

Dean's
Message**Welcome to Graduate School of Science
and School of Science, Osaka University****Tadashi Kondo**

Dean
Graduate School of Science
School of Science, Osaka University

Welcome to the School of Science and the Graduate School of Science, Osaka University, and thank you for your interest in our university. The research conducted in our departments is pure fundamental science, which has formed the basis of our civilization. Basic science research begins with a keen curiosity about the world around us, and the scientific discoveries that lead us to sustained prosperity can often be traced back to simply asking “why?” about the phenomena that take place in nature.

The surprising results obtained as a result of such research have become a universal cultural and intellectual asset for humankind. In addition, the results of basic science, in combination with applied science, have promoted dramatic technological advances, making our daily lives more comfortable, safer, and richer. The Graduate School of Science at Osaka University not only produces cutting-edge research results, but also nurtures researchers who will lead the next generation of basic science as well as internationally active human resources as leaders in various fields of society. Through training in friendly competition with researchers around the world to conduct research and present the results in papers and at academic conferences, students hone their advanced logical and scientific thinking skills, their ability to look at things from a broad perspective, and their ability to accurately express themselves. Furthermore, through various educational programs including interdisciplinary education, globalization education, and liberal arts and ethics education, students will develop the comprehensive ability to be active across a wide range of fields. Those who have a broad awareness of issues based on a background in basic science, who can identify problems to be solved by themselves, and who can design pathways to solutions will be able to respond appropriately to the changing natural environment and future social conditions. We strive to nurture such people every day.

Translated with www.DeepL.com/Translator (free version) The School of Science was established in 1931 with the goal of promoting fundamental science. Dr. Hantaro Nagaoka, the first president of Osaka University, was the first to advocate the Saturnian model of the atom.

His motto was “Originality and Inspiration,” which is still inherent at Osaka University. The field of basic science continues to gradually expand. The School of Science started with three departments, and now has four (Mathematics, Physics, Chemistry, and Biological Sciences). In these departments, we offer six majors (Mathematics; Physics; Chemistry; Biological Sciences; Macromolecular Science; and Earth and Space Science). Our faculty members actively pursue their own research goals and work hard on education and research. Our departments are open to other fields, and we value frequent interactions and promote interdisciplinary science.

In this pamphlet, we would like to introduce our graduate school and provide further information and descriptions of individual departments and majors. We hope it will help you, and you will join us in near future in our quest for scientific truths. Let us together pursue fundamental science with keen curiosity and inquiring minds.

History

History of the Graduate School of Science and the School of Science

The history of the School of Science of Osaka University dates back to 1931, when it was established together with the School of Medicine upon the foundation of Osaka Imperial University. At that time, Osaka was the commercial capital of Japan, and played a pivotal role in industrial development. The city became increasingly convinced that Japan should no longer rely on industrial technologies copied from the West, and should endeavor to create new technologies from original, fundamental studies. Accordingly, business leaders in Osaka came to recognize the need for an educational and research institution in Osaka to study basic science for the future, which coupled with the support of local citizens, led to the establishment of the School of Science. Reportedly, local citizens covered all the expenses of the School of Science for the first three years, including the funds for its establishment, without receiving any aid from the government. This demonstrates the future-oriented mindset and enterprising spirit inherent in the people of Osaka, which also actuated the establishment of two renowned private schools, Kaitoku-do and Tekijyuku, in Osaka in the Edo period (1603–1868).

Characteristically, from its onset, the School of Science of Osaka University focused on industrial application of technologies, while pursuing fundamental scientific principles. By placing equal importance on applied research and fundamental research, the School of Science aimed to always meet the needs of society. This attitude has become a traditional philosophy of the School of Science and is still much followed today.

The Graduate School of Science began accepting graduate students from universities under the old school system and started education and research guidance at the Department of Mathematics, the Department of Physics and the Department of Chemistry in 1933, and at the Department of Biology in 1952. In 1953, the Graduate School of Science was reestablished under a new school system with eight departments: one for mathematics, three for physics, two for chemistry and two for biology. The first master's students and doctoral students entered the Graduate School of Science in 1953 and 1955, respectively. The Department of Macromolecular Science was added to the Graduate School of Science in 1963, the three departments for physics were integrated into the Department of Physics in 1964, and the Department Earth and Space Science was established in 1995.

Following a reform to place greater emphasis on graduate education implemented between 1995 and 1996, the Graduate School of Science was reorganized and has since then comprised of six departments: Mathematics; Physics; Chemistry; Biological Sciences; Macromolecular Science; and Earth and Space Science. Affiliated institutes of the Graduate School of Science, the Research Center for Structural Thermodynamics and the Project Research Center for Fundamental Sciences, conduct education and research together with the Graduate School of Science.

Additionally, the Center for Advanced High Magnetic Field Science was opened in 2014. Recently, the Research Center for Structural Thermodynamics was reorganized to the Research Center for Thermal and Entropic Science in 2019 and the Project Research Center for Fundamental Sciences was reorganized to the Forefront Research Center in 2022.



Characteristics

Characteristics of the Graduate School of Science

Inheriting the founding spirit and tradition of the School of Science of Osaka University, which celebrated its 80th anniversary in 2011, the Graduate School of Science has maintained its research-first principle, which places importance on a liberal, lively spirit and creativity unencumbered by old conventions. It is very important for the progress of science to be in an environment where basic studies are highly valued even if they are seemingly useless at present. For instance, nobody pointed out the importance of the structure of a gene when it was revealed in 1950s. However, as a result of the progress of science in other fields, the structure of a gene is now applied to many different technologies. There are so many examples similar to this case. This means that behind the progress of technologies, there is a culture created by scientific studies. If a country is to produce a unique, revolutionary technology, the country should have a well-established scientific culture.



Experiment in Chemistry

Recently, science and technology are becoming more sophisticated and specialized, covering a wider range of fields. However, the original missions of the Graduate School of Science have remained unchanged, which include creating new culture based on the tradition of basic science, as well as educating researchers capable of contributing to this purpose. On the other hand, it is important to fully understand the relationship between science and technology and society with regards to issues such



Discussion in Macromolecular Science



Lecture in Mathematics

as environmental and energy problems. It is also important to have a broad international perspective and an attitude of contributing to the benefit of humankind. Researchers need to produce more creative and innovative science for the well-being of humans from a global perspective. In this light, graduate school education must be now expected to not only educate students through conventional basic studies, but also develop professionals who can respond to the changing needs of industry. In other words, graduate schools are required to take on two important roles: one is education in individual, highly specialized fields of study; the other is a comprehensively balanced education which integrates and organizes these fields of study.



Experiment in Biology

In order to meet the demands of the times by successfully playing these roles, the Graduate School of Science pursues the following two goals in its educational and research activities: (1) to maintain a liberal, creative, research-first principle as its academic culture, and educate distinguished researchers capable of conducting research on their own in their respective fields of study; and (2) to train highly specialized professionals who have expertise across a broad range of natural science disciplines by providing education and research guidance on basic science, which is fundamental for

all scientific skills and technologies. In order to achieve these two purposes, the Graduate School of Science has accepted a significant number of academic staff from external organizations and launched new educational and research programs of science, with a view to promoting advanced, interdisciplinary research on a global scale. The Graduate School of Science also offers courses jointly with other organizations within the university; namely, the Graduate School of Information Science and Technology; the Graduate School of Frontier Biosciences; the Graduate School of Engineering Science; the Research Institute for Microbial Diseases; the Institute of Scientific and Industrial Research; the Institute for Protein Research; the Research Center for Nuclear Physics; the Institute of Laser Engineering; the Radioisotope Research Center; the Center for Education in Liberal Arts and Sciences; the Cybermedia Center; the Department of Safety and Hygiene; and the Museum of Osaka University. Many academic staff members



Library in the Department of Mathematics

of these organizations have joined the Graduate School of Science to teach courses related to their fields of study. Moreover, a number of outside researchers have participated in research studies at the Graduate School of Science as collaborative and guest instructors. These instructors are from the Graduate School of Science and Technology of Keio University; the Institute of Physical and Chemical Research (RIKEN); the National Institute of Advanced Industrial Science and Technology (AIST); the National Institute of Information and Communications Technology (NICT); the National Institutes of Biomedical Innovation, Health and Nutrition; the Peptide Institute Inc.; Suntory Foundation for Life Sciences, Bioorganic Research Institute; and JT Biohistory Research Hall. With so many leading instructors with diverse specialties,

the Graduate School of Science provides a wide range of educational and research programs covering various areas from basic science to applied research.



Experiment in Earth and Space Science

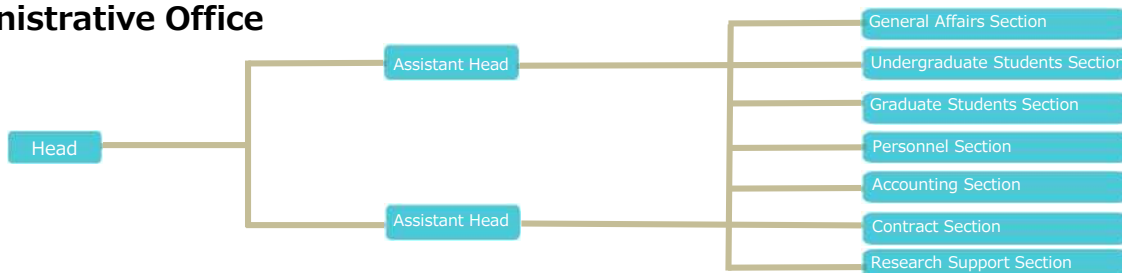
While science and technology made remarkable progress during the 20th century, the pace of progress will further accelerate during this century. The advancement of science and technology has enabled humans to enjoy affluent, comfortable lives, as well as increased longevity, which no previous generation has experienced before. On the other hand, the continuous pursuit of affluence and efficiency has resulted in serious environmental problems such as a depletion of energy resources and destruction of the global environment. These problems have arisen in a fairly short period of time, hardly a blink of an eye in light of long human history that spans hundreds of thousands of years. Therefore, humans in the 21st century should have the wisdom to reevaluate the significance of science and technology in human history. Humans will be inevitably led to extinction unless we achieve revolutionary breakthroughs in science and technology that will help us find fundamental solutions to various problems related to energy, the environment, food shortages, and overpopulation. As our generation enters the space age, we have an obligation to pass on the basic science that will create new technologies as a cultural heritage to the next generation. With this in mind, researchers at the Graduate School of Science devote their passion and energy to educational and research activities in an open and stimulating environment to achieve their own individual goals.

Organization

Organization of Graduate School of Science

	Number of interdepartmental course	Name of other departments and institutes that provide cooperation/partnership courses
Department of Mathematics	6 Courses	Graduate School of Information Science and Technology Graduate School of Engineering Science Center for Education in Liberal Arts and Sciences Cybermedia Center Keio University Graduate School of Science and Technology
Department of Physics	5 Courses	Institute of Scientific and Industrial Research Graduate School of Frontier Biosciences Institute of Laser Engineering Center for Education in Liberal Arts and Sciences Research Center for Nuclear Physics Cybermedia Center Institute for Radiation Science Low Temperature Center Cooperation with the Institute of Physical and Chemical Research (RIKEN)
Department of Chemistry	4 Courses	Institute of Scientific and Industrial Research Institute for Radiation Science Institute for Protein Research Center for Education in Liberal Arts and Sciences The Museum of Osaka University Cooperation with National Institute of Advanced Industrial Science and Technology Cooperation with Peptide Institute, Inc. Cooperation with Suntory Foundation for Life Sciences, Bioorganic Research Institute Cooperation with National Institutes of Biomedical Innovation, Health and Nutrition
Department of Biological Sciences	5 Courses	Research Institute for Microbial Diseases Institute of Scientific and Industrial Research Institute for Protein Research Graduate School of Frontier Biosciences Center for Education in Liberal Arts and Sciences Cooperation with National Institute of Information and Communications Technology Cooperation with JT Biology Research Hall Cooperation with Center for Biosystems Dynamics Research, the Institute of Physical and Chemical Research (RIKEN)
Department of Macromolecular Science	3 Courses	Institute for Protein Research Department of Safety and Hygiene Institute for Advanced Co-Creation Studies
Department of Earth and Space Science	3 Courses	Institute of Laser Engineering
Forefront Research Center	3 Departments	Cooperation with the Institute for Radiation Sciences Cooperation with Graduate School of Medicine Cooperation with Research Center for Nuclear Physics Cooperation with National Institutes of Biomedical Innovation, Health and Nutrition Cooperation with the Institute of Physical and Chemical Research (RIKEN)
Research Center for Thermal and Entropic Science	Department of Chemistry	
Center for Advanced High Magnetic Field Science	Department of Physics	

Administrative Office



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