_supp/

5.
Integrated Evolutionary Science Program Publication Support

This support provides full or partial support for the costs for submission and publication of papers in journals. The objective is to promote and encourage students' research activities and disseminate the accomplishments both domestically and internationally.

6.
Others

A laptop computer is lent to students to support their research activities. Students can use the accommodation facilities at the Hayama campus with their supervisor's permission (with washing machine and shower facilities) to support their research activities over the long hours of the day. The number of students is small compared to the number of faculties, so each student is well supported.

In addition, a system is in place for students to consult specialists in the event of various problems arising. Detailed support is available from academic advisors regarding student life and research activities, and an external mental health counselor is available once a month.

Reference URL:
https://ies.soken.ac.jp/en_life.html

From Graduate Students

Second-year student (D2) majoring in Marine Ecology

Q.1 What motivated you to enroll at SOKENDAI?

The highly productive research environment is the primary motivation. Firstly, I have the opportunity to receive direct supervision from renowned researchers in the field of animal behavior and conduct research within a rich research environment. Moreover, all the essential equipment and facilities required for my research are readily accessible. Furthermore, the five-year program enables me to consistently concentrate on one research theme, which I believe is especially beneficial for graduate students.

Q.2 What are the benefits of enrolling at SOKENDAI?

At SOKENDAI, one of the benefits is the opportunity to receive lectures from experts in various fields such as genetics, neuroscience, and behavioral studies on the theme of "evolution." Unlike many universities where students typically interact with professors in closely related fields, here at SOKENDAI, we have the opportunity to receive guidance and insights from top scholars across diverse disciplines, which is truly exciting.

Q.3 How do you typically spend your days off?

wake up early in the morning and head to the public bath or go for a run along the seaside. It's like spending a day off just like my grandma does. Haha.

Q.4 How do you conduct your research?

Since my research primarily involves data analysis, I mainly work from home.

Q.5 Do you have any advice for undergraduate students?

If you learn statistics concurrently with data collection and analysis, you may realize that there are more appropriate analysis methods than the ones you learned initially. This realization may lead you to redo everything from scratch. I recommend starting early, even after the entrance exams.

Do you have a message of encouragement for those hoping to enroll?

The entrance exams are just around the corner. Good luck!

Fourth-year doctoral student (D4) majoring in Mathematical Biology

Q.1 What motivated you to enroll at SOKENDAI?

My specialization is mathematical modeling in ecology and evolutionary biology. Although I gained fundamental knowledge in biology during my master's degree, I felt my proficiency in mathematics and physics was insufficient. Therefore, I aimed to pursue this specialization to actively engage in daily discussions with my current supervisor, who is among the top experts in mathematical biology.

Q.2 What are the benefits of enrolling at SOKENDAI?

Our campus, situated atop a small hill, provides an environment conducive to focused research. Additionally, being located near Zushi and Yokosuka allows easy access to Tokyo and Kanagawa, as well as convenient transportation links to shinkansen and airports, facilitating nationwide travel. Furthermore, the low barriers between research labs foster a sense of community, with numerous events such as welcome parties for new students and mochitsuki (rice pounding) gatherings involving both students and faculty members.

Q.3 How do you typically spend your days off?

I am a member of a community orchestra and regularly participate in instrumental performances. When a concert is approaching, I dedicate myself to practicing for it, but otherwise, I make a point to rest as much as possible and refrain from engaging too much in research.

Q.4 How do you conduct your research?

I ensure to come to campus three days a week to prevent myself from slacking off with remote work. On the remaining days, I either work remotely or conduct research at other research institutions.

Q.5 Do you have any advice for undergraduate students?

One thing I aim to improve is developing a habit of reading. Without a consistent reading habit, I sometimes find it daunting to go through research papers.

Do you have a message of encouragement for those hoping to enroll?

We only live once, so it's worth considering immersing yourself in research on a topic you're passionate about. If you feel a strong connection with your potential supervisor, or find the research environment appealing, we would be delighted to welcome you into our program. Both students and faculty are eager to have you join us!

Fourth-year doctoral student (D4) majoring in Marine molecular biology

Q.1 What motivated you to enroll at SOKENDAI?

- I've found that the research program provides a high level of autonomy. With professors from diverse fields available, there's a broad range of feasible research topics and experiments to explore.
- I'm particularly drawn to evolutionary behavioral ecology, where I can observe animal behavior to uncover its significance and develop general theories applicable to multiple organisms.
- I was confident that I could pursue my passion for studying sea slugs and elucidating organism behavior from various perspectives.

Q.2 What are the benefits of enrolling at SOKENDAI?

- The program offers a wide range of feasible research opportunities, providing significant freedom to choose topics without being confined to strict boundaries.
- There is ample research funding available, and the facilities are well-equipped.
- The close relationship between students and professors allows for active discussions and consultations regarding research topics, and everyone is approachable and friendly.
- The program fosters a vibrant community among students, leading to enjoyable interactions and exchanges.

Q.3 How do you typically spend your days off?

When I'm at home, I prioritize maximizing sleep and then engage in activities such as watching videos, anime, or my favorite content, as well as playing games. I aim to spend as much time as possible in bed. When I go out, I enjoy a variety of activities including walking, shopping, visiting aquariums, shrines and temples, and attending live events.
My level of activity varies greatly from day to day.

Q.4 How do you conduct your research?

My activities vary according to the life cycle of the research subject. From spring to summer, I engage in fieldwork such as collecting marine organisms and conducting dissections on campus. From autumn to winter, I focus on molecular biology experiments and data analysis on campus. Occasionally, I may also work from home.

Q.5 Do you have any advice for undergraduate students?

・Studying English: While accumulating knowledge of vocabulary, grammar, and other aspects is important, I wish I had focused more on speaking English and become more accustomed to it.
・(Even though I don't remember anything anymore): Since I chose physics in high school, I think it would have been better to learn the basics of biology, including high school level, early on.
・I would have trained myself to be able to collect research organisms.

Do you have a message of encouragement for those hoping to enroll?

I believe SOKENDAI provides an unparalleled and fantastic environment for conducting research! Let's enjoy our lives as researchers together! I look forward to meeting everyone!

Q & A session with first-year students!

We asked first-year students about SOKENDAI!
Here is a summary of what first-year students want to say!

Q1 What did you do to prepare for entrance exams?

A1

English: I practiced TOEFL-ITP practice tests, studied materials for TOEIC, and read books recommended by teachers.

Specialized subjects: I read books written by teachers I hoped to be instructed by, as well as books recommended by them. I read "Molecular Biology of the Cell" by Albert et al., "Campbell Biology" by Campbell et al., and "An Introduction to Behavioral Ecology" by Davies et al. Additionally, I practiced repeatedly presenting my research topic.

Q2 When did you decide on your research topic?

A2

Some people already had a research topic they wanted to pursue, while others decided on a rough research topic around the winter of their third year of undergraduate studies. Some decided on their research topic around May after enrollment. The timing of deciding on a research topic varies from person to person.

Q3 Did you visit labs before you apply?

A3

All of the first-year students I asked had visited candidate labs at the Hayama Campus. While it's possible to contact professors directly to arrange lab visits, you can also visit labs during information sessions or open campus events held at the Hayama Campus! Some students also participated in information sessions for other departments (courses) at SOKENDAI online!

Q4 What impressions did you have about the sub-thesis before and after enrollment?

A4

Some students felt that they needed to conduct research more thoroughly and to think deeply about their topics more than they had anticipated before enrollment. They also mentioned that it provided an opportunity to consider societal implications as a researcher and to reevaluate the interdisciplinary aspects of their main thesis. In the Integrated Evolutionary Science Course, there were also opinions that conducting interviews was technically challenging.

Q5 What are the good points of our course (major)?

A5

One of the best aspects is the close relationship between professors and students, making it easy to consult even with professors from other fields! Both professors and students have ample time, making it easy to approach them for discussions. Since most classes are intense lectures, it's easy to focus on research! Regular seminars featuring external speakers are held, providing opportunities to hear about various research topics!

Q6 Do students hang out together outside of classes?

A6

Among peers, we sometimes go to movies, horse races, aquariums, and restaurants together. We also participate in student-led events held on campus, where we interact not only with our peers but also with seniors.

Q & A session with prospective students!

Here is a summary of frequently asked questions from prospective students!

Q1 Is it necessary to choose a supervisor at the time of entrance exams?

A1

No, it's not necessary!

You can enter without selecting a supervisor. After enrollment, you can explore different supervisors through rotations and make a decision around November, before the Progress. You have the opportunity to visit multiple labs before making your choice.

Q2 What is the relationship like among the faculties and students within the course?

A2

The relationship among students, instructors, and postdoctoral fellows is excellent.

While students often organize parties and gatherings, there are also events where professors and postdocs frequently participate. Participation is optional, so it's okay if you don't feel like joining.

Q3 Are there any fun events?

A3

Absolutely!

Participation is voluntary, so feel free to join in if you'd like. Let's have a great time together! Also, if you have any ideas for new events, we'd love to hear them!

From Alumni

1

XIAYIRE XIAOKAITI

Degree obtained
in 2023 September

Current occupation

Assistant researcher,
Institute of Archaeology,
Chinese Academy of Social Sciences

Career trajectory from post-graduation to present

Current position since 2023

Research topic conducted at SOKENDAI

My PhD research focused on the analysis of dog remains from archaeological sites as dog was the only animal domesticated by hunter-gatherers before Neolithic period, and established close relationships with humans. My work aims to reveal the origin and early stages of dog evolution by genomic analysis of ancient DNA (aDNA) preserved in dog remains from different periods in East Asia which would ultimately help us to reconstruct evolutionary process of dogs and human-animal relationships.

Memories at SOKENDAI

I had such a very wonderful time during my stay with the excellent guidance, great support, and friendly help that I received from all the members of the Department of Evolutionary Studies of Biosystem, SOKENDAI. My accomplishment would not have been possible without them.

Reasons for pursuing your current profession

I was sponsored by the scholarship (MEXT) for doctorate study and was very fortunate to have the opportunity to apply for this position at the most prestigious institute for Archaeological research in China after the graduation. With more attention given to the application of scientific methods in archaeological research, the institute established the Center of Archaeological Sciences where I can apply the newest aDNA extraction method and the genome analysis method that I have learned during my PhD at SOKENDAI.

A few words to prospective students

SOKENDAI is no doubt a great place where you can learn how to do research and become a researcher. It offers a cutting-edge and very relaxing research environment, and has a great finical supporting system for student. It is a place where my research life started, and I really appreciate for all the support that I have received from SOKENDAI. And I am looking forward to carrying out collaborative research with SOKENDAI.

2

Naoko Kato-Nitta

Degree obtained
in 2012 March

Current occupation

Associate Professor,
J. F. Oberlin University

Career trajectory from post-graduation to present

2016-2016	Researcher, Institute of Health and Sports Sciences, University of Tsukuba
2016-2017	Researcher, College of Agriculture, Ibaraki University
2017-2019	Project Researcher, Joint Support-Center for Data Science Research/The Institute of Statistical Mathematics, Research Organization of Information and Systems
2019-2021	Project Assistant Professor, Joint Support-Center for Data Science Research/The Institute of Statistical Mathematics, Research Organization of Information and Systems
2021-2023	Project Associate Professor, Joint Support-Center for Data Science Research/The Institute of Statistical Mathematics, Research Organization of Information and Systems

Current position since 2023

Research topic conducted at SOKENDAI

Science, Technology and Society

Memories at SOKENDAI

In the fourth year of my five-year doctoral course, I had to give a presentation to obtain competitive funding from the university. My doctoral research was in a difficult situation at first, as if I was walking in a dark tunnel, but just before the presentation there was an opportunity that opened my eyes and I was able to get out of the tunnel. As a result, I was able to present with confidence on the day and succeeded in obtaining the funding for my doctoral research. President Takahata, who attended the presentation, said: "When I heard your presentation, I thought, 'Oh, Kato-san, you've taken off from the land'". He talked to me as such just before I completed my doctoral course, which has encouraged me since then.

Reasons for pursuing your current profession

I was enrolled in SOKENDAI after working outside academia and decided to pursue a career as a researcher because I truly enjoyed research at SOKENDAI. Seminars and other programs in SOKENDAI trained me to approach my own research themes from a broad perspective and with original ideas, without being bound by existing frameworks. I believe this experience is my foundation to continue producing research attainments as an independent researcher after obtaining the Ph.D. degree.

A few words to prospective students

The faculties work together to support students in fostering the ability to continue challenging themselves with original research. SOKENDAI is a unique graduate school where students can get a distinctive education.

3

Masato Yamamichi

Degree obtained
in 2012 March

Current occupation

Associate Professor, National Institute of Genetics / SOKENDAI

Career trajectory from post-graduation to present

2012-2014	JSPS Postdoctoral Fellow for Research Abroad, Cornell University (USA)
2014-2017	Program-Specific Assistant Professor, Hakubi Center for Advanced Research/Center for Ecological Research, Kyoto University
2017-2020	Lecturer, Department of General Systems Studies, The University of Tokyo
2020-2023	Senior Lecturer, School of Biological Sciences, The University of Queensland (Australia)

Current position since 2023

Research topic conducted at SOKENDAI

- Theory of population dynamics driven by prey rapid evolution and phenotypic plasticity
- Theory of single-gene speciation promoted by predators
- Inference of the process of human-chimpanzee speciation
- Research object biases of conservation ecology in Japan

Memories at SOKENDAI

During my time at SOKENDAI, I was able to receive support from various faculties and engaged in a broad spectrum of theoretical and empirical research. I also actively participated in academic conferences and summer schools. Furthermore, I had a wealth of diverse international experiences, such as spending several months at Cornell University and attending academic exchange seminars with foreign universities.

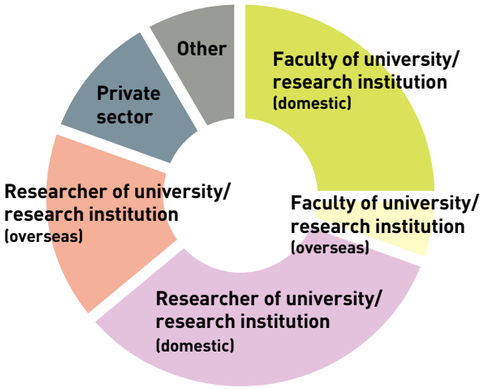
Reasons for pursuing your current profession

Through my various experiences at SOKENDAI, I realized the importance of conducting research abroad and combining mathematical ecology, population genetics, and theoretical and empirical approaches. As a result, after conducting research in the USA and Australia, I moved to my current position to further develop my research.

A few words to prospective students

I hope you enjoy your research utilizing the abundant resources of SOKENDAI!

Career paths for degree holders



Awards received by graduates

JSPS Ikushi Prize

February 2022	Takahiro Sakamoto, 13th JSPS Ikushi Prize
February 2018	Shiho Kariyazono, 8th JSPS Ikushi Prize

SOKENDAI Award, Nagakura Research Incentive Award, SOKENDAI Future Scientist Award, SOKENDAI Research Award

March 2023	Takahiro Sakamoto, 10th SOKENDAI Award
March 2021	Masato Sato, 6th SOKENDAI Award
December 2018	Shiho Kariyazono, 23rd Nagakura Research Incentive Award
April 2017	Takahiro Kato, Sokendai Future Scientist Award
October 2016	Kohei Takeda, 21st Nagakura Research Incentive Award
October 2016	May Masahito Morita, SOKENDAI Research Award

Conference Poster Award and Oral Presentation Award

September 2022	Yusuke Kuwano Best Poster Award 32nd Annual Meeting of the Japanese Society for Mathematical Biology
November 2021	Takahiro Sakamoto BP Award 93rd Annual Meeting of the Genetics Society of Japan
August 2018	Takashi Seiko Best Oral Presentation Award 20th Annual Meeting of the Evolutionary Society of Japan
October 2016	Takahiro Kato Poster Award 2016 Meeting of the Japanese Ornithological Society
September 2016	Yuu Utsumi Poster Award 26th Annual Meeting of the Japanese Society for Mathematical Biology
September 2016	Takahiro Kato Poster Award 2016 Annual Meeting of the Japanese Society for Ornithology
October 2015	Gaku Oya Poster Award 2015 Annual Meeting of the Japanese Society for Mathematical Biology
December 2014	Tokiho Akiyama Best Presentation Award 70th Annual Meeting of the Japanese Society for Physiological Anthropology

About RCIES

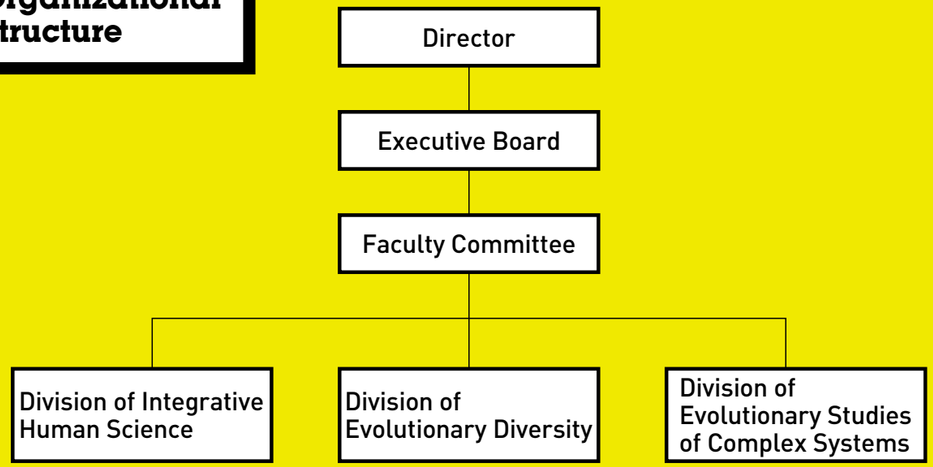
About

As the only research center in Japan with "evolution" at its core, the center aims to create a new academic field of "Integrated Evolutionary Science" in collaboration with domestic and overseas research institutions. The word "evolution" evokes the evolution of living organisms, but technology, culture, and society also evolve.

We consider evolution in such a broad sense and try to address how the system of organisms was created and changed in the 3.8 billion years-long history of life, how human activities (society, psychology, language, culture, etc.) have changed, how global problems in the Anthropocene progress, and what possible solutions can be comprehensively examined from the perspective of evolution. The Research Center for Integrative Evolutionary Science thus aims to reconsider the concept of "evolution" and create a new research field "Integrated Evolutionary Science", which not only advances the knowledge system of biology but also incorporates the findings of evolutionary science into human understanding and solutions to social issues.

Organizational Structure

Divisions



Board Member

Director: Prof. Hideki Innan
Deputy Director: Prof. Naoki Irie
Steering Committee: Prof. Hideki Innan (Chair)
Prof. Yoko Satta　Prof. Naoki Irie
Prof. Nobuyuki Kutsukake　Prof. Akira Sasaki
Prof. Yuuki Watanabe　Prof. Takehiko Kobayashi (External)
Distinguished Prof. Tetsu Sato (External)　Prof. Toru Miura (External)
Emeritus Prof. Yoh Iwasa (External)
Distinguished Prof. Kentaro Arikawa (Observer)
Assoc. Prof. Kaori Iida (Observer)

Collaboration

RCIES promotes evolutionary studies by providing various levels of collaboration to researchers, from giving simple one-time advice or frequent consultation to prolonged collaboration (with members in the center) and, if appropriate, we may also introduce some experts (both domestic and international) who may assist your research project.

Joint-usage Facilities

RCIES actively promotes the joint use of research equipment to enhance collaborative research The equipment includes a Scanning Electron Microscope, Transmission Electron Microscope, and Confocal Laser Scanning Microscope.

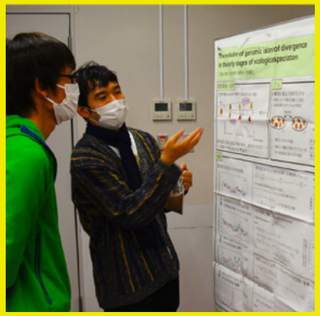
Scanning Electron Microscope

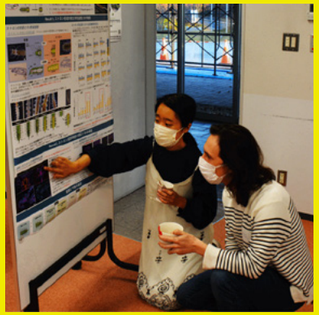
Transmission Electron Microscope

Communications with Other Institutes

RCIES promotes communications with other institutions. For example, student exchange meetings with Misaki Marine Biological Station (MMBS), the University of Tokyo have been held every year.

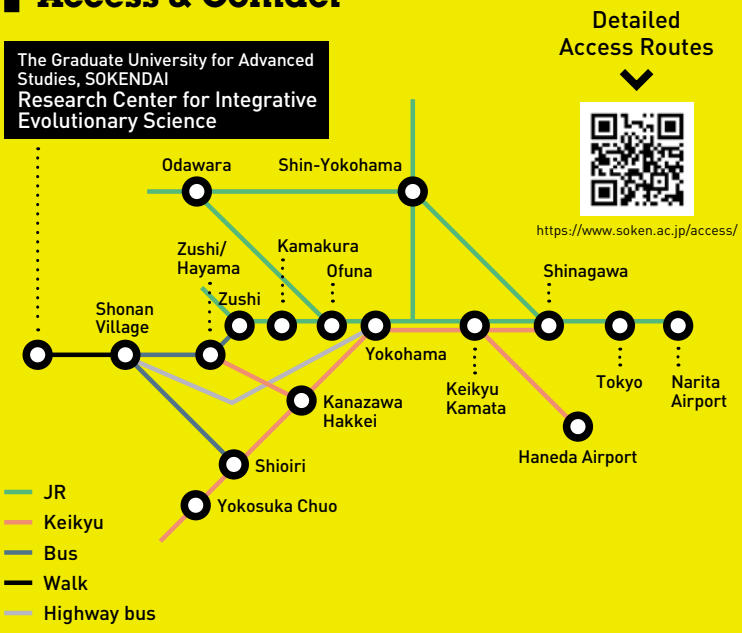
In FY2022, a poster presentation was held at the Hayama Campus to deepen exchanges. In FY2023, oral presentations were held the MMBS.





View of Sagami Bay from the Research Center for Integrative Evolutionary Science.

Access & Contact



Detailed Access Routes

https://www.soken.ac.jp/access/

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