Science is a relentless pursuit of universal truths in Nature driven by the curiosity of individuals. Scientists ask: How did the Universe begin? What is its fate? What is it made of? What are its fundamental laws? How did life begin? How did life evolve? How do cells in the brain work together to make the human mind? Is there life beyond the Earth? The list of such fascinating questions goes on. The School of Science at the University of Tokyo invites you to join this intriguing quest to find answers to these questions. At the School of Science we train you to learn and study science and provide exciting opportunities to conduct your own scientific research. You will experience the joy of understanding and gaining new knowledge and making discoveries through the variety of Ph.D. programs we offer. In the School of Science we strive to offer world-leading research programs in both traditional and interdisciplinary fields. Our programs are highly rigorous and demanding, but you will find them rewarding.

Science has become an integral part of everyday life. You benefit, and, indeed, cannot escape, from the outcomes that Science has produced. Today, science exerts great impact on society in the same way politics, economics and culture do. Science is expected to play a major role in problem solving for many difficult societal issues. For instance, energy and environmental issues are major challenges that Science faces today. At the School of Science we train you to apply scientific knowledge and experience to solve important real-life problems and to assess their impact within a wide context. The School of Science has introduced many programs to enhance academic cooperation with industries and to promote social application of scientific knowledge and methods.

In Science, there are no barriers of gender, national borders, religion or language. The School of Science considers respect for cultural and ethnic diversity on campus as one of its most important core values. The School has included in its educational objectives enhancing cross-cultural interactions with diverse peers in order to stimulate the minds of students to make their academic work more professional and creative. The School offers a variety of internationalization programs designed to promote mutual understanding through exchanges of views between Japanese students and researchers and their counterparts having non-Japanese backgrounds about their research and scientific developments. We offer programs to foster wider perspectives and maintain the competitive edge required for the next generation of leaders by bringing together a multiplicity of experience and interests. We strive for academic excellence through its demand for ever-increasing diversity. Indeed, our commitment to diversity is stronger than ever.

Finally, let me offer a few words of advice to you, prospective graduate students. Science is truly intriguing. It is a life-long activity full of excitement. All you need to do is aim high and work hard. We invite you to join us.

A message from the Dean

Hiroaki Aihara, Dean
Science, which elucidates universal truths of the natural world and searches for its underlying fundamental laws and principles, forms the foundation of human society and civilization. Science is an essential component of the accumulated wisdom of the human race and of human intellect. Based on these ideals, the School of Science is conducting education and research in advanced science that will open pathways to a prosperous and peaceful future for humankind.

About the School

Our university was established in 1877 as the first national university in Japan with the name “Imperial University.” This was changed to “Tokyo Imperial University” when Kyoto Imperial University was established. The name was changed to the present “University of Tokyo” after World War II. The full Japanese name of our university, 東京大学 (Tokyo Daigaku) is commonly contracted to 東大 (Todai) in everyday usage.

The undergraduate Faculty of Science was established at the same time as the University. In accordance with the reforms of the postwar education system, the Graduate School of Science was established as an appendage of the Faculty of Science in 1953. In the early 1990s the Faculty of Science was reorganized as the School of Science, which includes both undergraduate and graduate programs in science, with institutional emphasis on the latter. The School provides its students with outstanding opportunities for intellectual development and the acquisition of professional knowledge and skills.

At present, the School offers master’s and doctoral programs in six departments: Physics, Astronomy, Earth and Planetary Science, Chemistry, Biophysics and Biochemistry, and Biological Sciences. These programs are run in close cooperation with other research institutes within the university and with some external institutions. The School also offers undergraduate education in Mathematics and Information Science, but undergraduate education is not discussed further in this Prospectus.

The School has a world-class faculty of more than 260 full-time professors, associate professors, and research associates, and a diverse student body of more than 1,350 graduate students. Students and researchers from many disciplines, backgrounds, and regions collaborate together on multidisciplinary study and research. The School is committed to accepting international students proactively, and intends to expand the number of lectures delivered in English.

The alumni of the School include three Nobel laureates in Physics: Leo Esaki (1973 laureate), Masatoshi Koshiba (2003), and Yoichiro Nambu (2008).

Mission

The School of Science will conduct education and research to further understand the truths of nature, to expand and develop the frontiers of knowledge, and to communicate such new knowledge to future generations.

Fairness

The School of Science will hold fairness and openness to be paramount in all personnel and other organizational decisions, and will maintain the highest standards of education and research through rigorous external evaluation.

Social contribution

The School of Science will make the results of its education and research available to the general public and will make efforts to prevent such results from being used to harm the peace of human society and the global environment and will, in this way, contribute to the development of culture and the continued existence of the human race.

Non-discrimination

Consistent with the ideals of science, the School of Science will not discriminate on the basis of gender, nationality, race or religion, and will respect academic freedom in education and research.

Education

The School of Science will educate young people who will lead the next generation of science and who will contribute to the continuous and peaceful progress of human society by solving new research problems.
Advanced Leading Graduate Course for Photon Science (ALPS)

The Advanced Leading Graduate Course for Photon Science (ALPS) is run through the joint efforts of the Graduate School of Science and the Graduate School of Engineering of the University of Tokyo. The objective is to train doctoral students Doctors of Philosophy with wide-ranging interdisciplinary viewpoints and the ability to apply their knowledge to real-world problems, by conducting research in several cutting-edge research fields of fundamental science, joined together by one common theme: frontier photon science. We seek to provide the industrial, academic and governmental arenas with doctoral graduates who possess leadership qualities. In cooperation with industries related to photon science, topics of frontier photon science will be taught through work (both lectures and laboratory). This interdisciplinary learning environment will give students from various disciplines a high level of specialization, a flexible and creative viewpoint that allows them to cross the boundaries between research fields, and effective leadership abilities.

Graduate Program for Leaders in Life Innovation (GPLLI)

Life innovation involves multiple factors in a sophisticated way, making it extremely difficult to be achieved by a single discipline and requiring collaboration and integration of multiple disciplines. Therefore, to realize life innovation, it is necessary to produce leaders who have a solid basis in their specialty and simultaneously have broad perspectives, communication skills and deep insight to integrate results and human resources from related multiple disciplines. The aim of this program is to provide selected graduate students with various opportunities to gain the following three talents:

1. A high degree of specialty and systematic broad knowledge
2. Language skills (including English) and communication skills
3. Insight required for leaders (originality, foresight, leadership and a sense of morality)

Program for Leading Graduate Schools

The Program for Leading Graduate Schools, sponsored by MEXT (the Ministry of Education, Culture, Sports, Science and Technology) and the JSPS (Japan Society for the Promotion of Science) is intended to become a driving force behind drastic reform in applicable areas of graduate school education at leading educational centers. This program seeks to foster leaders who can play global roles across a wide spectrum of academic, corporate and governmental sectors. The School of Science has established two degree programs under this program starting in the 2012 academic year. For more information about the program, please visit the website is cited below.
That’s why I came to Todai

Seung-Won Choi

South Korea — Entered doctoral program in biological sciences in April 2009

When I was a master’s course student in South Korea, I got a chance to participate in an international conference in Beijing. At that conference, I met many researchers from all around the world, including Japan. I found about some interesting research being done at Todai, and talked with people making presentations about it. They had lots of interesting topics to talk about and, what is more, passion for the research. It was a nice experience and made me think about studying at Todai. I hope to be a scientist in the field of plant science. Plants are different from us animals. So I believe they hold many secrets for life and could be a hope for us. I want to continue to globalized technologies in the future. Moreover, lots of specialists and professors always support and encourage students to increase our own potential and achieve our goals. Concentrated research along with these factors will help you to achieve your research and move us to a new period of technology.

Clement Ng

Australia — Entered master’s program in physics in April 2006, and defended PhD. program in April 2010

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 the frontiers of knowledge. While the high demands of knowledge. While the high demands of research and teaching at academic institutions, I chose Todai because it suited my research interest.

Andraus Robayo.

Columbia — Entered doctoral program in physics in April 2011

Due to my primary field of research (statistical mechanics, stochastic processes and random matrices), I found that after completing my master’s studies in Chuo University, I should apply for admission to Todai in order to find a place where I could discuss and share my ideas and broaden my horizon, and my expectations have been greatly exceeded. I find it hard to think about the possibility of having this kind of experience anywhere else.

Shen Xi

China — Entered Master’s program in Chemistry in April 2011

1. I want to go to the best university since I was a kid. Unfortunately, I failed in the university entrance examination, so I couldn’t choose my dreamed university at that time but I didn’t give up. When I was a senior, there was a chance to come to Japan as an exchange student for half a year. I thought it was a good chance to know the outside world, so I took it and came to Japan. It turned out I liked here and wanted to stay and study here longer. So I chose Todai, which is the best university in Japan.

2. I am not sure about the future goals right now. Maybe, go to the doctor course, or find a job here. Anyway, I want to stay here longer and learn more.

3. I think it is a fantastic university. The professors, the students and the Japanese are very nice. I think it would be easy to live here, but the pressure is very huge sometime. All the people around you are very excellent, so maybe at first, you would find a little depressed. My suggestion is do what you want to do and just complete with yourself. No matter what happens, try to be optimistic. Another is learning Japanese. It is true you can communicate with others with English, but Japanese is very funny, you would love it.

Kyle Mede

Canada — Entered Master’s program in Chemistry in October 2011

1. Throughout my undergraduate degree in Canada, I made many Japanese friends and grew very fond of the culture and language by taking part in our university’s Japan Club. When looking into graduate schools to apply to, a friend suggested I look into Todai. It became a dream come true to not only attend the top university in Japan, but to live and experience the country for years. It was the best decision I ever made, as the staff, professors and fellow graduate students are all amazingly friendly and knowledgeable. It is a fantastic environment to reach your highest goals in research.

2. My next immediate goal is to conduct PhD research in Australia in Hawaii. After which I hope to start a career as a professional researcher at either a university or top class astronomical observatory.

3. Taking some basic Japanese courses ahead will make your life more comfortable and fun. During my undergraduate I added a few intensive Japanese language classes, to my 3rd and 4th year school schedule and have benefited immensely from them. If you have the opportunity, apply to the UTRIP to see what research at Todai is really like first hand.

Thantip S. Krasienapibal

Thailand — Entered Master’s program in Chemistry in April 2011

1. When someone thinks of studying in Japan which has advance technologies, I believed that most students dream to come to Todai and one of those is me. Todai has not only a prestigious program in Sciences but also has advanced researches along with high performance equipment which promote the quality of researches. Moreover, lots of specialists and professors always support and encourage students to increase our own potential and achieve our goals. Concentrated research along with these factors will help you to achieve your research and move us to a new period of technology. Thus, I would like to pursue my graduate time here.

2. My future goal is to work in the field of Solid State Chemistry in a University where I can do research and help people both my students and non-students. No matter I was in Japan or my own country, I would like to make collaborative research which will lead to globalized technologies in the future.

3. For newcomers, Todai is welcoming you to come to conduct a valuable research with well-equipped laboratories and modern technologies. To prepare your basic knowledge and research spirit is my advice to spend your perfect research time here.
Voices of alumni
To me, Todai is…

David Casenove
France
Ph.D. Earth and Planetary Science 2010

When I was a Todai student, I had a lot of wonderful experiences, such as attending lectures of Nobel Prize winners, learning how to ski, joining student tours, and so on.

I want to continue my research on plant biology and to become a faculty member in a university or other academic institution in the future. I think that having studied at Todai will help me to make relationships with the leading scholars in my field.

Studying Japanese is very important. Because most Japanese people are reluctant to speak English, learning Japanese will help you to understand them better and also make your life convenient in Japan.

Working hard on research is also important, but it is not the only thing in your life. Learning how to balance study and leisure is important for the people who want to get a Ph.D. degree and pursue a career in science.

Choosing Todai came to me naturally. The initial reason is that my supervisor during my Master’s degree work is a good friend of Professor Tabushi. Now at Nagoya University, Professor Tabushi especially advocates professor in the Earth and Planetary Science Department, who supervised me for the Ph.D. Being a paleo-ecologist specializing in Cambrian (i.e., 540 Ma) plankton, I investigate how these organisms lived in very old ecosystems. Therefore, an essential component of my work consists of understanding the rules that are underlying modern animal communities, and the facilities (marine laboratories and sampling cruises) provided by Todai supported my research remarkably.

I am currently an Adjunct Postdoctoral Fellow at Todai (Komaba Campus) until March 2011. I hope to pursue my research abroad and find a permanent academic position in a good institution.

I would just advise students to enjoy themselves in Japan. There are so many things to see and experience both in Todai and, mostly, outside Tokyo that the duration of a course always seems too short.

I enjoyed a lot of intercultural experiences, because Todai is, without any doubt, situated at the academic center of Japan. It was not difficult to find and invite excellent Japanese and foreign researchers to our seminar on Friday morning (which began at 8:30!), and they encouraged me very much in my thesis work as well. I also found it very interesting to talk with researchers at Todai in fields from literature to medicine. But remember, it’s up to you to get the most out of your Todai experience.

I would like to extend my research in geophysics in order to improve our understanding of our planet’s interior, primarily using seismic data. I imagine that in every aspect my Todai connections will help me wherever in the world I am. After all, as the famous Scottish song suggests, “Should old acquaintance be forgot and never brought to mind?”

I strongly recommend that you study Japanese in advance; unfortunately there may not be so many people who are willing to talk with you in a foreign language at Todai, and there may be even fewer outside Todai. Think of it positively—you will benefit by improving your Japanese. In my case, since I moved to Toulouse in April 2010 just after having obtained my Ph.D. degree from Todai I have spoken and discussed science only in the French language, and I find my progress has been very rapid. However, my French is still far from the level of a native speaker. So learning Japanese is the best way to make your Todai life comfortable and enjoyable.

1. Hui-Yu Wang
China
Ph.D. Biological Sciences 2010

2. Nobuaki Fuji
Japan
Ph.D. Earth and Planetary Science 2010

Q1: What did you like best about your experiences as a Todai student?
Q2: How do you envision your future career, and how will your Todai education help you?
Q3: What advice do you have for prospective overseas grad students at Todai?

1. Nobel Laureates

As examples of the honors and awards received by alumni and faculty members of our School in recognition of their contributions to science, we present a list of Nobel Laureates from the School of Science. We also list Nobel Laureates from other Schools of the University.

Nobel Laureates from other Schools of the University

Yasunari Kawabata
(B.A., Literature, 1934)
1968 Nobel Laureate, Literature
For his narrative mastery, which with great sensibility expresses the essence of the Japanese mind.

Eisaku Sato
(B.A., Law, 1924)
1974 Nobel Peace Prize
For contributions to human rights, arms control and disarmament.

Kenzaburo Oe
(B.A., Literature, 1959)
1989 Nobel Laureate, Literature
Who with poetic force creates an image of the human predicament today.

Ei-ichi Negishi
(B.S., Chemistry, 1954)
2010 Nobel Laureate, Chemistry
For palladium-catalyzed cross couplings in organic synthesis.

Leo Esaki
(B.S., Physics, 1947; Ph.D., 1959)
1970 Nobel Laureate, Physics
For experimental discoveries regarding tunneling phenomena in semiconductors.

Masatoshi Koshiba
(B.S., Physics, 1951; Ph.D., 1959; Faculty member, 1963–1987; Professor Emeritus, 1997–present; Special University Professor Emeritus, 2005–present)
2002 Nobel Laureate, Physics
For pioneering contributions to astrophysics, in particular for the detection of cosmic neutrinos.

Yoichiro Nambu
(B.S., Physics, 1942; Ph.D., 1972)
2008 Nobel Laureate, Physics
For the discovery of the mechanism of spontaneous broken symmetry in subatomic physics.

Nobel Laureates

1. Nobel Laureates from the School of Science
The Department of Physics covers almost all of the frontier areas of physics including condensed matter physics, astrophysics and cosmology, particle physics, nuclear physics, and general physics. The department has the longest history among Japanese universities for education and research in physics, and has educated many outstanding physicists, including three Nobel Prize laureates, Leo Esaki (1973 laureate), Masatoshi Koshiba (2002 laureate), and Yoichiro Nambu (2008 laureate). Faculty and students are based at both the Hongo Campus and also affiliated institutes, which enables them to conduct diverse and advanced research. For example, in the field of experimental physics, experiments are carried out at major domestic and international facilities such as particle accelerators.

**Research groups**

**Condensed matter**

The experimental condensed-matter physics group covers a wide range of materials and phenomena that include strongly-correlated electron systems, exemplified by high-\(T_c\) superconductors, superfluid helium, quantum Hall systems, Tera-Hertz photons, and physics of surfaces. The theoretical condensed-matter physics group covers a wide spectrum as well, ranging from fundamental aspects to realistic analysis of diverse materials. The experimental and theoretical groups collaborate actively.

**General physics**

General physics covers the study of nonlinear non-equilibrium physics, quantum information processing, quantum optics, atomic/molecular physics, plasma physics, biophysics, and neuroscience. Our group is attempting to expand its conceptual scope to promote truly original and unique research.

**Particle physics**

The particle physics theory group covers model building, phenomenology, string theory, mathematical physics, and particle cosmology. We are conducting experiments at the LHC, an energy frontier collider, in which the origin of mass and physics beyond the Standard Model will be discovered in the near future. Experimental activities for discovering dark energy, dark matter, and the origin of the CP violation are also ongoing in the particle physics group.

**Astrophysics and cosmology**

The theoretical astrophysics group is actively working on a variety of broad topics in astrophysics and cosmology. In particular, our current interests include the following three major research topics: “physics of the early universe,” which aims at describing the birth of the universe within the framework of string theory and brane-world models; “observational cosmology,” which attempts to understand the evolution of the universe based on rapidly accumulating observational data in multiple wavebands; and “particle and nuclear astrophysics,” which considers unexplored aspects of particle and nuclear physics as applied to astrophysical phenomena in regimes of extremely high energy, density, and temperature.

**Nuclear physics**

Nuclear physics now extends its scope to the structure of exotic/unstable nuclei, antimatter, nuclear/hadronic matter under extreme conditions and quark gluon plasma, areas which are intimately linked to atomic physics, elementary particle physics and astrophysics. We also explore fundamental problems such as the dynamical origin of proton mass, precise measurement of antiproton mass, and the EPR paradox.

**Interactive lectures by Sir Anthony James Leggett (2003 Nobel Laureate in Physics).**

Prof. Anthony James Leggett, who has been awarded an honorary doctorate by the University of Tokyo in 2010, visits the School annually from 2011 to 2013. During his visit, he delivers an intensive course of lectures on condensed matter physics. Each course includes interactive lectures that give students the opportunity to make presentations on their research in English. Presentations are followed by Q & A sessions, during which Prof. Leggett and other students make questions and presenters answer, resulting in extensive discussions. All lectures are videotaped and become available on the UT Open Course Ware (a free and open publication of the University of Tokyo course materials). Lecture notes taken by students are also published in distinguished domestic science journals. This past program is supported by the JSPS Award for Eminent Scientists. http://www.s.u-tokyo.ac.jp/en/event/leggett/ http://ocw.u-tokyo.ac.jp/eng_course_list/830.html?teachcat=2

Prof. Anthony James Leggett (photo by Sato. Q).
Astronomy

http://www.astron.s.u-tokyo.ac.jp/index.html/en

Astronomy education and research at the University of Tokyo began in 1877 when the University was founded and the Department of Astronomy was established together with the Mathematics and Physics Departments in the Faculty of Science. Since then, UT’s Department of Astronomy has been at the forefront of astronomy education and research at both the undergraduate and graduate levels, and has produced many outstanding astronomers.

The astronomy courses develop graduate students to function later as front-line researchers and educators in astronomy and other fields and to play central roles in international and interdisciplinary research projects. Graduate students strive to develop a high level of expertise, a willingness to challenge new tasks, and the ability and sense to open unknown research paths.

Fully mindful of these educational objectives, faculty members provide students with advanced training in astronomy to meet their needs as future researchers. Although the number of faculty members in the Department of Astronomy is small relative to other departments in the Graduate School of Science, it is large by global standards. In addition, the fields covered by the faculty constitute the largest astronomy graduate course in Japan, enabling it to provide astronomy education that is not available at any other universities.

Theoretical astronomy

This group covers a wide range of research fields of 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.

Optical and infrared astronomy

This group covers observational astronomy at optical and infrared wavelengths, ranging 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. Another major part of the activities of the group is the hardware development of optical and infrared instruments as well as large telescopes, such as the Tokyo Atacama Observatory (TAO) in Chile, which uses the latest technology.

Radio astronomy

The major fields of observational radio astronomy this group studies include 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.

Space and gravitational wave astronomy

The space and gravitational wave astronomy group is working actively on space missions, such as the Suzaku (X-ray), AKARI (infrared), and Hinode (solar) satellite missions, as well as studying 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. The group is also involved in the hardware development of space telescopes and instrumentation for future space missions.

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Earth and planetary science covers a wide range of fields, from study of the solid Earth, atmosphere and oceans, and surface environment, including the biosphere, to planets and minor objects in the solar system, as well as space beyond the solar system. Moreover, it covers a wide range of time scales, from the evolution of the solar system to the future of the Earth, and from billions of years to hours or less. Diverse research methods are required to study these diverse research fields, including field work, observation, laboratory experiments, chemical analyses, theoretical modeling, and simulation. Recent research aiming to understand the Earth and planets as a large-scale and complex system requires interdisciplinary research and education based on strong programs in the various disciplines of this field. 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
http://www.eps.s.u-tokyo.ac.jp/index_en.html

This group studies oceanic and atmospheric phenomena on a wide range of space and time scales. Specific topics include small-scale turbulence, internal gravity waves in the troposphere, stratosphere and ocean, eddies and large-scale circulation of the ocean and atmosphere, and their coupling. Our aims are to deepen our understanding of the physical processes and, to the greatest extent possible, to enhance our ability to make predictions of these phenomena.

Atmospheric and oceanic science

This group aims to study the Earth as well as other planets as a single system comprising closely interacting multiple subsystems, with interaction times varying from seconds to billions of years and with spatial scales from the atomic scale to the distance between planets. We seek to understand the stability, variability, and evolutionary trends of planetary systems and surface environments.

Earth and planetary system science

We study space physics, magnetospheric physics, observational planetology, comparative planetology, and planetary material science. Japan’s commitment and contributions to planetary/asteroid/asteroid scientific missions are expanding, and this group’s members are playing an important role in these efforts.

Space and planetary science

This group studies 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 on field observation, analysis of geological, mineralogical, and paleontological samples, and laboratory experiments.

Geosphere and biosphere science

On March 11, 2011, the largest earthquake in Japanese history caused tremendous disaster to eastern Japan. It was also the best observed earthquake in the human history. The seismic data revealed the unique characteristics of the Tohoku-Oki earthquake, such as shallow relatively smooth slip and deep energetic ruptures, which are respectively responsible for large tsunami and damaging strong motions. The rupture on the plate interfaces migrated back and forth for more than 100 s. Fault slip near the Japan Trench was larger than 30 m, completely changed stress state around the subduction zone, and left Japanese islands in a tectonic setting we have never seen.

The Tohoku-Oki Earthquake


The “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. Among the fields covered by this group are the structure and dynamics of the Earth’s interior, magma dynamics, global tectonics, dynamic geomorphology and earthquake physics.

Solid earth science

This group studies 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 on field observation, analysis of geological, mineralogical, and paleontological samples, and laboratory experiments.

Geosphere and biosphere science
Our graduate program covers advanced studies in all fields of chemistry, Physical, Organic, Inorganic, and Analytical Chemistry, and their interdisciplinary subjects through both lectures and frontier research projects. Students in the Master Course are encouraged to build a foundation of knowledge in the respective fields of chemistry and also develop experimental skills in their own fields of expertise as well as other research fields. Students in the Doctoral Course are strongly encouraged to conduct frontier research projects using their own knowledge and expertise in chemistry. In addition, those in the graduate program have various opportunities to develop teaching skills of chemistry via Teaching Assistantship of the undergraduate laboratory course and research activities in their own research groups. All lectures in our graduate program are given in English, aiming at exposures of all students to English-speaking scientific environment as well as encouraging international students to enroll in our graduate program. We also hold various research seminars and symposia that invite domestic/international speakers who conduct world-top-class research programs, providing opportunities for students to learn “hot topics” of chemical research.

Chemistry

http://www.chem.s.u-tokyo.ac.jp/english/index.html

Research groups

Four research groups are in the organic chemistry division, and the respective group conducts unique research programs in organic chemistry and interdisciplinary fields. The Synthetic Organic Chemistry group aims at developing environmentally friendly reactions with extreme efficiencies. The Physical Organic Chemistry group challenges new reactions and materials that lead to novel principles of chemistry. The Bioorganic Chemistry group advances biosynthetic methodologies that produce novel bioactive compounds, and apply them to various topics in chemical biology. In addition to the regular group meetings in each group, this division holds a weekly Organic Seminar, and graduate students in this division present not only their own experimental results but also literatures of hot topics in the related fields.

Physical chemistry

A variety of frontier research projects are being conducted in the three research groups in the physical chemistry division. The Solid State Chemistry group designs and synthesizes novel functionalized molecule-based and metal oxides magnets. The Quantum Chemistry group investigates molecules interacting with ultrashort intense laser fields for fundamental understanding of interaction of molecules and light fields. The Catalytic Chemistry group aims at developing novel techniques of synthesizing metal clusters and investigates their physical and chemical properties. In all three groups, students master basic and advanced skills in experiment and theory and develop their understanding of essential aspects physical chemistry through their own research projects, group meetings, and daily discussions.

Inorganic and analytical chemistry

The research interests of four groups 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. Both experimental and theoretical aspects are addressed in the area. Research in the laboratory is carried out in four groups led by sixteen members of academic staff. Our common concept is to cultivate and enrich our knowledge of fundamental and applied chemistry through advancing the state-of-the-art in beautiful compounds, functional materials and analytical methods.

Titanium oxide \( \text{A-Ti}_3\text{O}_5 \) for gigantic optical recording media

Research group of Prof. Shin-ichi Ohkoshi reported that they discovered a new type of metal oxide which shows reversible transition between metal and semiconductor by photon irradiation at room temperature. This new type of metal oxide (lantha4ntype titanium peroxide, \( \text{L-TiO}_2 \)) was synthesized by the chemical technique using surfactant. \( \text{L-TiO}_2 \) shows photoinduced phase transition (photoinduced metal-insulator transition) from black colored lanthana phase (metallic conductor) to brown colored beta phase (\( \text{TiO}_2 \)) (semiconductor). Moreover, the reverse phase transition was also observed by the photothermolysis. This is the first example of a metal oxide which shows photoinduced phase transition at room temperature. Lanthana titanium oxide is a simple material consists only of titanium atom and oxygen atom and hence it is very economical and environmentally benign material. Furthermore, the lanthana titanium oxide can be obtained by a simple crystallization of commercial \( \text{TiO}_2 \) photocatalyst under hydrogen, which is an industrial advantage from the viewpoint of cost and mass production.

The objective of the lectures in the first year of the master’s degree course is to ensure that students acquire essential knowledge of biochemistry and molecular biology, including the principles of biological phenomena, so that they can use this knowledge for the preparation of their thesis and eventually solve the important biological problems that we face today. After successfully completing the doctoral course, students will be prepared and qualified to continue their careers as advanced researchers.

Structural biology

This group’s research aims to determine tertiary structures of proteins and nucleic acids that are crucial for biological processes. The group’s research interest is focused on: 1) how genetic code is translated into protein with high fidelity, 2) how membrane transporters selectively transport cations, sugars, metabolites, proteins and drugs and how their activities are regulated, 3) how the innate immune system protects humans from cancer.

Circadian clock and photosensory systems

This group is pursuing research on the molecular and cellular mechanisms controlling animal physiologies, with special interest in the circadian clock and photosensory systems, by using molecular and genetic approaches in mice, chicks and zebrafish. Their research topics include: 1) the molecular clockwork that generates a 24-hour oscillation and its resetting by external cues such as light and food, 2) the 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 photosensory machineries controlling light-triggered physiologies such as body color change in teleosts.

RNA biology

This group studies the molecular mechanisms of RNA silencing in Drosophila. RNA silencing is gene silencing pathways mediated by small non-coding RNAs, including short-interfering RNA (siRNA), microRNA (miRNA) and PiWI-interacting RNA (piRNA). A small RNA functional in RNA silencing is associated with Argonaute protein to form RNA-induced silencing complex (RISC) to silence target genes by either cleaving target mRNAs or inhibiting their transcription or translation. In Drosophila, five Argonaute proteins are expressed; each Argonaute binds to a particular set of small RNAs and functions in a distinct gene silencing pathway. The core schemes of gene silencing mediated by siRNA and miRNAs have been emerged. However, the mechanisms of germline-specific piRNA-mediated gene silencing and piRNA biogenesis remain largely ununderstood. Thus, we investigate to understand the molecular mechanisms of RNA silencing, especially those triggered by piRNAs and piRNA biogenesis in Drosophila.

LIGHT SWITCHES FOR NEURAL BEHAVIORS

The structure of channelrhodopsin reveals its cation-conducting pathway and activation mechanism

Channelrhodopsin (ChR) is a light-gated cation channel derived from algae that conducts cations, including sodium ions, in a light-dependent manner. Because the inward flow of sodium ions changes the electrochemical gradient and triggers neural firing, neurons expressing ChRs can be electrically controlled with high temporal precision within systems as complex as freely moving mammals. Although ChR has been broadly applied to neuroscience research, little is known about its molecular mechanism. Research group of Prof. Osamu Nureki have determined the crystal structure of ChR at atomic resolution, showing its basic architecture and molecular mechanism, and given the long-awaited answer to the question, “Where is the cation conducting pathway?” This integration of structural and electrophysiological analyses provides insight into the molecular basis for the remarkable function of ChR, and paves the way for the precise and principled design of ChR variants with novel properties.

Crystals obtained from the channelrhodopsin light-gated cation channel


Systems biology of cellular signaling

The ultimate goal of this group’s research is the understanding of mechanisms of signal transduction networks that regulate various cellular functions including cell-fate determination, synaptic plasticity, and insulin actions at the systems level. 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 this processing. The group uses both experimental and computational approaches; thus they are trying to understand cellular processes in terms of Systems Biology.

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 the 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 destroyed. Examples of the questions the group is addressing are: 1) How does the nervous system control the movement of the animal as it steers its way? 2) What molecular components direct the switching of the behavior caused by learning? 3) How is behavior affected by interaction with other individuals?

Biophysics and Biochemistry

http://www.biochem.s.u-tokyo.ac.jp/english/
The Department of Biological Sciences was established in April 1995 by the merger of three separate departments which specialized in zoology, botany and anthropology. An outstanding feature of the research in our department, as a whole, is its variety, as is evident from the presence of four diverse sections described below. The research being carried out in our department covers a wide range of studies at a variety of levels, from gene, protein, cell and organism to the disciplines of molecular biology, cell biology, developmental biology, ecology and evolutionary biology. Despite the wide variety of research topics, a common theme is our emphasis on the basic principles of biology. Graduate education in our department is conducted in part in collaboration with other departments and institutions, including the Marine Biological Station, the Atmosphere and Ocean Research Institute, Botanical Gardens of the University of Tokyo, and the National Science Museum.

Zoological science

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

Anthropology

Research in our department covers studies on a variety of organisms, from microorganisms to flowering plants, and focuses on multiple hierarchical levels 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.

Plant science

Research in the plant science group covers studies on a variety of organisms, from microorganisms to flowering plants, and focuses on multiple hierarchical levels 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.

Evolutionary biology

Evolution and biodiversity are fundamental properties of organisms. This group’s research and training are focused on evolution and biodiversity at the molecular, cellular, individual, and population levels. Graduate students are engaged in research in molecular evolution, human genetics, morphological anthropology, population biology, and evolution of human social behaviors.

How did plants pioneer unique trafficking routes in the cell?

Endosomal trafficking plays an integral role in various phagocytic cell activities. In animal cells, a member of the Rab GTPase family, Rab5, is known as a key regulator of various endosomal functions. In addition to orthologs of animal Rab5, land plants harbor the plant-specific Rab5. It was unknown and of much interest why plants evolved two distinct types of Rab5 and how they differed functionally. Using Arabidopsis thaliana, we showed the plant specific Rab5A (ARA6) promotes membrane fusion between endosomes and the plasma membrane. We further demonstrated that ARA6 has a functional role in the vacuolar stress response. These results indicate that acquisition of a new membrane trafficking pathway may be associated with maximization of the fitness of each organism in a lineage-specific manner.


Endosomal trafficking is conducted at the cellular, 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.

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Affiliated facilities of the School of Science

The Graduate School of Science also includes the units described on this page, which are collectively referred to as “affiliated facilities.” Many of the faculty members of these units participate in graduate education in the School through joint appointments in one of the six departments described above on pp.19-21.

Marine Biological Station (MBS)

The Missaki Marine Biological Station (MBS) is located in one of the world's richest regions in terms of biodiversity. Taking advantage of the abundant marine life available there, extensive research and training are being conducted at MBS.

In 2009, the Center for Marine Biology, which is an interdisciplinary research organization of the University of Tokyo, was established at MBS with the aim of creating a frontline research center in biology and promoting international collaboration.

Institute of Astronomy (IoA)

The Institute of Astronomy promotes 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 and death of stars, evolution of galaxies, and cosmology. The Institute operates a 3 m infrared telescope at an observatory in Alacama, Chile and a 1.05m Schmidt telescope in Nagano Prefecture, as well as a 10m submillimeter antenna in Chile in collaboration with the National Astronomical Observatory of Japan. Together with other large ground-based facilities and satellite observatories like Subaru and AKARI, the Institute is at the cutting-edge of astronomy today.

Research Center for Spectrochemistry (RCS)

Current research at this center mainly covers ultrafast (pico- to nanoseconds) Raman and synchrotron radiation spectroscopy. Spectroscopic observation on living cells or functional molecules such as ionic liquids is also being undertaken there. This research is related not only to chemistry but also to other scientific disciplines, including clinical diagnosis, and to the development of inter- and multidisciplinary sciences. The Center also maintains and manages various spectroscopic instruments for common use.

Research of Center for the Early Universe (RESCEU)

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

Center for Ultrafast Intense Laser Science (CUILS)

The Center for Ultrafast Intense Laser Science is dedicated to exploring through international research cooperation the frontiers in the interdisciplinary research field of Ultrafast Intense Laser Science. It aims to achieve research and researcher exchange as a central organization in the international research network, to train young researchers so that they can play a leading role in the international research community in the future, and to further the training of graduate students in UY’s master’s program in advanced optical science in tandem with the activities of the Consortium on Education and Research on Advanced Laser Science (CORAL) and in cooperation with other universities and private companies.

Botanical Gardens (BG)

The University of Tokyo Botanical Gardens consist of the main garden in Tokyo, which originated as the Koshikawa Medicinal Herb Garden of the Tokugawa Shogunate in 1684 and was annexed to the University in 1977, and the branch garden in Nikko which was established in 1902. Both gardens have excellent facilities and wild plant collections that contribute to research and education in plant sciences, and together they have been the leading research botanical gardens in Japan. Both are open to the public.

Geochmical Research Center (GCRC)

The Geochemical Research Center conducts fundamental research on Earth and planetary materials. GCRC research activities cover the chemistry of Earth and planetary materials and the behavior of fluids in volcanic and earthquake activity. To understand the behavior of hydrous volatiles in the Earth and planetary interiors, GCRC has been designated as a core research group for developing neutron diffraction techniques at high pressure. State-of-the-art noble gas mass spectrometry developed by GCRC contributes to the understanding of the evolution of the solar system and mantle dynamics of the Earth. GCRC’s synergy of fundamental and field research will open up new avenues in geoscience.

Institute for Nuclear Study (CNS)

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 (MGRL)

The Molecular Genetics Research Laboratory (MGRL) 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 MGRL share a common interest in the molecular basis of life and its genetic disorders. Their research aims at understanding how thousands of genes and their encoded proteins serve to bring about the highly coordinated behavior of cells and tissues. The research groups approach this goal from many levels of organization, ranging from individual cells to multicellular systems and the whole organism, from mammals to plants.
University-wide Centers/Institutes

The following Centers and Institutes participate in graduate education in the School.

University-wide Centers

University Museum (UMUT)
http://www.um.u-tokyo.ac.jp/index_en.html

The University Museum of the University of Tokyo (UMUT) is one of the leading university museums in Japan. The museum holds approximately three million specimens, which are used for academic research, education for students, and exhibition to the public. The museum has three major divisions devoted to geology, biology, and cultural history respectively, which are further divided into seventeen different departments. In the field of natural sciences, the departments of botany, anthropology, mineralogy, and paleontology have particularly large collections of high scientific value. All exhibitions are free of charge, and special exhibitions are opened twice a year on the first floor of the museum.

Institute for the Physics and Mathematics of the Universe (IPMU)
http://www.ipmu.jp/

IPMU was launched in October 2007 under the World Premier International Research Center Initiative (WPI) program. The primary mission of the institute is to address deep mysteries of the universe by integrating the foremost knowledge of physics and mathematics. IPMU explores dark energy and dark matter of the universe by fully exploiting astronomical observations, high-energy accelerator experiments, and underground experiments, as well as various theoretical approaches in particle theory, cosmology, and mathematics.

International Center for Elementary Particle Physics (ICEPP)
http://www.icepp.s.u-tokyo.ac.jp/index-e.html

ICEPP studies the most fundamental particles and forces of nature using the world’s most advanced particle accelerators.

Center for Spatial Information Science (CSIS)
http://www.csis.u-tokyo.ac.jp/english/

In 2006, CSIS became a national joint-usage/research center to develop, expand, and spread spatial information science and offer greater support for researchers around the country. It promotes joint research in a variety of fields by providing spatial data and services.

Other Related Institutes

<table>
<thead>
<tr>
<th>URL</th>
<th>MAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthquake Research Institute (ERI)</td>
<td><a href="http://www.eri.u-tokyo.ac.jp/eng/">http://www.eri.u-tokyo.ac.jp/eng/</a></td>
</tr>
<tr>
<td>Institute of Industrial Science (IIS)</td>
<td><a href="http://www.iis.u-tokyo.ac.jp/index_e.html">http://www.iis.u-tokyo.ac.jp/index_e.html</a></td>
</tr>
<tr>
<td>Institute of Molecular and Cellular Biosciences (IMCB)</td>
<td><a href="http://www.iam.u-tokyo.ac.jp/index.html">http://www.iam.u-tokyo.ac.jp/index.html</a></td>
</tr>
<tr>
<td>Institute for Cosmic Ray Research (ICRR)</td>
<td><a href="http://www.icrr.u-tokyo.ac.jp/index.html">http://www.icrr.u-tokyo.ac.jp/index.html</a></td>
</tr>
<tr>
<td>Institute for Solid State Physics (ISSP)</td>
<td><a href="http://www.issp.u-tokyo.ac.jp/index_en.html">http://www.issp.u-tokyo.ac.jp/index_en.html</a></td>
</tr>
<tr>
<td>Atmosphere and Ocean Research Institute (AORI)</td>
<td><a href="http://www.aori.u-tokyo.ac.jp/index_e.html">http://www.aori.u-tokyo.ac.jp/index_e.html</a></td>
</tr>
<tr>
<td>Research Center for Advanced Science and Technology (RCAST)</td>
<td><a href="http://www.rcast.u-tokyo.ac.jp/en/">http://www.rcast.u-tokyo.ac.jp/en/</a></td>
</tr>
<tr>
<td>The Institute of Medical Science (IMSUT)</td>
<td><a href="http://www.ims.u-tokyo.ac.jp/imsut/en/">http://www.ims.u-tokyo.ac.jp/imsut/en/</a></td>
</tr>
</tbody>
</table>

Off-campus facilities

The facilities shown in this map are operated by the School of Science or by the institute shown in parentheses.
Facts and data

The faculty participating in graduate education in the School of Science come from the six core departments of the School, other laboratories and centers affiliated with the School, other Schools and Institutes of the University, and the external institutions listed below. Faculty members from outside the six core departments often serve as advisors for graduate students.

Graduate School of Science

<table>
<thead>
<tr>
<th>Departments</th>
<th>Core faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>22/12</td>
</tr>
<tr>
<td>Astronomy</td>
<td>5/32</td>
</tr>
<tr>
<td>Earth and Planetary Science</td>
<td>6/18</td>
</tr>
<tr>
<td>Chemistry</td>
<td>7/10</td>
</tr>
<tr>
<td>Biophysics and Biochemistry</td>
<td>6/6</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>14/4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Laboratories/Centers</th>
<th>Other Department/Laboratories/Centers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botanical Gardens</td>
<td>CNS (2/3) GSAS (8/7) GSFM (1/0)</td>
</tr>
<tr>
<td>MBS</td>
<td>ICERP (2/0) ICRR (2/0)</td>
</tr>
<tr>
<td>RCS</td>
<td>ISSP (12/12) ISCB (1/1)</td>
</tr>
<tr>
<td>GCRC</td>
<td>DSMC (1/3) JAXA (3/10)</td>
</tr>
<tr>
<td>i) University Museum</td>
<td>RIKEN (2/0)</td>
</tr>
<tr>
<td>RC</td>
<td>47/40</td>
</tr>
<tr>
<td>Physics</td>
<td>1/01</td>
</tr>
<tr>
<td>Earth and Planetary Science</td>
<td>6/18</td>
</tr>
<tr>
<td>Chemistry</td>
<td>7/10</td>
</tr>
<tr>
<td>Biophysics and Biochemistry</td>
<td>6/6</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>14/4</td>
</tr>
</tbody>
</table>

Other Todai Schools and Institutes participating in graduate education in the School of Science

<table>
<thead>
<tr>
<th>Schools</th>
<th>Other Schools/Institutes of the University</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate School of Science and Engineering (GSSE), Graduate School of Agricultural and Life Sciences (GSALS), Graduate School of Arts and Sciences (GSAS), Graduate School of Frontier Sciences (GSFS), Graduate School of Interdisciplinary Information Studies (GSIS)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>University-wide Centers</th>
<th>Other Institutions/Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>The University Museum</td>
<td>The Institute of Medical Science (DMSIT), Earthquake Research Institute (ERI), Institute of Industrial Science (IIS), Institute of Molecular and Cellular Biosciences (IMCB), Institute for Cosmic Ray Research (ICRR), Institute for Solid State Physics (ISSP), Atmosphere and Ocean Research Institute (AORI), Research Center for Advanced Science and Technology (RCAST), Institute for the Physics and Mathematics of the Universe (IPMU)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Institutes</th>
<th>Other Institutions/Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Institute of Advanced Industrial Science and Technology (AIST), High Energy Accelerator Research Organization (KEK), Institute of Molecular Science (IMS), Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Japan Aerospace Exploration Agency (JAXA), National Astronomical Observatory of Japan (NAO), National Institute of Genetics (NIG), National Museum of Nature and Science (NMNS), RIKEN</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Universities</th>
<th>Other Institutions/Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chiba University, Kyushu University, Tokyo University of Pharmacy and Life Science, University of Tsukuba, Chuo University</td>
<td></td>
</tr>
</tbody>
</table>

For more detailed information, please see our website: http://

Number of graduate students (as of May 1, 2011)

<table>
<thead>
<tr>
<th>Department</th>
<th>Master's</th>
<th>Ph.D.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>220 (15)</td>
<td>202 (25)</td>
<td>422 (36)</td>
</tr>
<tr>
<td>Astronomy</td>
<td>34 (2)</td>
<td>44 (2)</td>
<td>78 (1)</td>
</tr>
<tr>
<td>Earth and Planetary Science</td>
<td>184 (4)</td>
<td>203 (14)</td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td>131 (7)</td>
<td>72 (7)</td>
<td>203 (14)</td>
</tr>
<tr>
<td>Biophysics and Biochemistry</td>
<td>60 (8)</td>
<td>140 (14)</td>
<td></td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>115 (5)</td>
<td>109 (6)</td>
<td>224 (11)</td>
</tr>
<tr>
<td>Total</td>
<td>744 (29)</td>
<td>687 (45)</td>
<td>1,431 (74)</td>
</tr>
</tbody>
</table>

*Numbers in parentheses are numbers of professors/associate professors and lecturers

Degrees conferred [2010 academic year]

<table>
<thead>
<tr>
<th>Department</th>
<th>Master's</th>
<th>Ph.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>106</td>
<td>54</td>
</tr>
<tr>
<td>Astronomy</td>
<td>23</td>
<td>7</td>
</tr>
<tr>
<td>Earth and Planetary Science</td>
<td>63</td>
<td>16</td>
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<tr>
<td>Chemistry</td>
<td>60</td>
<td>18</td>
</tr>
<tr>
<td>Biophysics and Biochemistry</td>
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<td>26</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>41</td>
<td>24</td>
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<tr>
<td>Total</td>
<td>327</td>
<td>156</td>
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</table>

Budget for fiscal year 2010

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic operating funds</td>
<td>1,290,781 ($16,212,917)</td>
</tr>
<tr>
<td>Sponsored research</td>
<td>2,749,266 ($33,541,924)</td>
</tr>
<tr>
<td>GSAS**</td>
<td>415,040 ($1,133,927)</td>
</tr>
<tr>
<td>Other</td>
<td>721,358 ($8,787,098)</td>
</tr>
<tr>
<td>Total</td>
<td>6,929,487 ($84,316,054)</td>
</tr>
</tbody>
</table>

**JSPS: Japan Society for the Promotion of Science

Sponsored research

<table>
<thead>
<tr>
<th>Sponsor</th>
<th>No. of Projects</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private companies</td>
<td>40</td>
<td>1,102,941 ($1,367,046)</td>
</tr>
<tr>
<td>Government organizations</td>
<td>65</td>
<td>1,302,126 ($1,617,720)</td>
</tr>
<tr>
<td>Inter-university research institutes</td>
<td>6</td>
<td>67,721 ($836,062)</td>
</tr>
<tr>
<td>Total</td>
<td>111</td>
<td>1,411,915 ($17,429,814)</td>
</tr>
</tbody>
</table>

*For more detailed information, please see our website: [http://]
Your graduate student experience

If you enter the School of Science as a graduate student, your experience will differ depending not only on the research style of your department but also on the research style of the particular group you join. For example, some groups are involved in large-scale international collaborations, while others conduct research on a smaller scale in their own laboratory. Nevertheless, many facets of graduate student life will be common to all students.

The purpose of graduate education

The purpose of graduate education in science at any leading research university anywhere in the world, including the University of Tokyo, is to train graduate students to become leading-edge researchers at an international level. Students who enter the master’s degree course complete a two-year program of coursework and research for their master’s degree thesis. Some students will choose to leave academia at this point, and pursue careers in business, government, education, and so on. The skills learned as a Todai student will prove valuable in these professions.

Master’s and Doctoral Programs

Most master’s degree students, particularly those from overseas, will opt to continue for a doctoral degree. A student’s master’s degree thesis, and the student’s oral presentation of the results, serve as the basis for judging whether the student is admissible to candidacy as a Ph.D. student. Some students also may apply directly for admission as a Ph.D. student, in which case they must take a series of examinations (which may include GRE general and subject tests, TOEFL, and an oral examination based on their master’s degree). Details may be found in this booklet and on the website of each department. Successful candidates usually spend at least three years (up to five years is allowed) after receiving their M.S. degree to complete their Ph.D. research.

Research and Education

You will expect, and be expected, to work as a team member with your advisor and the other members of your research group. This will include participation in seminars and joint research projects. As you gain experience and knowledge, you will be expected to gradually but steadily develop your talents as an independent researcher.

Japanese Language Ability

International students in the School of Science can in most cases function in English in their academic work, but enjoyment of everyday life in Japan will probably increase in proportion to your Japanese language ability. Developing your Japanese language ability can also enhance career prospects for academic or industrial positions in Japan after you receive your Ph.D.

Your Doctoral Degree

The award of the Ph.D. degree is based on original research described in the Ph.D. thesis, which the student must also present orally and defend at an oral examination. We expect our students to publish their research in leading international journals (usually in collaboration with their advisor and/or other members of their research group) in accordance with their department’s detailed regulations. Ph.D. recipients may follow a variety of career paths. The most common position after the Ph.D. is as a post-doctoral researcher, following which students may go into academia, industry, or government research positions, or may, in some cases, apply their skills in business. In all of these cases the ability developed by our Ph.D. students to carry out projects and to clearly and logically present the results orally and in writing is a valuable asset for a successful career.
Application Procedures

The Graduate School of Science offers advanced graduate study in a wide range of scientific fields to international students. The School has already established a system to provide international students with full support in English. In this regard, the School has introduced a special admissions procedure for international students. This application procedure enables students to apply for admission to the School from outside of Japan, making the application process more flexible than the ordinary procedure. The selection of graduate students is based on the applicants’ academic records, letters of recommendations, statement of purpose, and GRE (Graduate Record Examination) Subject or General Test score is required.

A. Master’s/Doctoral degree candidates

1. Documents required for application
   a) Completed School Application Form
   b) Graduate Record Examination (GRE) General Test scores
   c) Graduate Record Examination (GRE) Subject Test scores
   d) Test of English as a Foreign Language (TOEFL) score
   e) Two recommendation letters
   f) Transcripts (academic records of undergraduate and graduate education)
   g) Statement of Purpose
   h) In the case of application to the Doctoral program: copy of master’s thesis, and copies of any papers or scientific publications
   i) Any other documents (or conditions) required by the department. (Access the websites below for more information on application to specific departments.)

Astronomy: http://www.astron.s.u-tokyo.ac.jp/index.html.en
Earth & Planetary Science: http://www.epc.s.u-tokyo.ac.jp/
Chemistry: http://www.chem.s.u-tokyo.ac.jp/english/admissions.html
Biophysics & Biochemistry: http://www.biophys.s.u-tokyo.ac.jp/school/school_4
Biological Sciences: http://www.biol.s.u-tokyo.ac.jp/english/information.html

*For only those applying to the Department of Physics, write an essay on an area that you wish to do research in after admission to the Graduate School (one sheet of A4-size paper).
*For only those applying to the Department of Earth and Planetary Sciences, write a short essay on studies or research that you are currently engaged in, or on an area that you wish to do research in after admission to the School.
*For those applying for Chemistry, GPA score reports (from university/college you graduated)
*For the official transcripts, statement of completion of course or diploma, and recommendation letters, any necessary Japanese or English translations must be officially issued by the institution that has issued the original documents.
*All documents are non-returnable.

2. Applicant qualifications
   «Master’s program»
   a) You must have completed 36 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
   b) be approved as having appropriate qualifications. (In such cases please contact us directly before filing your application.)
   c) If you are applying as an Embassy Recommended Mombukagakusho Scholarship Student, you must be considered as belonging to one of the two categories (a-b) above and also must have passed the preliminary selection by a Japanese Embassy/Consulate General.

   «Doctoral program»
   a) You must have one of the following: Master’s Degree, a Professional Degree, or a degree equivalent to either degree mentioned above, OR
   b) be approved as having appropriate qualifications. (In such cases please contact us directly before filing your application.)
   c) If you are applying as an Embassy Recommended Mombukagakusho Scholarship Student, you must be considered as belonging to one of the two categories (a-b) listed above and also must have passed the preliminary selection by a Japanese Embassy/Consulate General.

*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.

3. Other information for prospective students
   a) Examination fee and payment
      The examination fee is 10,000 yen. (Japanese government-funded students are exempted from paying the application fee.)
      *The fee is non-refundable and must be paid before the relevant application deadline.
      *The fee is paid only once, via bank transfer, when the applicant is admitted to the School.

   b) School expenses
      1. Entrance fee: 282,000 yen
      *The entrance fee is paid only once, via bank transfer, when the applicant is admitted to the School.
      2. Tuition fee:
         a) Master’s program: 272,900 yen per semester (545,800 yen/year)
         b) Doctoral program: 300,400 yen per semester (600,800 yen/year)

   *Graduate International Research Students (“Kenkyu-sei”) are admitted to the Graduate School of Science to study a specific subject under the supervision of a professor. Note that a “Kenkyu-sei” is not entitled to receive any degree or qualification on completion of the program. Applications for this status are not encouraged, except for students who receive Japanese government scholarships.
   *For more information about the program, please visit our website:
   http://www.s.u-tokyo.ac.jp/en/admission/research-students.html

B. International research students (Kenkyu-sei)

Graduate International Research Students (“Kenkyu-sei”) are admitted to the Graduate School of Science to study a specific subject under the supervision of a professor. Note that a “Kenkyu-sei” is not entitled to receive any degree or qualification on completion of the program. Applications for this status are not encouraged, except for students who receive Japanese government scholarships.

C. Special auditor

A graduate student enrolled in a university that has an exchange program with the University of Tokyo in accordance with the Agreement on Academic Exchange for Cooperation with the University of Tokyo is eligible to audit classes at the Graduate School of Science of the University of Tokyo.

http://www.s.u-tokyo.ac.jp/en/admission/special-auditor.html

Application mailing & contact address

Applications should be mailed to: Graduate School Office, Graduate School of Science, the University of Tokyo 7-3-1, Hongo Bunkyo-ku Tokyo 113-8652 JAPAN
Tel: +81-3-5841-4499
Email: daigakuin@adm.s.u-tokyo.ac.jp

For more information about the program, please visit our website:
http://www.s.u-tokyo.ac.jp/en/admission/research-students.html

Email: daigakuin@adm.s.u-tokyo.ac.jp

Tel: +81-3-5841-4009

University of Tokyo 7-3-1, Hongo Bunkyo-ku
Tokyo 113-0033 JAPAN

Scholarships and financial support

The University of Tokyo provides international students with access to many financial aid options that span various forms and purposes, including school expense exemptions, scholarships, emergency loans, and student discounts. Further details are available at the following website:

International Student Support Group: http://www.u-tokyo.ac.jp/res03/122_e.html
Japan Student Services Organization (JASSO) http://www.jasso.go.jp/study_j/scholarships_sfisij_e.html

A. Scholarships funded by the University of Tokyo

1. Graduate School of Science Scholarship for International Students
This program aims to support in their academic research at the Graduate School of Science of the University of Tokyo privately financed international students with excellent academic achievement by granting scholarships to promote the acceptance of international students from various countries.

- Amount of the Scholarship: 150,000 yen per month
- Applying for the Scholarship: An applicant shall submit his/her application to the Dean at the time of application to the graduate school.
- Payment Period: Limited to the standard duration of study as prescribed in Article 2 of Regulations of the University of Tokyo Graduate Schools.

*University of Tokyo Research Internship Program (UTRIP) participants will be given priority for the scholarship when and if the participant applies to the Graduate School of Science for the following year.
*For more information about the scholarship, please see the website: http://www.s.u-tokyo.ac.jp/ilo/en/scholarship.html

2. The University of Tokyo Special Scholarship for International Students
The University of Tokyo Special Scholarship for International Students, or University of Tokyo Fellowship, is a research grant offered to privately financed international students who have demonstrated academic excellence.

- Monthly research grant: 150,000 yen
- For details, see the website below: http://www.u-tokyo.ac.jp/stu02/i04_03_e.html

3. Scholarship for International Students, the University of Tokyo Foundation
This program is a fund designed to financially assist international students through donations made by University of Tokyo employees and alumni.

- Scholarship amount: 50,000 yen/month
- Eligibility: privately financed international students

* For more information about the scholarship, please see the website below: http://www.u-tokyo.ac.jp/res03/122_e.html

B. Japanese Government Scholarships
The Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) administers a scholarship program for international students.

- Monthly amounts vary: 148,000 yen (Ph.D. program), 147,000 yen (master's program)

*For more information about the MEXT scholarship program, please visit the website below:
Scholarship for International Students in Japan http://www.jasso.go.jp/study_j/scholarships_sfisij_e.html

C. JASSO Scholarships
Japan Student Services Organization (JASSO) offers honors scholarships for privately financed international students who attend a university or graduate school in Japan, are of good character, have a good academic record, and require financial assistance to continue their studies as an international student. Applications will be accepted every April.

- Scholarship amount: 65,000 yen per month (graduate/research student)
- Eligibility: • Students enrolled at the University of Tokyo (including research students).
  • GPA at least 2.3/3.0

*For more information about the JASSO scholarship program, please visit the following website:
• Scholarship for International Students in Japan (JASSO)
  http://www.jasso.go.jp/study_j/scholarships_sfisij_e.html
• Application procedure
  http://www.u-tokyo.ac.jp/res03/i22_e.html

D. School Fee Exemptions
Students who face difficulty in paying the admission fee/tuition can apply for an exemption, which is granted to those who pass a screening process. Applications are accepted twice a year.

*For details, see the website: http://www.u-tokyo.ac.jp/stu02/004_03_e.html

E. The University of Tokyo Foundation for supporting international students
This assistance is provided mainly in the form of condolence money and emergency loans.

- Condolence Money: up to 100,000 yen
- Emergency Loans: up to 200,000 yen

* For more information about the program, please see the following website:
Support and facilities for students

**Graduate School Office**

There are about 1,300 students, including international students, currently pursuing graduate degrees at the Graduate School of Science. To assist them, in cooperation with the six graduate department offices, we handle graduate admissions, course registration, procedures for school registration and overseas traveling while in graduate school, obtaining of certificates, renewal/reissue of student ID cards, and doctoral dissertation-related procedures. For more information about the Office’s services, please visit the following website:

https://www.s.u-tokyo.ac.jp/jimu/

**Libraries**

The Graduate School of Science has six departmental libraries on the Hongo Campus. In addition, the University of Tokyo Library system encompasses the General Libraries at the Hongo, Komaba, and Kashiwa campuses. The entire collection includes more than 8.8 million books, subscriptions to nearly 30,000 journals and periodicals, and various digital resources. For detailed information about the libraries, please visit the following website:

http://www.lib.u-tokyo.ac.jp/index-e.html

**Tutoring**

For new students: A tutor will be appointed for each newly arrived international student to help him/her get used to the first year on campus. Tutors will help international students with registration matters at the very beginning of their academic stay to ensure they start their life in Japan smoothly. Arrangements for a tutor will be made by the student's supervisor.

Study & research support: Besides the campus life support, there is another special tutoring system at the School of Science to support international students in their study and research. Arrangements will be made at the request of the supervisor.

**International Liaison Office**

The International Liaison Office of the School of Science supports about 80 international students enrolled in the School. The Office deals with matters such as arrival orientation, arrangements of scholarships, housing, and visas. The Office also provides advice for students’ daily lives and organizes various intercultural events to enhance mutual understanding. For details about the Office, please visit the website below:

http://www.s.u-tokyo.ac.jp/ilo/en/

Other sources of information for international students

The University of Tokyo provides a diverse array of support to international students to help them enjoy a pleasant, rewarding experience while at Todai.


**Computing Facilities**

The University of Tokyo has established the Educational Campus-wide Computing System (ECCS), which is operated by the Information Technology Center, to support the university's academic activities through information media. All of the students of the university can use the computer system; to obtain a computer account, see the online manual:

http://www.ecc.u-tokyo.ac.jp/ENGLISH/tebiki-2010e.pdf

**International Student Advising Room**

The International Student Advising Room provides a variety of consultation services to support currently enrolled students. Advisors, who are experts in dealing with problems international students and foreigners often face, are able to provide advice about most issues, including psychological problems.

Languages supported: Japanese, English, Chinese, and Korean

http://www.ic.u-tokyo.ac.jp/adv/a00_e.html

**International Student Associations**

International students at the University of Tokyo have formed various associations for promoting fellowship among students from the same country or region. For detailed information about each association, please visit the website below:

http://www.ic.u-tokyo.ac.jp/ic/party/index_e.html

**Japanese Language Course**

The Center for Japanese Language Education at the University of Tokyo provides various Japanese language courses for international students. The Japanese language courses consist of the “General Course,” “Intensive Course,” “Academic Japanese Course,” and “Short-term course.” The courses are available at the Center, which is located on the Hongo campus. For detailed information about the program, please visit the website below:

http://www.nkc.u-tokyo.ac.jp/index_e.html

**Health Service Center**

http://www.bh.u-tokyo.ac.jp/index_e.html

**Disability Services Office**

http://ds.adm.u-tokyo.ac.jp/en/contact/index.html

**Office of Gender Equality**

http://kyodo-sankaku.u-tokyo.ac.jp/en/

**Todai Hongo Keyaki Nursery**

Campus Map

Hongo Campus

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
Chuo Refectory (underground)
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 Spectrochemistry, Center for Ultrafast Intense Laser Science)
School of Science Bldg. 1 West wing (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)

Kashiwa Campus

Institute for Solid State Physics (ISSP)
Institute for Cosmic Ray Research (ICRR)
Advanced Spectroscopy Laboratory, ISSP
Kashiwa Guesthouse
Food Shop & Café
Kashiwa Student Counseling Center
Academic Shop (COOP)
Kashiwa Library
IPMU Bldg.
IPMU Prefabricated Bldg.
Atmospheres and Ocean Research Institute (AORI)

Komaba Campus

Komaba Student Counseling Center
Komaba Health Service Center
Komaba Library
Graduate School of Mathematical Science Bldg.
Komaba Communications Plaza

Campus Maps produced by Public Relations Group, the University of Tokyo, Rei Design and Plannings (changes were made to the original map.)
Rail Access from Narita Airport

To Hongo Campus
- Keisei Express “Skyliner”
  - 15 min walk
  - 44 min/2400 yen

To Komaba Campus
- Keisei Express “Skyliner”
  - 29 min/180 yen

To Kashiwa Campus
- Nippori
  - 19 min/550 yen
- Shibuya
  - 8 min/600 yen
- Komaba
  - 7 min walk
  - 3 min/120 yen
- Kita-senju
  - 12 min/700 yen
- Kashiwanocho
  - 8 min/600 yen

Rail Access from Haneda Airport

To Hongo Campus
- JR Yamanote Line
  - 7 min walk
  - 7 min/80 yen

To Komaba Campus
- JR Yamanote Line
  - 18 min/130 yen

To Kashiwa Campus
- Haneda Airport Terminal 1 or 2
- Keisei Ueno
  - 41 min/2400 yen
- Shinjuku
  - 43 min/2500 yen
- Shibuya
  - 8 min/600 yen
- Komaba
  - 7 min walk
  - 3 min/120 yen
- Kita-senju
  - 12 min/700 yen
- Kashiwanocho
  - 8 min/600 yen

Notes:
(1) The Hongo Campus can be reached on foot (15 min.) or by taxi (about 1,000 yen) from Ueno station.
(2) The Hongo Campus can also be reached from the following stations:
Tokyo Metro: Nezu or Yushima (Chiyoda Line) 8 min walk, Todai-mae (Nanboku Line) 5 min walk
Toei Subway: Kasuga (Mita Line) 10 min walk, Hongo Sanchome (Oedo Line) 7 min walk
Keisei Express “Skyliner”
41 min/2400 yen
1 min walk
Komaba-Todaimae
25 min walk
Hongo Campus
Kashiwa Campus
Kashiwanoha-campus

Tobu Express
8 min/650 yen
1 min walk

Keisei Bus
No.03 or No.04
15 min/
160 yen

JR Joban Line
8 min/
150 yen

JR Yamanote Line
18 min/130 yen

Metro Marunouchi Line
7 min walk

Keisei Ueno
41 min/2400 yen
4 min walk

Shibuya
19 min/550 yen

Tobu Bus
No.03 or No.04
10 min/
160 yen
3 min walk

JR Yamanote Line
19 min/150 yen

Hongo Campus
Kashiwa Campus
Kashiwanoha-campus

Notes:
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Toei Subway: Kasuga (Mita Line) 10 min walk, Hongo Sanchome (Oedo Line) 7 min walk
Keisei Express “Skyliner”
41 min/2400 yen
1 min walk
Komaba-Todaimae
25 min walk
Hongo Campus
Kashiwa Campus
Kashiwanoha-campus