Pursuit of Universal Truths

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The various departments and laboratories of our School have the common goal of understanding the structure and order of nature. Our primary mission is creating new scientific knowledge and conveying it to our peers through publication and presentations, and to our students through lectures and individual instruction. However, we are also mindful of the multitude of problems faced by humankind in all nations, as many people struggle just to survive from day to day. It is important that we recognize how fortunate we are, as students, researchers and academics, to be able to dedicate ourselves to the challenging and exciting search for scientific knowledge, which has contributed so much to the progress of human society. This recognition highly motivates us to impart this passion to the rest of human society, and to continue to inspire and to be inspired. It is also our responsibility, whenever possible, to assist human society in using scientific knowledge to help solve the many practical issues now confronting us.

Prerequisite to the creation of knowledge is the ability to adopt a logical approach, which only becomes possible through the development of a strong ability to articulate ideas and a sound foundation of knowledge. We must ensure that newly created knowledge is communicated to others — including researchers in the same field — and that its validity is independently tested and verified. New knowledge can often be revolutionary, and may at times be strongly opposed by some research communities. Scientists must be as strong emotionally as they are intellectually, because they must be able to persevere when faced with incorrect criticism of their research while at the same time they must always be prepared to accept correct criticism.

We must be as resolute as Galileo Galilei and Mencius. “Eppur si muove.” (“And yet it moves”) said Galileo. “If I search inwardly and find that I am upright,” said Mencius, “though I face ten million men I will attack.” This is the spirit that we must adopt in the tasks that face us; we are charged with nurturing a new generation of Galileos and Menciuses who can forge strong links with their international colleagues and hone their research through friendly competition and debate.

Through collaboration between individual research groups, laboratories, departments, universities, and countries, we intend to generate exciting opportunities for exchange and innovation that are so vital for the communication and creation of original scientific knowledge. We invite researchers and students who share our goals to join us in these dynamic and rewarding endeavors.
Commitment to Diversity

Today, respect for cultural and ethnic diversity in all aspects of campus life is one of the most important core values for the world’s leading universities. Academic researchers cannot conduct their activities now without interacting with their peers from different socio-cultural backgrounds. Internationalization is part of the everyday academic life of researchers.

The Graduate School of Science at Todai includes among its educational objectives the enhancing of cross-cultural interactions with diverse peers in order to widen students’ outlooks and stimulate their minds to make their academic work more creative and professional. The School has opened its doors to students and researchers from around the world with the aim of establishing globe-spanning academic standards. Our internationalization programs include two recently launched international courses and a set of global research programs called the Global Center for Excellence (COE) Programs, sponsored by Japan’s Ministry of Education, Culture, Sports, Science and Technology (MEXT).

We expect these programs to promote mutual understanding through exchanges of views between Japanese and overseas students and researchers concerning their research and the latest scientific developments. The above programs will help the School foster broad perspectives as well as promote the competitiveness required for training next-generation leaders by bringing together people with a multiplicity of experiences and interests. Inviting students and researchers from all over the world will further enrich the backgrounds, cultures, talents and interests of the School’s faculty and students, thereby furthering our ultimate goal of making increasingly valuable academic contributions to global society.

The Graduate School of Science is striving for academic excellence through its increasing diversity. We are proud to say our commitment to diversity is stronger than ever.

Hiroaki Aihara
Associate Dean

Master’s and Ph. D. programs for International Students

Ph. D Program at Frontier Physics Research Centers
Japan’s Ministry of Education, Culture, Sports, Science and Technology (MEXT) has implemented the International Priority Graduate Program (PGP) with the objective of promoting the internationalization of universities in Japan through the offering of academic programs with international appeal to foreign students. MEXT will provide financial support to participating foreign students. The Ph. D Program at the Frontier Physics Research Centers of UT’s School of Science’s Department of Physics was selected as one of the PGP Programs. This program is run by the staff members of the Department and other affiliated institutions. Researchers at the University of Tokyo as a group have the world’s second-highest number of citations in physics for their papers published in the past five years (2005 – 2009). This program can accept up to five students each year from abroad. The selected students will be granted benefits, including a scholarship for three years, to support their lives in Japan and cover tuition costs.

Graduate Courses for International Students
Reflecting the Global 30 Project, the School has extended its existing international courses aimed at building an education system that encourages international students to obtain a Master’s or Doctoral degree from the School. Fundamental classes will be conducted in English, responding to the needs of international students. Courses will be offered on a semester basis, which enables students from overseas to enroll and graduate in September as well as in April.

Global Center for Excellence (COE) Programs

This Project involves five Departments in three Graduate Schools (the Departments of Astronomy and Physics of the School of Science, the Department of Applied Physics and Materials Engineering of the School of Engineering, and the Department of Advanced Materials Science of the School of Frontier Science). The project is based at the Department of Applied Physics and Department of Physics. This project aims at developing training courses for:
- Scientists deepening and expanding the knowledge of physics as a fundamental science,
- Physicists leaders of the global society, and
- Reformers and creators of industries and innovations.

Center for Advanced Experimental and Theoretical Deep Earth Mineralogy

This project has been selected as one of three Global COE programs in the Earth science field. A researcher of an affiliated research center of the School, Geodynamics Research Center, participates in the project together with other program members from the Synchrotron Research Institute (JASRI) and Stony Brook University (SBU). The research hub is at the Geodynamics Research Institute of Ehime University. The project members will advance cutting-edge research in deep Earth mineralogy, focusing on the topics represented by the keywords “lower mantle mineralogy,” “core materials,” and “deep Earth water.”

Integrative Life Science Based on the Study of Biosignaling Mechanisms

The School of Science will pursue integrative life science with the keyword being “biosignaling” through cooperative work with the Graduate School of Medicine and Institute of Molecular and Cellular Biosciences. The Program has set itself the objective of fostering international leaders of the next generation while providing graduate students and postdoctoral fellows with scientific and financial support.

Global Center of Excellence programs: The Program has been launched by MEXT. It provides funding support for establishing education and research centers that perform at the apex of global excellence to elevate the international competitiveness of Japanese universities. The program will strengthen and enhance the education and research functions of graduate schools, in order to foster highly creative young researchers who will go on to become world leaders in their respective fields through experiencing and practicing research of the highest standard in the world.
Voices of International Students -To me, Todai is-

Questions to Interviewees:
1. Please explain briefly the reason(s) why you chose Todai (or Japan)? What do you enjoy about your life as a student in Todai?
2. What is your goal in the future?
3. Advice for newcomers to Todai.

Josephine Francoise Galipon
France, Entered Doctoral Program in Biophysics and Biochemistry in Apr. 2009

1. My supervisor in France introduced me to his Japanese colleague from the University of Tokyo with whom he has been collaborating for many years. Of course, if you end up in a famous university it is even better, but you should always choose your lab carefully according to your research interest and whether you get along well with your supervisor.
2. It is very important to work on the fundamental aspects of cellular biology to find clues to fight cancer and enhance the quality of life and life span. After graduating from the University of Tokyo, I will most likely continue contributing to science as a post-doctoral researcher, in Japan or in another country. If possible, I would like to maintain a strong connection with Japanese researchers throughout my career.
3. If you are planning to take a degree at the Graduate School of Science, make sure you give yourself enough time to study for the entrance examinations. Studying Japanese is very important, of course, but getting into the graduate program will certainly brighten your outlook. Don’t settle for less than what you aim for. If you get along with your lab and supervisor, Japan provides an incredible research environment and enjoyable student life. Please make as many Japanese friends as possible!

Seung-won Choi
Korea, Entered Doctoral Program in Biological Sciences in Apr. 2008

1. It was happy because there was a chance for me to get the ADK Scholarship and study in Todai. I decided not to miss this opportunity. Of course, the level of science education and research in Japan, especially Todai, are very high. This is the main reason why I chose Japan for my graduate study. Also, some of the Japanese culture attracts me a lot.
2. Perhaps, I’ll go back to China and do some research work in the future.

Clement Ng

1. Tokyo is an inspirational environment for all kinds of research, and studying at Todai is like being placed at the hub of that vast academic network. There is no greater place for reaching out to top researchers in the country. In science, breakthroughs are heard of almost every week here, and clearly some of the most committed scientists in the world are here working at extraordinary lengths to push back the frontiers of knowledge. While the high expectations for and stories of limited academic freedom led me to consider a range of other universities, I chose Todai for my research interest.
2. To research and teach at academic institutions.
3. Learn Japanese before coming to Japan. This is an exceptional opportunity to enter and observe a thriving research environment, but on the other hand it will probably seem isolating if you try to remain in your familiar working space. There should be always something to learn about the place, so treat every day as an opportunity to add to your research knowledge.

Quan Chen
China, Entered Master’s Program in Chemistry in Oct. 2008

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David Miles Kahl

1. My Master’s thesis work at McMaster University in Canada was all done in Japan in collaboration with the University of Tokyo. As I was interested in continuing the same work, I thought it would make more sense to have direct access to the laboratory (RIKEN). I knew all the members of the group I would be joining in Tokyo, so this made the choice much easier. I was also accepted to the University of Notre Dame in the US and McMaster University in Canada. I found that the University of Tokyo had the most attractive program in terms of graduation requirements and being able to focus clearly on only the research for my PhD.
2. Although I plan to continue doing pure research in experimental nuclear physics (as opposed to switching to industry), I do not have a clear plan in mind. The obvious path would be to get a post-doctoral fellowship, and I am not particular about the location, although I have thought of moving to Europe since I have never lived there. However, I thought a better experience might be to be an ion source and beam accelerator technician for a few years at a smaller facility. Ideally, I’d like to open a private nuclear laboratory to do scientific research and fund it by selling medical isotopes.
3. Study Japanese as much as possible before arriving. I did not have much chance to learn Japanese before arriving, and it has made things much more difficult.
GRADUATE SCHOOL OF SCIENCE

DEPARTMENTS
- PHYSICS
- ASTRONOMY
- EARTH AND PLANETARY SCIENCE
- CHEMISTRY
- BIOPHYSICS AND BIOCHEMISTRY
- BIOLOGICAL SCIENCES

AFFILIATED FACILITIES
- BOTANICAL GARDENS
- MARINE BIOLOGICAL STATION
- RESEARCH CENTER FOR SPECTROCHEMISTRY
- GEOCHEMICAL RESEARCH CENTER
- INSTITUTE OF ASTRONOMY
- CENTER FOR NUCLEAR STUDY
- RESEARCH CENTER FOR THE EARLY UNIVERSE
- CENTER FOR ULTRAFAST INTENSE LASER SCIENCE
- MOLECULAR GENETICS RESEARCH LABORATORY

FACTS AND DATA (AS OF MAY 1, 2009)

DEAN
Toshio Yamagata

NUMBER OF FACULTY MEMBERS
Total: 256
Physics(57), Astronomy(4), Earth and Planetary Science(45), Chemistry(40), Biophysics and Biochemistry(20), Biological Sciences(40), Botanical Garden(4), Marine Biological Station(4), Research Center for Spectrochemistry(1), Geochemical Research Center(8), Institute of Astronomy(13), Center for Nuclear Study(8), Research Center for the Early Universe(4), Center for Ultrafast Intense Laser Science(1), Molecular Genetics Research Laboratory(0), Administration(3)

NUMBER OF STUDENTS
Master’s Program: 730
Physics(221), Astronomy(41), Earth and Planetary Science(160), Chemistry(134), Biophysics and Biochemistry(70), Biological Sciences(104)

Doctoral Program: 607
Physics(188), Astronomy(44), Earth and Planetary Science(99), Chemistry(68), Biophysics and Biochemistry(92), Biological Sciences(116)

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The Department of Physics, which has more than 130 faculty members, is internationally recognized for its covering almost all of the domains of physics, such as condensed matter physics, astrophysics and cosmology, particle physics, nuclear physics, and general physics. The Department is the oldest physics department among Japanese universities, and has graduated many outstanding physicists, including Leo Esaki, a 1973 Nobel Prize laureate, Ryogo Kubo, a distinguished professor emeritus at UT, Masatoshi Koshiba, a 2002 Nobel Prize laureate, and Yoichiro Nambu, a 2002 Nobel Prize laureate, professor emeritus at UT, Masa- toshi Koshiba, a 2002 Nobel Prize laureate, and Yoichiro Nambu, a 2002 Nobel Prize laureate. The Department work not only at the Department of Physics at the Hongo Campus but also at related graduate schools, research institutes and centers, and other research organizations, which enables them to conduct diverse and advanced research. For example, in the fields of experimental physics, which use large facilities like particle accelerators, UT physics faculty members are carrying out experiments at research institutes and centers in collaboration with international research organizations.

The Department is considered one of the world’s top-ranked graduate schools for physics. The frontiers of modern physics span a very wide range, and the faculty members of the Department work not only at the Department of Physics at the Hongo Campus but also at related graduate schools, research institutes and centers, and other research organizations, which enables them to conduct diverse and advanced research. For example, in the fields of experimental physics, which use large facilities like particle accelerators, UT physics faculty members are carrying out experiments at research institutes and centers in collaboration with international research organizations.

Astrophysics and Cosmology

The theoretical astrophysics group is actively working on a variety of broad topics in astrophysics and cosmology. In particular the current interests include the following three major research topics: “Physics of the Early Universe,” “Observational Cosmology,” and “Particle and Nuclear Astrophysics.” Experimental studies in astrophysics and cosmology are currently carried out using satellites and ground based telescopes.

Condensed Matter

The experimental condensed matter physics group covers a wide range of materials and phenomena that include strongly correlated electron systems exemplified by the high-Tc superconductor, superfluid helium, the quantum Hall effect, surface physics, and photo-excited phenomena. The theoretical condensed matter physics group covers a wide spectrum as well, which ranges from fundamental aspects of cooperative phenomena to realistic analyses of diverse materials. Active collaboration between the experimental and the theoretical groups is a key feature of their activities.

Particle Physics

The scientific activities of the theoretical particle physics group cover model building, phenomenology, string theory, mathematical physics, and particle cosmology. Group members are also engaged in research using the LHC (Large Hadron Collider), the high-energy frontier collider, in which the origin of mass and physics beyond the Standard Model will be clarified in the near future. The group’s other experimental activities are focused on trying to discover dark energy, dark matter, and the origin of the CP violation.

General Physics

The research domain of the general physics group covers nonlinear non-equilibrium physics, quantum information processing, quantum optics, atomic/molecular physics, plasma physics, biophysics, and neuroscience. This research group is attempting to expand researchers’ conceptual scope in these areas, and is working to develop the originality and uniqueness of research being carried out in the Department of Physics and the University of Tokyo as a whole.

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Knowledge of the Universe, the subject of the study of astronomy, is the ultimate intellectual pursuit for humankind, and astronomy itself has helped form the very basis of human beings’ outlook on nature. The recent advances in astronomy are remarkable, and research fields in astronomy are now reaching the edges of the Universe as well as its creation. Research in astronomy is also delving into the origin of the Earth or even that of life.

The number of faculty and researchers, including both part-time and affiliated staff members belonging to either the UT-related National Astronomical Observatory or the Institute of Space and Astronautical Science, and the variety of fields covered by them are large even by global standards, making UT’s astronomy graduate program the largest one in Japan. Taking advantage of this feature, the program aims at instilling and fostering in students a broad outlook on the field of astronomy as a whole.

### Theoretical Astronomy

The theoretical astronomy group, consisting of about 7 professors, covers a wide range of research fields in theoretical astronomy, including solar/stellar seismology, stellar astrophysical fluid dynamics, theory of rotating/magnetic stars, evolution of binary systems, formation of planetary systems, supernova explosions, gamma-ray bursts, chemical and dynamical galaxy evolution, formation of star clusters and galaxies, N-body simulation, origin of elements, and cosmology.

### Radio Astronomy

The radio astronomy group, consisting of about 6 professors, studies major fields of observational radio astronomy, including the formation and evolution of galaxies, active galactic nuclei in galaxy clusters, interstellar physics in our galaxy and other galaxies, the center of our galaxy, and star and planet formation. This group is also playing a leading role in the hardware development of radio instrumentation, including that for the Atacama Submillimeter Telescope Experiment (ASTE) and the Atacama Large Millimeter/submillimeter Array (ALMA) in Chile, and that for very long baseline interferometry (VLBI) with ground-based radio telescopes and satellites.

### Optical and Infrared Astronomy

The optical and infrared astronomy group, consisting of about 10 professors, covers observational astronomy in optical and infrared wavelengths, and its research areas range from observational cosmology, the formation and evolution of galaxies and galaxy clusters, stellar evolution, star-formation, and circumstellar physics to exo-planets and their formation, based on observations with the Subaru telescope and other ground-based telescopes. The group is also engaged in the hardware development of optical and infrared instruments as well as large telescopes, such as the Tokyo Atacama Observatory (TAO) located in Chile, using the latest technology.

### Space and Gravitational Wave Astronomy

The space and gravitational wave astronomy group, consisting of about 7 professors, is working actively on space missions, such as those involving the Suzaku (X-ray), AKARI (Infrared), and Hinode (Solar) satellites, as well as gravitational wave astronomy. The group’s major research topics range from solar physics, interstellar physics, star and planet formation, and high-density objects to black holes. A significant part of the activities of this group also includes the hardware development of space telescopes and instrumentation for future space missions.

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Earth and Planetary Science

The Earth and Planetary Science Department covers a multiplicity of fields, from study of the solid Earth, atmosphere and ocean, and surface environments, including the biosphere, to planets and minor objects in the solar system, and space beyond the solar system. Moreover, it covers a wide range of time spans, from the evolution of the solar system to the future of the Earth, from billions of years to hours or less. Diverse research methods are required for such a wide variety of research fields, including field work, observation, laboratory experiments, chemical analyses, theoretical modeling, and simulation. Recent progress in Earth and planetary science, which aims to understand the entire large-scale and complex Earth and planetary system, requires interdisciplinary research and education based on strong programs in the various disciplines in this field.

The collaboration among the five core research groups in the department — Atmospheric and Oceanic Science, Space and Planetary Science, Earth and Planetary System Science, Solid Earth Science, and Geosphere and Biosphere Science — as well as with affiliated institutions has made the Earth and Planetary Science Department a core academic base for both research and education in Earth and Planetary Science in Japan.

The department’s educational programs aim to train doctoral-level researchers to become leading figures in their respective fields and master’s degree-level graduate students and undergraduates to take important positions in government, industry, and education, where it is hoped they will be able to make significant contributions to society.

Another important objective of the department is to contribute directly to society through participation in national and international programs of applied research in areas such as global climate change or mitigating catastrophic damage from earthquakes.

Earth and Planetary Science

This group aims to establish a new scientific field, which stresses the study of the Earth as well as other planets as a single system comprising closely interacting multiple subsystems, interaction times which vary from seconds to billions of years, and spatial scales from atoms to the distance between planets. The group also investigates individual phenomenon on and within the Earth and other planets from this point of view to understand the stability, variability, and evolutionary trends of the planetary system and planets’ surface environment. This group consists of the following four subgroups: Analysis of the Earth and Planetary System, Evolution of the Earth and Planetary System, Dynamics of the Earth System, and Dynamics of the Earth’s Surface Environment.

Atmospheric and Oceanic Science

This group is conducting high-level education and research on various oceanic and atmospheric phenomena that occur in our climate system on a wide range of spatial and temporal scales. Specific topics include small-scale turbulence, internal gravity waves in the troposphere, stratosphere and ocean, eddies and large-scale circulation in the ocean and atmosphere, and their coupling as well, giving rise to extreme weather conditions and climate variations from seasonal to centennial timescales, and transport of various substances, including ozone, aerosols, carbon and fresh water. Conducted through data analysis, theoretical/analytical methods, global/regional modeling and field observations, our research activities aim at deepening our understanding of physical processes involved in those phenomena and of their predictability, which is of great social concern.

Space and Planetary Science

This group consists of five subgroups: Space Physics, Magnetospheric Physics, Observational Planetology, Comparative Planetology, and Planetary Material Science. Note that there are differences in the research status of the different disciplines covered by these five subgroups. The research activities of the subgroup related to planetary exploration, though being at the highest level in Japan, are at the developing stage by international standards. As Japan’s commitment and contributions to various planetary/planetary asteroid scientific missions expand, we expect that these fields in Japan will certainly grow in the coming years. The group’s members are, and will be taking, important roles in these ongoing and future planetary missions.

Solid Earth Science

The solid Earth is a large-scale complex system. The term “solid Earth” denotes the Earth’s crust, mantle, outer core (which is actually fluid) and inner core. These regions differ greatly both physically and chemically. This group seeks to reveal the complex structure, composition, state, and evolution of the Earth’s interior and to thereby achieve a better and more unified understanding of the various geophysical, geochemical and geological processes operating on different temporal and spatial scales. In order to fulfill the above purposes, six subgroups, named Structure of the Earth’s Interior, Dynamics of the Earth’s Interior, Magma Dynamics, Global Tectonics, Dynamic Geomorphology and Earthquake Physics, have been set up within this group.

Geosphere and Biosphere Science

The Earth is a unique planet in the solar system as life was born and diversified on it. On the outermost layer of the Earth, various interactions have been occurring among the lithosphere, hydrosphere, atmosphere, and biosphere over the long history of the Earth. This group has been conducting research and training on the formation of geosphere materials, the evolution of the geosphere, the origin and evolution of life, and the fundamental processes of geosphere-biosphere interactions. This research is based mainly on field observation, analysis of geological, mineralogical, and paleontological samples, and laboratory experiments using various techniques such as transmission electron microscopy, scanning electron microscopy, atomic force microscopy, electron probe and energy dispersion X-ray microanalyses, X-ray diffraction analysis, gas- and ICP-mass spectrometry, gas-chromatography, and amino-acid and DNA sequence analyses.
In addition to the 47 resident faculty members who are in charge of the department’s core courses, the Department of Chemistry is affiliated with research laboratories in the Research Center for Spectrochemistry and the Geochemical Research Center within the School of Science, the Graduate School of Arts and Science, Graduate School of Frontier Sciences, Institute for Solid State Physics, Ocean Research Institute, Radioisotope Center, Research Center for Advanced Science and Technology, Institute of Space and Astronautical Science, and High Energy Accelerator Research Organization. There are currently 134 master’s degree students and 68 doctoral degree students enrolled in the Department of Chemistry.

The graduate programs encompass research and education in Physical Chemistry, Organic Chemistry, Inorganic and Analytical Chemistry, and other interdisciplinary areas of chemistry. Students in the master’s degree program acquire basic knowledge and skills in experimental techniques in all branches of chemistry, with an emphasis on those directly related to the subject of their own interest, and are expected to perform research at the highest possible level. Students in the doctoral degree program are expected to conduct original research of the highest quality and to enhance their own capabilities by advising younger students on various matters.

The three physical chemistry groups cover fields such as structural chemistry, which explores the structure and dynamics of molecules and molecular systems including living cells, solid state chemistry, which is designing and synthesizing novel functionalized molecule-based and metal oxides magnets, and quantum chemistry, which is investigating the mechanisms of molecular interaction and molecular dynamics with light. Students in the groups are trained through experiments, seminars, and daily discussions conducted in these laboratories, where they acquire the necessary skills and knowledge for advanced research.

The four organic chemistry groups cover various fields of organic chemistry such as heteroatom chemistry, which characterizes individual elements, synthetic organic chemistry, which is developing environmentally friendly reactions for highly efficient organic synthesis, natural products chemistry, which visualizes cells and marine ecology by precision chemistry, and physical organic chemistry, which is taking on the challenge of finding new reactions, new materials, and new principles. Students in these groups are required to report their experimental results and/or write related papers, depending on their classes in the Organic Group Seminar, in addition to regular laboratory work. This is a unique training and research system different from those in the Physical Chemistry and the Inorganic and Analytical Chemistry groups.

The research interests of the four groups in this field encompass not only the traditional areas of inorganic and analytical chemistry but also cover many interdisciplinary areas, including materials science, surface science, electrochemistry, study of proteins, bioanalysis and bioinorganic chemistry. The groups address both experimental and theoretical aspects in these areas. The four groups conduct extensive laboratory research and are led by a total of 16 faculty members. The groups’ common goal is to cultivate and enrich members’ knowledge of fundamental and applied chemistry through the achieving of state-of-the-art advances in the development of beautiful compounds, functional materials, and analytical methodology.

| Physical Chemistry |
| Organic Chemistry |

Overall, the Department of Chemistry offers a comprehensive and dynamic education and research environment for students interested in various aspects of chemistry.
The graduate program in Biophysics and Biochemistry includes faculty from the Department of Biophysics and Biochemistry as well as selected members from the Graduate School of Arts and Sciences, the Graduate School of Medicine, the Institute of Medical Science, the Institute of Molecular and Cellular Biosciences, and the Molecular Genetics Research Laboratory. A faculty advisor is assigned to each student for his/her thesis work from the Department, and the student works in the laboratory of the advisor.

In the Biophysics and Biochemistry graduate program, the lectures in the first year focus on essential knowledge regarding biochemistry, molecular biology and bioinformatics so that students can fully understand the principles of biological phenomena, an understanding which students must apply later in their thesis work to solve important biological problems confronting us today. Based on this educational approach, students are trained to develop the capacity to find, analyze and solve scientific problems, which capacity they will use to develop, research, and write their own original thesis. When they have completed the graduate program, students are prepared and qualified to continue their careers as advanced researchers working at the highest level in their fields.

BIOPHYSICS AND BIOCHEMISTRY
Website: http://www.biochem.s.u-tokyo.ac.jp/

The ultimate goal of this group’s research is understanding the mechanisms of signal transduction networks that regulate various cellular functions, including cell-fate determination, synaptic plasticity and insulin actions at systems levels. In these biological processes, the same input stimulation elicits distinct outcomes depending on temporal patterns of input, and the group is interested in the quantitative mechanisms of the encoding/decoding systems via signaling networks that underlie these processing. The group uses both experimental and computational approaches. Thus they are trying to understand cellular processes in terms of Systems Biology.

Molecular Genetics

Meiosis is the process of forming haploid gametes from diploid germ cells, which is essential for sexual reproduction and the transmission of genetic information to the next generation. The molecular genetics group studies molecular mechanisms that control the cell cycle switch from mitotic proliferation to meiosis, using fission yeast as a model system. The group has found an interesting molecular mechanism, named “selective elimination,” that removes mRNAs required only for meiosis from cells proliferating mitotically. The key regulator of meiosis in fission yeast, the Msi2 protein, inactivates this selective elimination system. The group is also extensively studying additional cellular reorganization and signal-transduction mechanisms that facilitate the execution of meiosis.

This group is pursuing research on the molecular and cellular mechanisms controlling animal physiologies, with special interests in the circadian clock and photosensory systems, by using molecular and genetic approaches in mice, chicks and zebrafish. The group’s research topics include: 1) Molecular clockwork that generates 24-hour oscillation and its resetting by external cues such as light and food, 2) Molecular link between the circadian clock and brain functions, such as memory formation in the hippocampus, and 3) Visual transduction processes determining differences between rod and cone photoreceptor cells, and non-visual photoreceptor machineries controlling light-triggered physiological processes such as body color change in teleosts.

Systems Biology of Cellular Signaling

The ultimate goal of this group’s research is understanding the mechanisms of signal transduction networks that regulate various cellular functions, including cell-fate determination, synaptic plasticity and insulin actions at systems levels. In these biological processes, the same input stimulation elicits distinct outcomes depending on temporal patterns of input, and the group is interested in the quantitative mechanisms of the encoding/decoding systems via signaling networks that underlie these processing. The group uses both experimental and computational approaches. Thus they are trying to understand cellular processes in terms of Systems Biology.

Circadian Clock and Photosensory Systems

This group is investigating the budding yeast transcriptome and proteome as well as the mammalian epigenome. An unsurpassed wealth of omics data and resources has made yeast an ideal model organism to understand the eukaryotic cell as a molecular system. The group intends to pursue the universality and variation in cellular regulation to learn how regulatory systems have evolved. Their approach to epigenomic regulation includes DNA methylation analysis at single nucleotide resolution. In all of these studies, the group is striving to develop novel methodologies and strategies that will lead to unique contributions to the understanding of biological systems.

Functional Genomics

This group is investigating the budding yeast transcriptome and proteome as well as the mammalian epigenome. An unsurpassed wealth of omics data and resources has made yeast an ideal model organism to understand the eukaryotic cell as a molecular system. The group intends to pursue the universality and variation in cellular regulation to learn how regulatory systems have evolved. Their approach to epigenomic regulation includes DNA methylation analysis at single nucleotide resolution. In all of these studies, the group is striving to develop novel methodologies and strategies that will lead to unique contributions to the understanding of biological systems.

Molecular Behavioral Genetics

This group aims at understanding the operating principles of the nervous system. For this purpose, the popular research model organism C. elegans, a soil nematode, is employed as a platform. On the basis of knowledge of the entire connection diagram of 302 defined neurons in C. elegans, two complementary approaches are used: forward genetics, in which mutants with behavioral defects are isolated and analyzed and reverse genetics, in which the gene of interest is genetically manipulated. The group is addressing are: 1) How does the nervous system control the movement of animal as it steers its way? 2) What molecular components direct the switching of behavior caused by learning? 3) How is behavior affected by interaction with other individuals?
The Department of Biological Sciences was established in April 1995 through the merger of three separate departments that specialized in zoology, botany, and anthropology. The new department consists of the following four major research groups: Zoological Science, Plant Science, Anthropology, and Evolutionary Biology. The Department of Biological Sciences currently has 40 faculty members and a total enrollment of 241 graduate students.

Zoological Science

All living organisms share many principles in common as to gene expression and cellular metabolism. But why are the animals so diverse in appearance, behavior, and the way of life? The group’s major goal is to seek answers to this fundamental question. Students are encouraged to learn the basics in physiology, developmental biology, endocrinology, biochemistry, molecular biology, etc., and then apply these to their research.

Plant Science

Research in the plant science group covers studies on a variety of organisms, from microorganisms to flowering plants, and focuses on multiple layers of life – genes, proteins, organelles, cells, tissues, organs, organisms, and populations. The group aims at elucidating the mechanisms of living strategies by exchanging information with peers through these studies and attempts to understand the issues of growth, reproduction, differentiation, morphogenesis, response to environment, and ecology with the common language of modern biology.

Anthropology

Research in physical/biological anthropology is conducted at the molecular, organismal, and population levels. Graduate students are engaged in research in molecular evolution, human genetics, morphological anthropology, population biology, and evolution of human social behaviors. Undergraduates acquire basic knowledge in human anatomy, biochemistry, genetics, molecular evolution, paleoanthropology, primatology, prehistory, evolutionary theory, etc.

Evolutionary Biology

Evolution and biodiversity are a fundamental aspect of biology. The group’s research and education are focused on evolutionary biology at the molecular, cellular, individual and population levels. Their evolutionary studies are closely associated with a wide range of biology including systematics, genetics, development, immunology, and theoretical biology. To cover broad fields, the group’s members cooperate closely with researchers at the National Museum of Nature and Science and at several research institutes and universities.

Overview of Major Research Groups

- Zoological Science
- Plant Science
- Anthropology
- Evolutionary Biology

Web site: http://www.biol.s.u-tokyo.ac.jp/english/index.html
Admissions Information

The Graduate School of Science has implemented a special admissions procedure for international students. This application procedure enables students to apply for admission to the School from outside of Japan. This process is more flexible than the ordinary processes for Japanese students in that students can apply for admission starting either in April or October.

1. Applicant Qualifications

Master’s Program
1. You must have completed 16 years of education abroad and have or will have graduated from an undergraduate program before entering the Master’s Program at the University of Tokyo OR
2. You must have completed 15 years of education abroad or while residing in Japan have completed a correspondence course given by an institution abroad and have completed 15 years of education. In either case, the applicant must be approved by the School of Science of the University of Tokyo as one that has earned the necessary credits with outstanding grades OR
3. You must have been approved by the School of Science of the University of Tokyo through an individual entrance screening as someone with scholastic abilities equivalent to or greater than someone holding a Master’s degree or a specializing field OR
4. If you are applying as an Embassy Recommended Mombukagakusho Scholarship Student, you must be considered falling into one of the categories from (1) to (3) described above and also have passed the preliminary selection conducted by a Japanese Embassy/Consulate General.

Ph. D. Program
1. You must have one of the following: a Master’s Degree, a degree in a specialized field, or a degree equivalent to either of these OR
2. You must have completed 16 years of education abroad or a correspondence course given by an institution abroad and have or will have partaken in research for at least 2 years at a university or research center in or outside of Japan before entering the Ph. D. Program at the University of Tokyo. You must also be approved by the School of Science of the University of Tokyo through an individual entrance screening as someone with scholastic abilities equivalent to or greater than someone holding a Master’s degree or a specializing field OR
3. You must have been approved by the School of Science of the University of Tokyo as having scholastic abilities equivalent to or greater than that of someone with a Master’s degree equivalent knowledge of a specialized field and be at least 24 years of age OR
4. If you are applying as an Embassy Recommended Mombukagakusho Scholarship Student, you must be considered falling into as one of the categories from (1) to (3) described above and also have passed the preliminary selection conducted by a Japanese Embassy/Consulate General.

Selection Procedure
1. Applicants to the Master’s and Ph. D. courses will be selected through an examination of the application documents listed below.
2. Some Departments may not admit applicants whose GRE Test and TOEFL scores do not meet certain standards. Both GRE Test and TOEFL scores are valid if they have been issued within the past two years. Applicants whose first or native language is English are not required to submit a TOEFL score.
3. Some Departments may require an interview with the applicants.

Application Documents
1. Application Form
2. GRE Subject and General Test Score
3. TOEFL Score
4. Two recommendation letters from supervisors or individuals who are familiar with the applicant's academic or scientific work.
5. Official transcripts of all colleges and universities attended AND a statement of completion of all colleges or universities attended (if unavailable, a copy of diploma)

Contact Address

Graduate Admissions Office
Web: • http://www.biochem.s.u-tokyo.ac.jp/public/admission.html
Phone: +81-3-5841-4009
Fax: +81-3-5841-4099
Email: daigakuin@adm.s.u-tokyo.ac.jp

International Liaison Office
Web: • http://www.phys.s.u-tokyo.ac.jp/en/admission_gc.html
• http://www.astron.s.u-tokyo.ac.jp/graduate/index.html.en
• http://www.chem.s.u-tokyo.ac.jp/english/admissions.html
• http://www.biochem.s.u-tokyo.ac.jp/public/admission.html
Phone: +81-3-5841-7630
Fax: +81-3-5841-7631
Email: ILO@adm.s.u-tokyo.ac.jp

Notes
• Japanese students can apply if they have completed both their high school and college education in a foreign country.
• Please contact the potential supervising professor and obtain his or her approval before submitting an application.

General Information & Admissions Procedure
Scholarship & Visa

Selection Procedure

Application Fee

Annual Cost

Ph. D. Course: ¥267,900 / semester
Master’s Course: ¥260,400 / semester

GRE Test and TOEFL scores are valid if they have been issued within the past two years. Applicants whose first or native language is English are not required to submit a TOEFL score.

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• http://www.astron.s.u-tokyo.ac.jp/graduate/index.html.en
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• http://www.chem.s.u-tokyo.ac.jp/english/admissions.html
• http://www.biochem.s.u-tokyo.ac.jp/public/admission.html
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• http://www.astron.s.u-tokyo.ac.jp/graduate/index.html.en
• http://www.chem.s.u-tokyo.ac.jp/english/admissions.html
• http://www.biochem.s.u-tokyo.ac.jp/public/admission.html
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Notes
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Hongo Campus Map

- **Main Gate**
- **Akamon**
- **International Center**
- **School of Science Bldg. 2 (Department of Biological Sciences)**
- **General Library**
- **School of Science Bldg. 7 (Molecular Genetics Research Laboratory)**
- **School of Science Bldg. 4 (Research Center for the Early Universe)**
- **School of Science Bldg. 3 (Department of Biophysics and Biochemistry)**
- **Hongo Health Service Center**
- **Old School of Science Bldg. 1 (Student Support Office at School of Science, Childcare Support Room)**
- **Chemistry Bldg. (Dept. of Chemistry, Geochemical Research Center, Research Center for Spectroscopy, Center for Ultrafast Intense Laser Science)**
- **School of Science Bldg. 1 (Administration Office, Intl. Liaison Office, Dept. of Physics, Dept. of Astronomy, Dept. of Earth and Planetary Science, Center for Nuclear Study, Center for Elementary Particle Physics)**

Getting to the Hongo Campus

1. **Chuo Refectory (Underground)**
2. **School of Science Bldg. 1 (Center), KOSIBA HALL**
3. **Institute of Molecular and Cellular Biosciences**
4. **Earthquake Research Institute Bldg. 1**
5. **Earthquake Research Institute Bldg. 2**
6. **Earthquake Research Institute Bldg. 3**
7. **Yasuda Auditorium**
8. **Second Refectory**

Kashiwa Campus Map

- **Main Gate**
- **Institute for Solid State Physics (ISSPP)**
- **Institute for Cosmic Ray Research**
- **Advanced Spectroscopy Laboratory, ISSP**
- **Kashiwa Guesthouse**
- **Cafeteria**
- **Kashiwa Library**
- **Kashiwa Student Counseling Center**
- **Academic Shop (COOP)**
- **Food Shop & Café**

Getting to the Kashiwa Campus

1. **Kashiwa Campus Map** (produced by Public Relations Group, the University of Tokyo, Rei Design & Plannings) Partial changes were made to the original map.
“The University of Tokyo Access Map” (produced by Public Relations Group, the University of Tokyo, Rei Design & Plannings) Some changes were made to the original map.
Botanical gardens

The University of Tokyo Botanical Gardens consist of the main garden in Tokyo, originated as the Koishikawa Medicinal Herb Garden of the Tokugawa Shogunate in 1684 and annexed to the University in 1877, and the branch garden in Nikko established in 1902. Both gardens have excellent facilities and wild plant collections that contribute to research and education in the plant sciences, and together they have been leading research in botanical gardens in Japan. Both of them are open to the public.

Research Center for Spectrochemistry

Current research at this center mainly covers ultrafast (femto- to sub-picosecond) ideas and evolution of galaxies, and cosmology. The Institute operates a 1.5m Schmidt telescope in Nagano Prefecture, as well as a 10m submillimeter in collaboration with the National Astronomical Observatory of Japan. Together with other large ground-based facilities and satellite observatories the Subaru and Akari, the Institute is at the cutting-edge of astronomy today.

Geochronology Research Center

The Geochronology Research Center was established in 1978 to promote research in isotope geochemistry. It aims to activate research cooperation at the frontiers in inter- and multidisciplinary sciences. The Center for Nuclear Study is one of the major research and education centers in the field. The primary emphasis in its current research activities is on heavy-ion science. In close collaboration with RIKEN, where the major facilities of CNS are located, a variety of advanced studies on heavy-ion science are being conducted. CNS has also established itself as an international base for research and training in nuclear science.

Research Center for the Early Universe

The Research Center for the Early Universe (RESCEU) is conducting research in cosmology and astrophysics, with special emphasis on "understanding the universe through three steps: baryons, dark matter, and dark energy." In addition to theoretical research, RESCEU’s activities include astrophysical observations in the optical, sub-millimeter, and X-ray wavelengths.

Marine Biological Station

The Marine Biological Station (MBS) is located in one of the world’s richest regions in terms of biodiversity. Taking advantage of the abundant marine organisms available there, extensive research and training are being conducted at MBS. In 2009, the Center for Marine Biology, which is an interfaculty research organization of the University of Tokyo, was established at MBS with the aim of creating a frontier research center in biology and promoting international collaboration.

Institute of Astronomy

The Institute of Astronomy promotes both research and educational activities especially in the field of optical, infrared and radio astronomy. A wide spectrum of research is conducted at the Institute, from the origin of the solar system to the birth of black holes, evolution of galaxies, and cosmology. The Institute operates a 1.5m Schmidt telescope in Nagano Prefecture, as well as a 10m submillimeter telescope in Nagano Prefecture, in collaboration with the National Astronomical Observatory of Japan. Together with other large ground-based facilities and satellite observatories the Subaru and Akari, the Institute is at the cutting-edge of astronomy today.

Center for Nuclear Study

The Center for Nuclear Study (CNS) plays a central role in nuclear science research and education at the University of Tokyo. Moreover, CNS is a well-known institute in the international community of nuclear physics, and indeed serves as one of the major research and education centers in the field. The primary emphasis in its current research activities is on heavy-ion science. In close collaboration with RIKEN, where the major facilities of CNS are located, a variety of advanced studies on heavy-ion science are being conducted. CNS has also established itself as an international base for research and training in nuclear science.

Molecular Genetics Research Laboratory

The Molecular Genetics Research Laboratory (MGL) provides advanced research instruments and lab space for University of Tokyo faculty members in order to assist and promote their research. The research groups in MGL share a common interest in the molecular basis of life and its genetic disorders. Their research aims to understand how thousands of genes and their encoded proteins serve to bring about the highly coordinated behavior of cells and tissues. The research group approach this goal from many levels of organization, ranging from individual cells to multicellular systems and the whole organism from mammals to plants.