



OSAKA UNIVERSITY  
PROSPECTUS  
2015

# Pursuing truth, creating harmonious diversity

## From 'Tekijuku' to a 'World Tekijuku' – shining forth into the 22<sup>nd</sup> century

Osaka University, with its 177-year history as a place of scholarship, was born from 'Tekijuku,' a private academy established in 1838 by Ogata Koan, the father of Dutch studies in Japan. It was established as a comprehensive university in 1931, the sixth Imperial University in Japan.

Nagaoka Hantaro, the first president of Osaka Imperial University, is a well-known physicist whose motto was: "Always be creative. Find your own path." Today, Osaka University continues to be guided by the spirit of this motto, along with that of Ogata Koan: 'For people, for society and for the pursuit of truth.' In the days of Koan's Tekijuku, people from all over the country came together to build a new era in Japan through the universal language of scholarship. In 2014, Osaka University initiated its mission to create a 'World Tekijuku,' in which scholars from all over the world will come together to learn, develop, and play vital roles in the world.

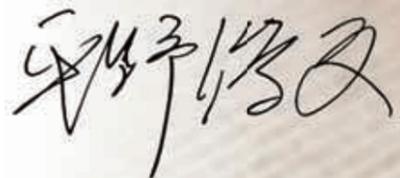
The world is currently facing a wide range of challenges and crises, including global-scale problems with complex causes such as explosive population growth, food shortages, energy issues, environmental destruction, and infectious diseases. There is no magical solution to these problems, but I am of the opinion that the tougher the dilemma, the greater the need to go 'back to basics.' Now, more than ever, it is vital that we seriously question the fundamental nature of these matters. Universities are places where we can discover ways to resolve these issues through the pursuit of truth in scholarship.

The development and social wellbeing of humanity depends upon the diversity of peoples, languages, cultures, and religions. However, in a global society, there may be times when this causes conflict. The common language of 'scholarship' can overcome such barriers through a variety of social interactions and exchanges. I believe that the role of the university, and of the 'World Tekijuku' we are pursuing at Osaka University, is to facilitate and create harmonious diversity through scholarship. This role will become increasingly important in the 21st century. By the time we celebrate the University's centenary in 2031, we aspire to be a world-leading, top ten, comprehensive research-oriented university. As a 'World Tekijuku,' we wish to play a pivotal role in creating harmonious diversity, shining forth even into the 22nd century.

In September of 2014, the 'World Tekijuku' initiative was selected for the Ministry of Education, Culture, Sports, Science and Technology's 'Top Global University Project.' With this initiative as its driving force, Osaka University will continue to promote varied university and education reforms.

This prospectus introduces the diversity of world-leading, state-of-the-art research being carried out at Osaka University. I trust that, in response to this prospectus, people from around the world will have an interest in Osaka University. Here, we hope to continue to have students who are full of ambition, who become globally active researchers to discover the true nature of how things work, and who play pivotal roles on the global stage.

With over 1800 years of history, Osaka is a modern, friendly and charming city. Located in the center of Japan and located near Kyoto, Nara and Kobe, Osaka is a place where you can make your dreams come true. We are looking forward to creating harmonious diversity, together with you, for the welfare of humankind.



HIRANO Toshio  
President, Osaka University



### President Toshio HIRANO's Profile

Having obtained his medical degree from the Faculty of Medicine at Osaka University in 1972, and a PhD in 1979, President Hirano has held many positions of responsibility at Osaka University, including Dean of the Graduate School of Frontier Biosciences and that of the Graduate School of Medicine. In 2011, he was appointed as the 17th President of Osaka University.

An eminent researcher in the field of molecular immunology, he is best known for discovering interleukin-6 in 1986, and for the clarification of the role of this protein in chronic inflammatory and autoimmune diseases. This work has led to him being honored with some of the most prestigious international awards for scientific research, including the Crafoord Prize in 2009 and the Japan Prize in 2011.

President Hirano is passionate about advancing Osaka University as a world-class institution. To this end, he initiated structural reforms and organizational changes, including the creation of the Institute for Academic Initiatives in 2012, which promotes interdisciplinary, cutting-edge research and innovative doctoral programs.



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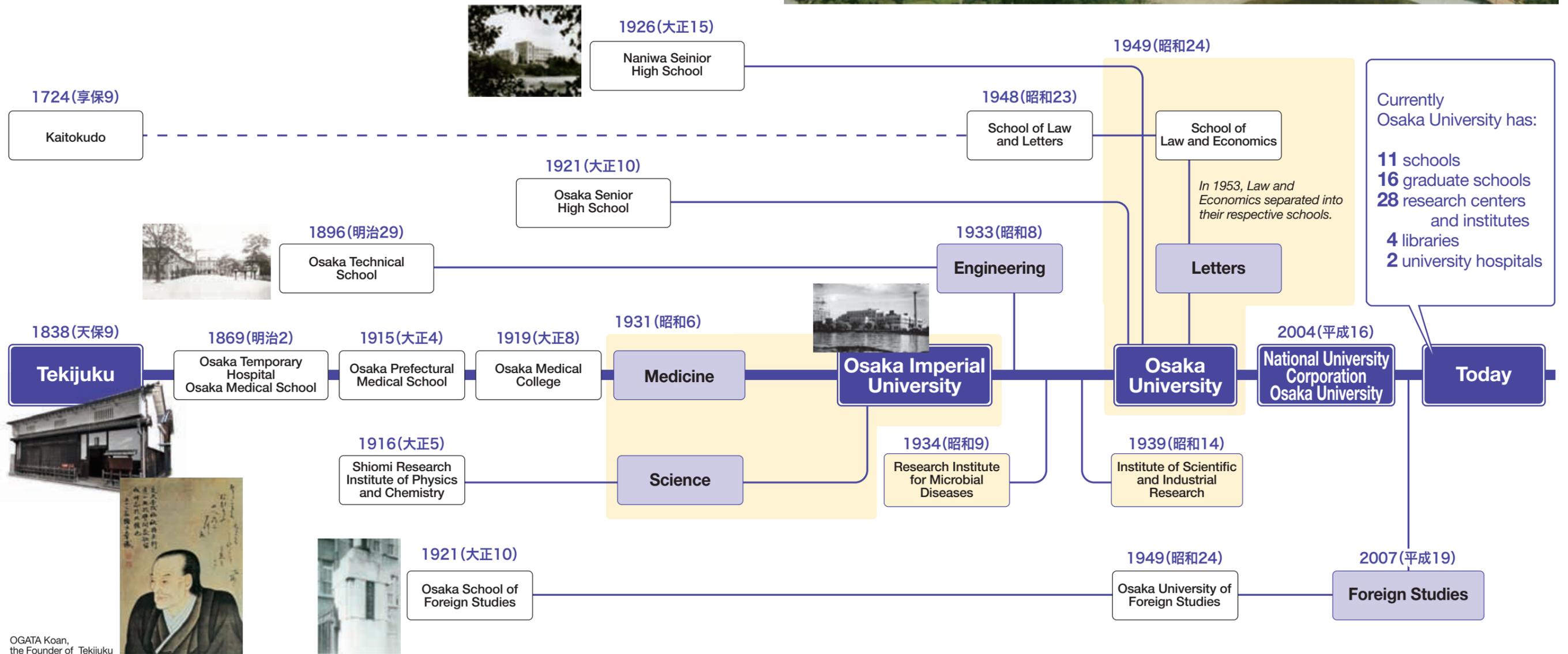
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# The Past and Present of Osaka University



The origin of Osaka University dates back to Tekijuku in 1838 founded by OGATA Koan. However, the spirit of the University can be traced back even further to Kaitokudo founded in 1724. This trait is inherent in today's Osaka University which continues to achieve cutting-edge research results worthy of great pride and international recognition and to provide society with distinguished researchers and professionals.



# Tekijuku – The Origin of Osaka University



Osaka Imperial University was established in 1931 as the 6th imperial university in Japan, and in 1949 was inaugurated as Osaka University. The private academy of Dutch studies known as “Tekijuku”, established by OGATA Koan in Osaka, is a precursor to the Osaka University of today.

Tekijuku, a “juku” or private school, was named after Koan’s pseudonym, “Tekitekisai”. It was founded in 1838 by Koan as a private academy of Dutch studies in Kawaramachi, Osaka (present day Kawaramachi, Chuo Ward, Osaka). Osaka at that time was a center of flourishing economic activity, sharing with Kyoto a cultural refinement known as Kamigata, and was matched only by Edo city, now Tokyo. At Tekijuku, Dutch medicine and studies became a part of Osaka, and Tekijuku developed into an outstanding academy in its time.

Scholastic research was unrestricted under the guidance of Koan, and students were encouraged to study entirely in their own time and pace. In this environment of open academic inquiry, many students, unhindered by a desire to imitate Koan, improved their abilities in a variety of academic fields. Moreover, Dutch texts originating from Tekijuku were not limited to medicine, but also extended to physics, chemistry, and other disciplines. For that reason, Tekijuku was not just a school for Dutch medical studies, but a center that advanced linguistic proficiency to the level of decoding and disseminating the teachings of European texts concerning the natural sciences. In that era, Tekijuku was leading Japan in the advancement of Dutch studies, and young minds from all over Japan gathered there to learn. Until Koan’s assignment as a shogunate doctor in 1862 and his resulting relocation to the city of Edo, it is

surmised that more than 1,000 individuals were educated at Tekijuku.

During the upheaval at the end of the Edo period, there were a great many leaders who influenced the modernization of Japan who had been educated at Tekijuku, including FUKUZAWA Yukichi, who founded Keio University; OMURA Masujiro, who was the father of the modern Japanese army; SANO Tsunetami, who founded the Japan Red Cross; HASHIMOTO Sanai, who was a governmental reformer and thinker; OTORI Keisuke, who was active as a diplomat; and NAGAYO Sensai, who established the modern Japanese medical system. Along with these luminaries were those who studied at Tekijuku and then returned to their villages and towns, sharing their learnings with the people of Japan. It is through these individuals that the Meiji Restoration could occur at such marked speed. The graduates of Tekijuku paved the way for this impactful societal transformation.

The legacy of Koan is not limited to his influence as a teacher of many. He published texts on medicine which allowed for the dissemination of medical knowledge, including Fushikeiken-ikun (roughly, “Dr. Hufeland’s Medical Advice”), Korori-chijun (“Treatment of Cholera”), and Byogaku-tsuron (“Introduction to Pathology”), among others. Further, Koan actively trained doctors in the creation and administration of vaccinations, widening the reach of his impact on Japan. He established the Joto-kan in 1849 to administer vaccinations to citizens to stop the spread of smallpox. Physicians were educated there on the administering and creation of vaccinations and smallpox. As a pioneering educational institution for medical technology, Joto-kan standardized practices



OGATA Koan's Medicine Box



Vaccinator license issued by Osaka vaccination clinic (1867)



Booklet 'Kolorichijun' (A guideline of treatments for cholera) compiled by OGATA Koan (1858)

in medicine by issuing licenses to physicians who had completed their training.

After Koan's death, his legacy continued in those he educated at his school. The Tekijuku building itself endured both fire and war. It is the only remnant of the impact of Dutch studies on Japan and a rare example of an Edo period townhouse in Osaka. In order to preserve this historic monument, the site and building of Tekijuku were donated to Osaka Imperial University in 1942. In 1964, it was recognized as a national treasure by the Japanese government and remains owned and maintained by Osaka University. From 1976 to 1980 it was dismantled and repaired, and in 2014, it was reinforced with a new method of construction to resist earthquakes. It continues to be a popular destination for visitors.

Koan's legacy, the guiding principle of his work, “For people, for society, and for the pursuit of truth” lives on to this day. In 1869, the new Meiji government welcomed the second son of Koan, OGATA Koreyoshi, and the Dutch doctor Anthonius Franciscus Bauduin to establish the Osaka Temporary Hospital and the Osaka Medical School. This in turn became the Osaka Prefectural Medical School, and then the Faculty of Medicine in the Osaka Imperial University, linking the legacy of Tekijuku directly to our modern Osaka University.



OGATA Koan (1810-1863), the founder of Tekijuku



House of Tekijuku remaining in the city of Osaka



World-renowned architect, Tadao Ando (right) and President Toshio Hirano (left), talking at Tekijuku. Photo courtesy of the Department of Publicity and University-Community Collaboration, Osaka University (The *Osaka University NewsLetter* No.45)

# From "Tekijuku" to the "World Tekijuku"



“Tekijuku” was an academy founded in 1838 by Ogata Koan. A precursor to Osaka University, it attracted diligent students to Osaka from around the country for study in an open environment of friendly competition. Koan, selfless in spirit and driven by an ethical imperative, advanced his research with a basis in studies from overseas, pursuing the truth and endeavoring to solve the societal issues of the day. Their primary texts were written in Dutch, and covered the latest advancements in European life sciences at the time. Koan and his Tekijuku cleared the way for a new, modern Japan and educated a great number of leaders that transformed the Japan of then and now.

Osaka University, honoring this heritage from Tekijuku, aspires to cultivate individuals who will contribute to the development of human society on the global stage of the 21st century in its “World Tekijuku”, a modern rebirth of Koan’s legacy.

## Educating to overcome modern issues

### Aiming to be an international top 10 comprehensive research university

Modern societal issues stem from a variety of intertwined causes. Graced with leading edge advancements in science and technology, our task is to build a vibrant human society by addressing these issues.

Osaka University aims to cultivate the talent necessary to lead the way to solutions, pursuing a high level of scholarship to “ascertain the true essence of things”, an aspiration of Osaka University. With the ideal of fostering “harmonious diversity” through scholarship and unhindered by preconceived notions, Osaka University aims to guide the way to solutions to the challenges of our global society.

The World Tekijuku initiative has been selected for the “Top Global University Project” by the Japanese government Ministry of Education, Culture, Sports, Science and Technology. Osaka University aims to become a world top ten comprehensive research university by our centenary in 2031, what will be a global-scale “World Tekijuku”. Continuously improving the quality of our education and research, Osaka University strives to emerge as a leading institution in a world of increasing international competition in higher education.

### The four abilities possessed by future leaders in a global society

- Sophisticated expertise and broad scholarship, needed worldwide
- Abundant education, the legacy of humankind
- The ability to discover problems and pave the way to solutions
- Transcultural communicability, to overcome borders

## Initiatives to realize the "World Tekijuku"

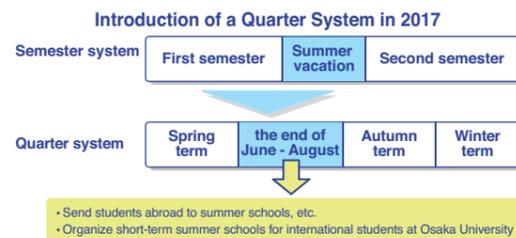
### Guaranteeing education at international standards and improving the learning environment

In order to further global education and research exchange, it is necessary to establish systems for education based on common international standards as well as to ensure teaching quality.

Osaka University plans to transition from its current semester system to a **quarter system**, which is scheduled for April of 2017. The aim is to strengthen mutual exchange, via summer programs, of both inbound international students from the end of June to August and internationally-outbound students while doubling the number of students studying abroad, taking short-term overseas program or internships (from 4% in 2013 to a goal of 8% by 2020).

In addition, to ensure smooth and structured planning for taking courses, Osaka University is carrying out university-wide reforms to curriculum and course hierarchy. The order and difficulty of courses will be displayed in numbers using a systematic **course numbering** which will be fully implemented by March of 2022.

Moreover, Osaka University continues to design curricula in line with international standards, such as online learning systems, **MOOCs** (Massive Open Online Courses), and programs particularly popular with international students such as FrontierLab@OsakaU and Maple, while increasing offerings for degree courses taught in English.



## Accepting a diversity of students and academic staff

Osaka University has rapidly increased its number of Inter-university Exchange Agreements and expanded its summer programs, aiming to **double the number of inbound international students** (from 8% in 2013 to 15% by 2030).

In September of 2014, entrance examinations were introduced for privately-funded international students. Admitted students will enter Osaka University in April of 2016, following a preparatory program to allow students with lower Japanese language proficiency to improve their abilities systematically. Even further, Osaka University established a **Global Admissions Office**, charged specifically with managing international student admissions.

Personnel hiring and salary systems are being reformed for greater flexibility in the interest of allowing for the inclusion of more outstanding academic staff from a diversity of nationalities and specialties at Osaka University.

Introduced in January of 2014, a **cross-appointment system** allows academic staff at Osaka University and universities overseas to flexibly carry out research and education at both universities without losing their status at their respective universities of origin. As of February of 2015, 26 universities and research institutes have completed agreements, resulting in active personnel exchange.

Finally, preparations are being made for a **Global Village**, which will comprise of a planned capacity of 2,600 residences with university dormitories and

residence halls. Osaka University students and staff from all parts of the world will gather in these facilities to communicate and exchange with each other.

## Strategically developing international education and research

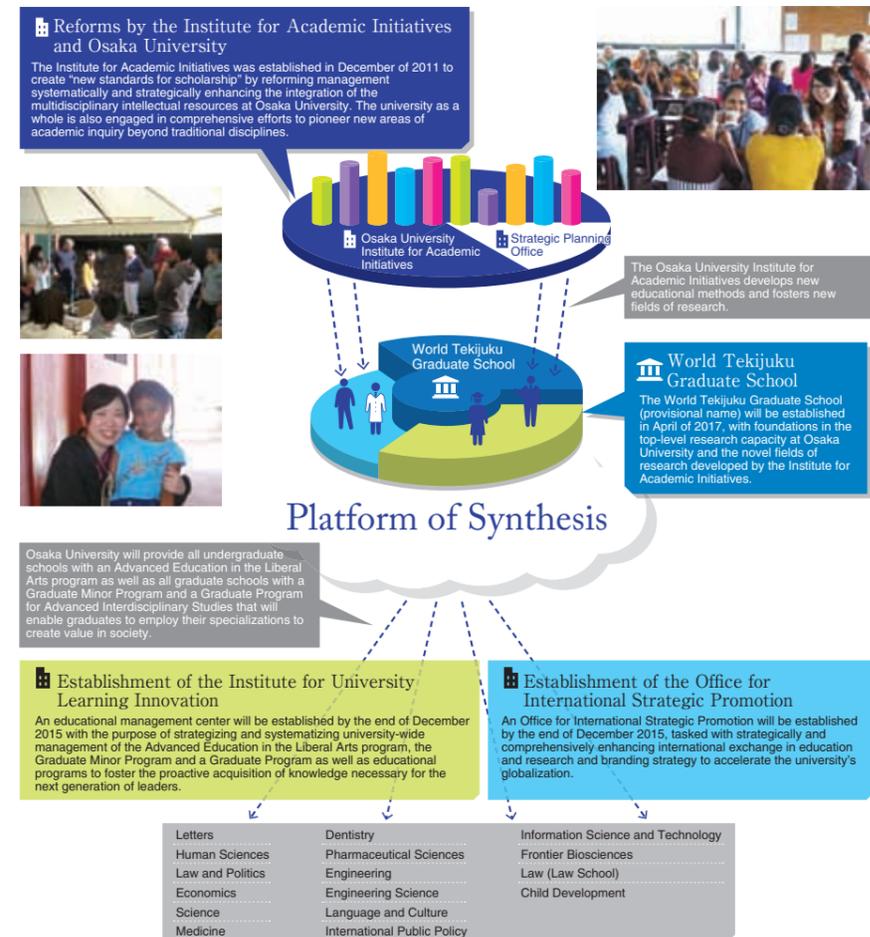
Anticipating international recognition in new research fields, Osaka University has established **international joint labs** to improve its research ability around the world and allow for greater international presence. While these labs will act as bases for international collaborative research, Osaka University will further plans to improve the cooperation of education and research institutions worldwide.

(See p. 100)

## Enhancing systems for university reform

Current university-wide management systems must be enhanced to extend novel programs in education and research.

Osaka University plans to ensure its continuity and security with three organizations - the existing Institute for Academic Initiatives, joined with the newly-established **Institute for University Learning Innovation** and the **Office for International Strategic Promotion**. The **World Tekijuku Graduate School** will be established in April of 2017, in preparation for the coming century of global graduate schools at the Osaka University as it celebrates its 100th anniversary in 2031. In the context of a global education, it will nurture talented individuals in an environment of friendly competition, individuals who can translate cutting-edge research results to the creation of value for society in a modern version of Koan’s Tekijuku.



# Information and History of Osaka

## The Word 'Osaka'

The geographical range currently indicated by the term 'Osaka' varies according to the context in which the term is used. The Tokugawa shogun that ruled Japan during the Edo period (1603–1867) clearly referred to Osaka as the administrative district that the Edo government had set under the direct control of the city. The administrative district was dominated by Osaka shogunate magistrates, set apart from the surrounding rural areas and was much smaller than present day Osaka. Nowadays, Umeda and Namba are densely populated areas located in downtown Osaka but during the Edo period neither Umeda nor Namba was included within Osaka itself rather considered rural land adjacent to it on both sides. To put it simply, Osaka in the Edo period was considered an area sandwiched in between; it was this area that was exclusively referred to as Osaka. Osaka began expanding its borders from 1868 onwards, the start of the Meiji era.

## Osaka in the Edo Period

Toyotomi Hideyoshi (1537–1598) finally put an end to civil war, which had lasted more than a century in Japan. He achieved unification in 1590 and this laid the foundations for the development of Osaka. As well as the construction of Osaka Castle, Hideyoshi attracted merchants and traders through urban development. After unification throughout Japan, the House of Lords was built in Osaka and it was decided that all lords should pay homage to Hideyoshi. Osaka subsequently thrived and became the political, economic and military center of Japan.

Toyotomi Hideyori (1593–1615) followed in his father's footsteps and became the head of Osaka Castle after Hideyoshi's death in 1598. In 1615, however, Hideyori would be overthrown by the first shogun Tokugawa Ieyasu (1542–1616) who had a firm grip on hegemony after winning the battle of Sekigahara in 1600 and the opening of the shogunate in Edo (modern day Tokyo) in 1603. As a result of this war, Osaka was destroyed and areas burnt to the ground.

Following this, post-war reconstruction was carried out and Osaka fell under the direct control of the Edo shogunate from 1619. In addition to the rebuilding of Osaka Castle, the shogunate focused on urban development and the area prospered greatly during the Edo period. In the 18th century, it was a huge city with a population of 400,000 second only to Edo where the shogunate was located.

Osaka became a distribution center furnishing goods and supplies to the rest of Japan. Rice instead of land tax was collected from each of the lords' village territories along with other special products and sent to Osaka



Osaka in the late Edo period.  
"Map of Osaka's National Treasure (revised and enlarged)." 『改正増補国宝大阪全図』  
1863, OSAKA UNIVERSITY LIBRARY

## The History and Spirit of Osaka



①View of Temma Bridge

②Sailing of Cotton-Loading Boats

③The Mitsui Draper's Shop

to be sold. To this end, the lords placed their goods in their own warehouse-residences in the city called 'kurayashiki'.

## Land Characteristics

Osaka in the Edo period comprised of Osaka Castle, Osaka shogunate magistrates, shogunate institutions and the kurayashiki, which were owned by the various different feudal lords. There was a presence of samurai in Osaka but their percentage compared to the total population of Osaka was negligible and most of the townspeople were actually engaged in commerce and industry. Due to the huge political shogunate organization in Edo, there was always a constant number of samurai present there. The 'sankin-kotai' system (lit. 'alternate attendance', a daimyo's alternate-year residence in Edo) meant there was also an influx of samurai to the area at this time and this became a major difference between the two regions. Furthermore, since Osaka had become the center of the national economy, the local merchants were able to influence the trend of prices and distribution nationwide.

These characteristics brought a sense of freedom to Osaka, a free spirit that did not fear the authority of officers or samurai. In addition, many private schools were opened and scholarship developed tremendously, but the ethos of this Osaka was also clearly reflected in its academic content. 'Kaitokudo' founded in Osaka thanks to the contributions of leading merchants in 1724, together with 'Tekijuku', are said to be the origins of Osaka University. Nakai Chikuzan (1730–1804), the principal of Kaitokudo, severely criticizes the samurai who displayed no signs of shame with regard to not repaying this debt owed to the merchants.

Once we leave the Edo period and enter the world of the Meiji era, any indication of the existence of samurai and *chonin* (merchants and traders) disappears. As mentioned earlier, at this time, the geographic region of Osaka itself expands. Nonetheless, even with era change, the ethos of Osaka nurtured during the Edo period is present and, in fact, still lives on today.

(Michihito MURATA, Professor, Graduate School of Letters)

①People toing and froing across the Temma Bridge which spans the River Yodo; Osaka Castle visible in the background.

Kunikazu, "View of Temma Bridge" 『天満ばし風景』  
THE OSAKA PREFECTURAL NAKANOSHIMA LIBRARY

②Large Higaki ships loaded with cotton (top right) headed for Edo departing from the estuary of the Yodo River.

Yoshitoyo, "Sailing of Cotton-Loading Boats" 『菱垣新綿番船川口出帆之図』,  
THE OSAKA PREFECTURAL NAKANOSHIMA LIBRARY

③Mitsui Echigoya dry-goods store, predecessor of the modern day Mitsukoshi.  
Kunikazu, "The Mitsui Draper's Shop" 『三井呉服店』,  
THE OSAKA PREFECTURAL NAKANOSHIMA LIBRARY

# Outstanding Achievements and Programs

## WPI Immunology Frontier Research Center

### Jun SAKANOUÉ

Associate Professor, Immunology Frontier Research Center

[www.ifrec.osaka-u.ac.jp/index-e.php](http://www.ifrec.osaka-u.ac.jp/index-e.php)

### Immunology at Osaka University and Four Immunologists

Currently, Osaka is known as one of the international hubs for immunology. The following four scientists are not to be forgotten when talking about immunology research in Osaka University. **Tadamitsu Kishimoto** (Osaka University President, 1997-2003) and **Toshio Hirano** (Osaka University President, 2011-present) studied at the laboratory of Yuichi Yamamura (Osaka University President, 1979-1985), a pioneer in microbiology and cancer immunology in Japan. Interleukin-6 (IL-6), discovered at Kishimoto's lab in 1986 has become a fascinating research subject around the world, because it plays important roles in pathogenesis and aggravation of various autoimmune diseases such as rheumatoid arthritis or juvenile arthritis. Due to their remarkable achievements in IL-6-based immunology and therapeutic application, Kishimoto and Hirano won the Crafoord Prize in Polyarthritits (2009) and the Japan International Prize (2011).

**Shizuo Akira** has made ground-breaking discoveries in the field of innate host defense mechanisms, and was chosen as the "Hottest Researcher in the World" by Thomson Reuters for the years of 2006-2007. He is a recipient of the Robert Koch Prize (2004), the William Coley Award (2006), and the Gairdner International Award (2011).

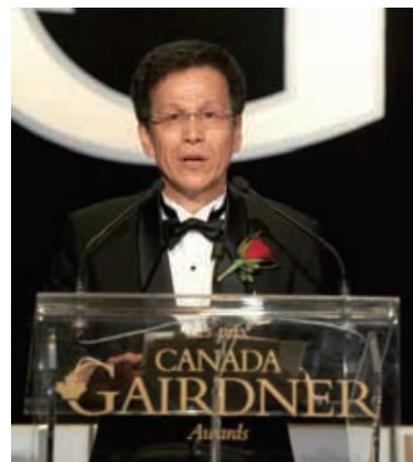
**Shimon Sakaguchi** identified regulatory T cells (Treg) as the "immune cells that suppress immune reactions". Sakaguchi has greatly contributed to the understanding of Treg and its roles in controlling a variety of physiological and pathological immune responses, including autoimmune disease, transplantation tolerance, and tumor immunity. Sakaguchi is also a recipient of the William Coley Award (2004).

The above three scientists Kishimoto, Akira and Sakaguchi have been elected as foreign associates of the National Academy of Sciences.

Partly through their achievements, Osaka University was ranked among the world's top institutes for the "Citations per Paper ranking" in the immunology field (Essential Science Indicators by Thomson Reuters®; amongst institutes that produced more than 500 papers between 2003 and 2013).



Tadamitsu Kishimoto (L), Toshio Hirano (C) with Charles Dinarello (University of Colorado) at the ceremony for the Crafoord Prize 2009 ©The Royal Swedish Academy of Sciences Photo: Markus Marcetic



Shizuo Akira at the ceremony for the Canada Gairdner International Award 2011 ©The Gairdner Foundation (www.gairdner.org)



Shimon Sakaguchi at the National Academy of Sciences in 2012 © The National Academy of Sciences

### Immunology Frontier Research Center (IFReC)

The **Immunology Frontier Research Center (IFReC)** at Osaka University, directed by Shizuo Akira, was established in 2007 with the aforementioned four immunologists at the core. IFReC was selected by the Japanese government as one of the nation's five exclusive **World Premier International (WPI)** Research Centers.

The research at IFReC has been maintained at a very high level in both quantitative and qualitative aspects. More than 800 papers have been published so far with an average number of citations of 30 as of August 20, 2014. Thus, IFReC researchers made a major contribution to rank Osaka University 1st in citation impact among the top institutions in immunology all over the world mentioned in the previous section.

In 2014, **Shigekazu Nagata** joined the members of IFReC. Nagata is a molecular biologist, well known for researches on apoptosis, the process of programmed cell death. His membership in IFReC will provide IFReC

researchers with fresh incentive and encouragement. As well as the five mentioned above, there are diverse researchers enrolled at IFReC. They are studying a wide variety of research fields besides autoimmune diseases including malaria infection, osteoporosis, metabolic syndrome et cetera, incorporating the latest technologies such as Laser microscopes, MRI, and computer simulation for their studies.

The scientific aim of IFReC is to contribute to a more comprehensive understanding of the dynamics of the immune system by employing not only traditional immunology experiments, but also a variety of imaging and bioinformatics technologies. This will lead to new and more efficient development strategies for vaccines and immune therapies when combating infectious diseases, cancers and autoimmune diseases.

IFReC is expected to grow into a new leading institute of immunology and biosciences in Japan.



IFReC Research Building where the top immunologists congregate

# Developments in particle physics and Osaka University

## Takahiro KUBOTA and Kazunori HANAGAKI

Professor  
Graduate School of Science

Associate Professor  
Graduate School of Science

[www.sci.osaka-u.ac.jp/en/](http://www.sci.osaka-u.ac.jp/en/)

### The discovery of the Higgs Particle

Exciting news came from CERN (European Organization for Nuclear Research) in Geneva on 4 July in 2012, that they have after all discovered Higgs-like particle, the long-sought fundamental particle explaining the origin of mass of all particles. This discovery is due to international collaboration involving several dozens of countries, among which Japan has been apparently one of the major driving forces of this world-wide project. Experimental particle physicists in Department of Physics at Osaka University have also been playing key roles in the course of pain-staking construction of this experimental apparatus and of nerve-breaking data analyses.

### Nagaoka Model for an Atom

The Department of Physics in Osaka boasts many luminous figures at each stage of development in physics, leading eventually to the discovery of the Higgs-like particle. Hantaro Nagaoka, the first president of Osaka University, is known to have advocated in 1903 [a Saturnian model for an atom](#), i.e., electrons are moving in one or more rings around a central body i.e., nucleus, just like the rings of the Saturn. Nagaoka's proposal was confirmed several years later by the celebrated experiment of Rutherford scattering. The Saturnian model has been known widely in the West through a popular science book *La Valeur de la Science* (1905) written by renowned scientist, H. Poincare.

### Yukawa's Meson Theory

While Nagaoka has opened the door to the atomic world, mysteries hidden in nucleus were uncovered in 1935 by a bold idea of then a 28-year old lecturer at Osaka University, Hideki Yukawa. It has been by now well established that there are four kinds of forces in nature: gravitational, electromagnetic, strong and weak forces. The concept of strong force that explains the binding of neutrons and protons in nucleus was

introduced for the first time by Yukawa. He is known to have predicted the existence of a new particle as a mediator of the nuclear force, which we now call  [\$\pi\$ -meson](#). Yukawa's great achievement of the meson theory earned him the first Nobel Prize in Japan in 1949.

### The Gauge Principle

The unified theory of electromagnetic and weak forces together with quantum chromodynamics for the strong force is now called standard model, in which the key idea is the '[non-abelian gauge symmetry](#)'. A special type of this symmetry was formulated mathematically in 1954 by C.N. Yang and R.L. Mills. It was, however, Ryoyu Utiyama, Professor at Osaka University who developed the gauge symmetry to its full generality including gravity. In his 1956 paper, Utiyama has heightened the gauge symmetry to the guiding principle of, and has paved the way for exploration of the present-day gauge theories of elementary particles.

### Spontaneous Symmetry Breaking

Another important ingredient in constructing the standard model is the concept of [spontaneous symmetry breaking](#), which was introduced in particle physics in 1961 by Professor Yoichiro Nambu (Nobel laureate) of Chicago University. He has been a frequent visitor to Osaka since 1990's and has been given special title of Distinguished Professor at Osaka University. The spontaneous symmetry breaking, when combined with gauge symmetry, is bound to predict the existence of a neutral spin 0 particle, named [Higgs boson](#). In spite of dedicated efforts of experimental physicists, the Higgs boson had eluded all the experiments until 4 July, 2012.

### LHC Experiment

The experimental apparatus that was constructed at CERN and connected with the discovery of the Higgs-like particle is called LHC (Large Hadron Collider). There are two experimental groups, ATLAS and CMS, and

the members of Osaka University belong to the former. The ATLAS strategy towards the milestone of Higgs discovery was to focus on the decay modes of the Higgs boson to two photons ( $\gamma\gamma$ ), to two Z bosons and to two W bosons. The two Z bosons decay further into four leptons (electrons and/or muons). The datasets used in the analyses were collected at the center of mass energy of 7 TeV in 2011 and of 8 TeV in 2012. Figure 1 shows the data of  $\gamma\gamma$  decay and Figure 2 the decay into four leptons through two Z bosons. These figures show a clear evidence for the production of a neutral boson with a mass of 125 GeV

### The Nobel Prize in 2013

The ATLAS group, in which our Osaka members are included, has gone further to determine the spin and parity properties of the new particle. It has been expected theoretically that the Higgs boson has the spin 0 and parity +, whose confirmation is absolutely necessary for the new particle to be the Higgs boson. The alternative possibilities other than spin 0 and parity + have been all excluded at confidence levels above 97.8 per cent by the time of writing this article. We are thus quite convinced that the newly discovered particle is endowed with many of the properties that the Higgs boson must have. We are all sure that the year 2012 will be remembered as the year of Higgs boson discovery, and that our all-out efforts underly the Nobel Prize in Physics in 2013. The experimental group members in Osaka University who have been participating in this success story are all full of joy and happiness.

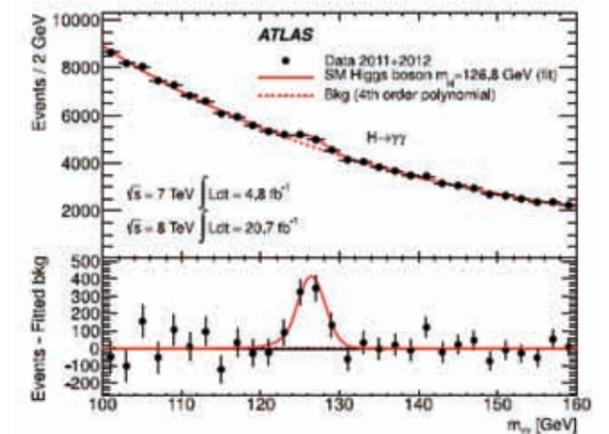


Figure 1. Invariant mass distribution of two photons.

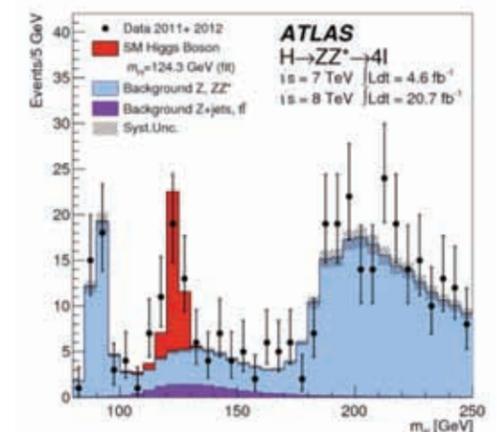


Figure 2. Invariant mass distribution of four charged leptons produced through two Z bosons.

# First Demonstration of Environmentally Friendly Nitride-Based Red Light-Emitting Diodes

**Yasufumi FUJIWARA**

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Energy harvesting, saving, and storage are technologies essential in realizing a sustainable society. The use of light-emitting diodes (LEDs) as a semiconductor light source is one of the key components of energy saving. Various types of LEDs have been developed and used as indicator lamps in many devices, and are being increasingly used in displays and general lighting. An  $\text{In}_x\text{Ga}_{1-x}\text{N}$ /GaN multiple quantum well (MQW), grown on sapphire, is used as an active layer in blue and green LEDs, and an  $\text{Al}_x\text{Ga}_{1-x}\text{In}_{1-x-y}\text{P}$  layer, grown on GaAs, is used in red LEDs. If a GaN-based red-light emitter can be developed, small nitride-based monolithic high-resolution optical devices that comprise red, green, and blue GaN-based LEDs can be realized for full-color displays and/or lighting technology.

Trivalent europium ( $\text{Eu}^{3+}$ ) ions have been widely used as red-emitting phosphors in cathode ray tube and plasma display panels. In these applications, the ions are doped in an insulator, and red emission is obtained mainly through optical excitation. Eu-doped GaN has been identified as a promising red emitter because it has excellent

luminescence properties in the red spectral region, resulting from the specific optical properties of rare-earth (RE) materials, such as a sharp, intense, and temperature-independent emission peak due to the intra- $4f$  shell transitions.

We have investigated the atomically controlled doping of RE atoms in III-V semiconductors by organometallic vapor phase epitaxy (OMVPE), and have developed novel devices with the luminescent and magnetic properties of RE ions. In this study, we have succeeded in growing Eu-doped GaN layers with high crystalline quality, and have demonstrated for the first time a low-voltage current-injected red emission from p-type GaN (p-GaN)/Eu-doped GaN/n-type GaN (n-GaN) LEDs, with an applied voltage of as low as 3 V. A main emission line with a half width of less than 1 nm was observed at 621 nm, which can be assigned to the  ${}^5\text{D}_0-{}^7\text{F}_2$  transition of  $\text{Eu}^{3+}$  ions. Red color corresponding to a wavelength of 621 nm has never been reported for conventional Eu-doped phosphors. Notably, no band-edge or defect luminescence was observed under

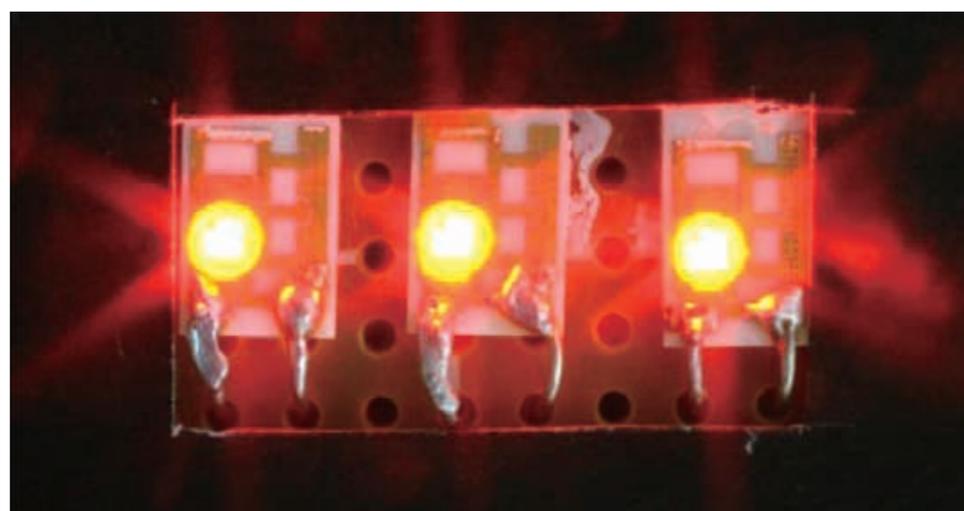
the bias conditions, indicating that the Eu luminescence is caused by an ultrafast energy transfer from the GaN host to the  $\text{Eu}^{3+}$  ions. By optimizing growth conditions and device structures in our laboratory, the light output power has been increasing steadily in recent years. For example, the atmospheric pressure growth of Eu-doped GaN markedly enhanced the Eu intensity. This was because of the increased number of optically active Eu centers, and the efficient energy transfer due to the reduced number of non-radiative processes in the GaN host. The LED's light output power also increased monotonically with the thickness of the Eu-doped GaN layer. At present, the maximum light output power of our LED is sub-mW at an injected current of 20 mA, which is the highest value ever reported. The corresponding external quantum efficiency is comparable to that of commercially available nitrogen-doped GaP green LEDs.

Utilizing RE-doped semiconductors with atomic-level control, it is possible to study the exploitation of not only their luminescent and magnetic properties, but also of

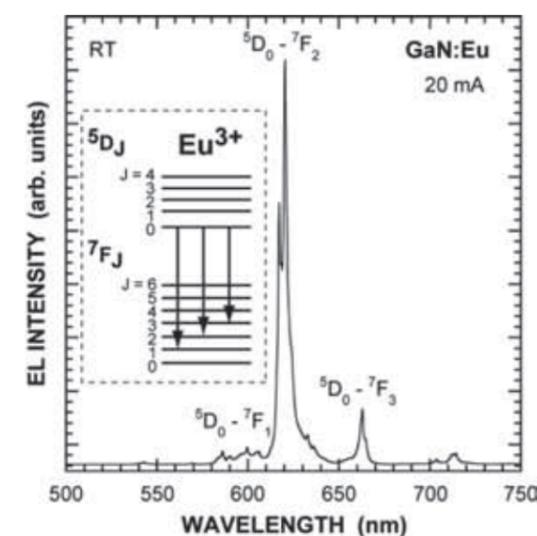
new functionalities resulting from their fusion. The results of this study are expected to open up a new research field in the science of various RE materials such as phosphors, magnets, catalysts, solid electrolytes, etc. This is because research on RE materials has so far been based on experience obtained through trial and error, rather than on materials design under the precise control of RE doping, and an understanding of the energy-transfer mechanism.



▲ Fig. 2 Monolithic integration of blue and red colors.



▲ Fig. 1 First GaN-based red LED operating under current injection at room temperature. Eu-doped GaN is used as the active layer of the LED.



▲ Fig. 3 Electroluminescence spectrum of the red LED using Eu-doped GaN.



▲ Fig. 4 Paradigm shift in the research on RE materials.

Exploratory Research for Advanced Technology (ERATO) Murata Lipid Active Structure Project

“To achieve something that no one has ever done or even attempted”

Michio MURATA

Professor, Graduate School of Science

[www.jst.go.jp/erato/murata/en/](http://www.jst.go.jp/erato/murata/en/)

Lipid-protein interactions have been recently revealed to play key roles in cell physiology such as signal transduction and substance transportation. Structural biology, which has greatly accelerated the advance of biosciences has mainly been focusing on proteins, whereas hardly dealing with membrane lipids and lipid ligands. Because lipids are highly flexible molecules, the elucidation of their three-dimensional structures binding to or surrounding membrane proteins is extremely difficult even with the use of X-ray crystallography. We have been studying how to elucidate the true active structure of lipids in and around proteins (Fig.1) by using cutting-edge solid-state NMR techniques (Fig.2) combined with ultra-high-resolution X-ray crystallography (Fig 3), organic synthesis and protein engineering. This breakthrough is expected to advance our knowledge in biological and biomedical sciences over

the next decade, and also contribute to the research and development of medical and pharmaceutical applications.

In 2010, Professor Michio Murata, department of chemistry, Graduate School of Science, was appointed as a Research Director of the Exploratory Research for Advanced Technology (ERATO) funded by Japan Science and Technology Agency (JST) to expand further his research on lipid for 5 years. ERATO research funding program was founded in 1981, to promote basic research in science and technology as an important part of “Strategic Basic Research Programs” initiated by the Japan government. Its main mission is to make Japan a world leader in science and technology: bringing a bright future to Japan as well as making significant contributions to the international scientific community. For ERATO projects, in

parallel with national strategic objectives in science and technology, JST establishes key research areas that offer high potential for creating seeds for new technologies, then appoints a research director to be responsible for each of these strategic research areas. The research director’s mission is to draw up a detailed research plan, recruit staff, and manage the 5-year project to achieve his or her vision as well as national strategy.

Prof. Murata set up an independent research organization from his laboratory at the Graduate School of Science. It consists of the administrative headquarters and three research groups. One of the groups works at Frontier Research Center at Suita campus and the others at Project Research Center of Fundamental Science at Toyonaka campus. Currently there are 9 scientists at both sites and they were recruited from Japan and from abroad. Besides, we have collaborators in the three universities. (Fig.4)

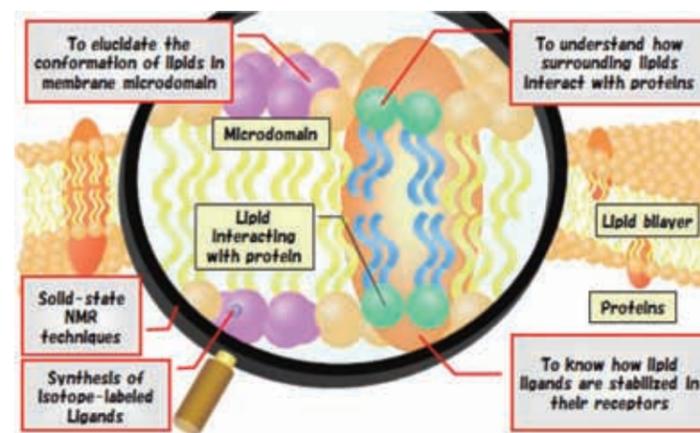
In order to facilitate ERATO research activity and to achieve the interdisciplinary objectives effectively, we

regularly have meetings such as weekly meetings with group members, bimonthly meetings with collaborators (Fig.5), and annual meetings with all project members including JST staff (Fig.6), where we usually invite guest speakers to collect information on hot topics on lipid-protein interactions.

Now membrane lipid, especially interactions between lipids and proteins, is one of the most exciting research topics; it is important for us to have a global research network. In 2011 we organized ‘International ERATO Symposium on Lipid Structures in and around Proteins’ and succeeded in expanding the collaboration network with 11 guest speakers from 7 countries (Fig.7). We have revealed some new insights into the mystery of membrane lipids. Such knowledge will highlight not only the basic principles of cell biology and tissues but also fundamental insights into the molecular biology. These findings will surely contribute to biomedical / pharmaceutical sciences through providing fundamental knowledge that can be utilized for diagnosis and medication.



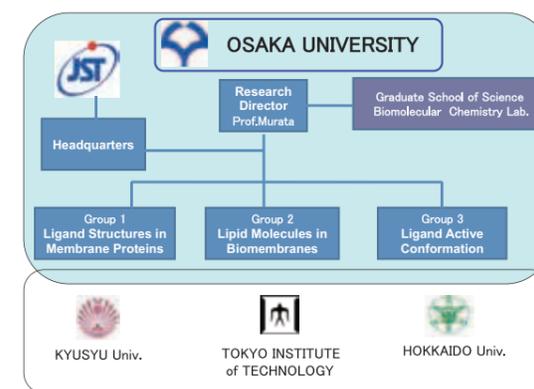
▲ Fig.2 Solid-state NMR Instrument



▲ Fig.1 Our ERATO research on lipid-protein interactions can lead to a new concept in structural biology based on lipid structure analysis



▲ Fig.3 Spring 8 (Synchrotron Radiation Facility)



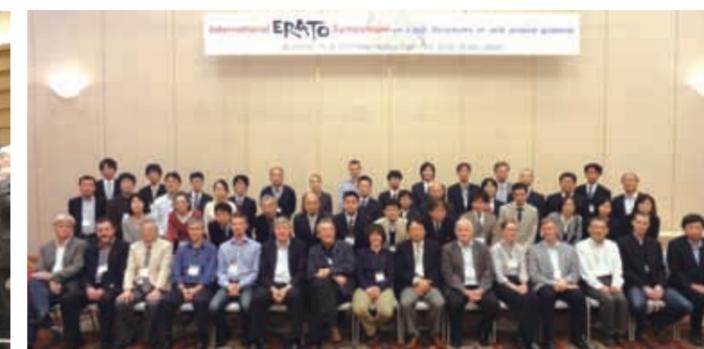
▲ Fig. 4 ERATO project organization chart



▲ Fig. 5. Bimonthly Project Meeting



▲ Fig.6. Annual progress report meeting



▲ Fig.7. International ERATO Symposium

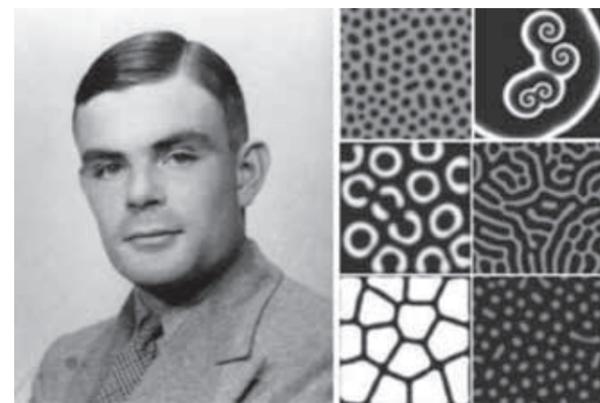
# Finding waves in animal bodies

## Shigeru KONDO

Professor, Graduate School of Frontier Biosciences

[www.fbs.osaka-u.ac.jp/labs/skondo/indexE.html](http://www.fbs.osaka-u.ac.jp/labs/skondo/indexE.html)

Over the past three decades, studies at the molecular level have revealed that a wide range of physiological phenomena are regulated by complex networks of cellular or molecular interactions (1). The complexity of such networks gives rise to new problems. However, the behavior of such systems often defies immediate or intuitive understanding. Mathematical approaches can help to facilitate the understanding of complex systems, and to date these have taken two primary forms. The first of these involves analyzing every element of a network quantitatively and simulating all interactions by computation (1). This strategy is effective in relatively simple systems, for example, the metabolic pathway in a single cell; it is also extensively explored in the field of systems biology. Nonetheless, for more complex systems in which spatiotemporal parameters take on importance, it becomes almost impossible to make a meaningful prediction. In such cases, a second strategy involving simple mathematical modeling from which the details of the system are omitted can be more effective in extracting the nature of the complex system (2). The reaction-diffusion model (3) proposed by Alan Turing is a masterpiece of this type of mathematical modeling, one that is capable of explaining how spatial patterns develop autonomously.



▲Photo of Alan Turing and the 2D patterns generated by the Reaction-diffusion equation presented by him.

In the RD model, Turing used a simple system of 'two diffusible substances interacting with each other' to represent patterning mechanisms in the embryo, and found that such systems have the ability to generate spatial patterns autonomously. Unfortunately, Turing died soon after publishing this legendary paper, but simulation studies of the model have shown that this system can replicate most biological spatial patterns (4,5,6). Later, a number of mathematical models (4) were proposed, but in most of them, Turing's basic idea that 'the mutual interaction of elements results in spontaneous pattern formation' has been followed. The RD model is now recognized as a standard among mathematical theories that deal with biological pattern formation.

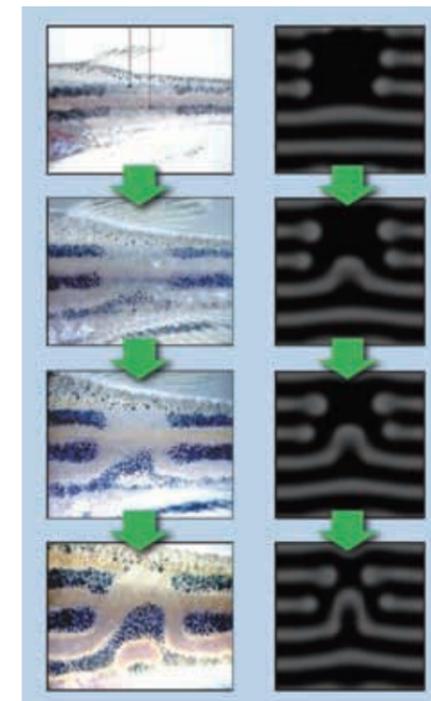
At the same, this model has yet to gain wide acceptance among experimental biologists. One of the major causes for this is the gap between the mathematical simplicity of the model and the complexity of the real world. The hypothetical molecules in the original RD model have been so idealized for the purposes of mathematical analysis that it seems nearly impossible to adapt the model directly to the complexity of real biological systems. Yet, this is a misunderstanding to which experimental researchers tend to succumb. It is possible to understand the logic of pattern formation using even simple models, and by adapting this logic to very complex biological phenomena, it becomes easier to extract the essence of the underlying mechanisms. Genomic data and new analytic technologies have caused a shift in the target of developmental research from the identification of molecules to understanding the behavior of complex networks, making the reaction-diffusion model more important as a tool for theoretical analysis.

$$\begin{aligned}
 U_t &= D_U \nabla^2 U + f(U, V) \\
 V_t &= D_V \nabla^2 V + g(U, V)
 \end{aligned}$$

▲Reaction-diffusion equation. U and V represent the local concentration of the chemicals.

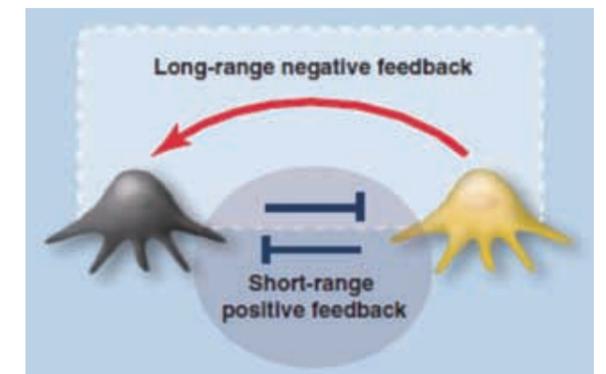
For the past ten years, our group has been trying to identify the cellular and molecular basis of how the skin pattern of animals is made by using zebrafish, small fish with striped skin. The first thing we did was to show the wave-like activity of the skin pattern. As the theory predicts that the pattern is a type of 'wave', it must move when artificially disturbed. The picture shown on the left is the change of the skin pattern induced by the killing of the black stripes (black pigment cells). This dynamic pattern change is precisely predicted using the simulation of RD model. We then examined the cellular behavior of cell pigment and found the cell activity was what Turing's theory had predicted.

Using the experimental data we published, the idea of Turing's theory has now become more accepted among biologists. In recent works, a number of scientific reports have suggested the involvement of Turing's mechanism in



▲The change of zebrafish skin pattern induced by an artificial injury is predicted by the simulation of RD equation

the morphogenesis of embryos. Our group is also trying to show that the Turing mechanism is functional during the shaping of vertebrate bones.



▲Schematic model of the interactions that generates the pigment pattern. the interaction network has the property equivalent to the Turing's hypothesis.



▲Skin pattern of Pomacanthus imperator gradually changes as it grows.

# Creation of innovation centers for Advanced Interdisciplinary Research Areas Human-Robot Theater

## Hiroshi ISHIGURO

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Human-robot theater has important meanings both for robotics and theater. In order to create interactive robots that can function in our daily lives, creators need to have knowledge of humanlike, natural, robot behaviors common to everyday situations. Researchers such as psychologists do not have the knowledge that can be applied to these complicated everyday occurrences. However, theater directors who can create realistic theaters do have these skills. Robot creators need to learn about natural robot behaviors from natural behavior itself in complicated environments.

Hiroshi Ishiguro, robot creator and distinguished professor at Osaka University and Oriza Hirata, representative of Seinendan Theater Company and a professor of Osaka University, have been collaborating for more than six years on various levels. Ishiguro is learning everyday, humanlike behavior from Professor Hirata by developing robots based on this knowledge and subsequently submitting patents on the developed robots. At the same time, Hirata is creating new theaters with the robots and androids. Human-robot theater has broken down the stereotypes of traditional theater in the sense that it should be played by humans. It has also been recognized

as a top-level artistic production.

Human-robot theater created at Osaka University is a typical example of the fusion of the arts and sciences; the following three theaters have been created by Ishiguro and Hirata. Ishiguro is the technical advisor and creator of the robot called Robovie and the android named Geminoid; Hirata, the script writer and director of the theaters.

### I, Worker (Hataraku-watashi in Japanese)

This is the first full-scale human-robot theater production featuring two robots co-developed by Ishiguro and Hirata at Osaka University. Set in the near future at a time when it is natural for robots and humans to co-exist, 'I, Worker' depicts a young couple, the Mayamas, who live with two robots named Takeo and Momoko. While Momoko plays an essential role in the family through her work, Takeo suffers from mental illness and loses his motivation to work. By definition, robots are made to work but by portraying a robot that cannot, the play invites the question, "What does work mean to humans?" This piece lasts only 30 minutes but its premiere was met with great excitement and powerful emotion by the audience.



▲ I, Worker by Robovie developed by Ishiguro in ATR

### In the Heart of a Forest (Mori-no-oku in Japanese)

Ishiguro and Hirata, two internationally acclaimed talents, have teamed up to develop the Human-Robot Theater Project to be performed at theaters and this production marks its world premiere.

### The story is set in a bonobos research institute.

Bonobos is a great ape only found in the Republic of the Congo in Central Africa. At the institution, robots

and humans are studying differences between apes and humans. Their conversations reveal fine lines between apes, humans and robots.

Robots and humans behave quite naturally, have dialogues and relate to one another on stage. 'In the Heart of a Forest' is an unprecedented theatrical endeavor that gives audiences a glimpse of how robots and humans can co-exist in the near future. Audiences will not only be impressed, but moved by the robots. It is an innovative collaboration where the entire production becomes a cutting-edge experiment that crosses 'theater' and



▲ In the Heart of a Forest by WAKAMARU - an interactive robot developed by Mitsubishi Heavy Industries Co., Ltd.



▲ Good-Bye by Geminoid F developed by Ishiguro in Osaka University

'science' – the process of its creation and performance can be directly fed back into the field of robot research.

### Good-Bye (Sayonara in Japanese)

After their human-robot theater production of 'In the Heart of a Forest' created a sensation in various fields, Ishiguro and Hirata presented the world premiere of their new piece 'Good-Bye' as part of Aichi Triennale 2010.

This innovative short play is played by a Geminoid F, a humanoid robot developed by Ishiguro in 2010 that

looks exactly like the actress after whom it was modeled. Examining the question, "What does life and death mean to humans and robots?" this piece will alter the audience's images of robots and humans, and present a compelling fusion of theater arts and science.

# Exploring New Fields of Science with Power Laser and Plasma Technologies

## Ryosuke KODAMA

Director Professor, Graduate School of Engineering and Photon Pioneers Center

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### Introduction

High power laser technologies are now opening up a variety of attractive fields in the sciences and technologies that deal with high-density plasma. A high power laser can create many states of matter, such as solid states under pressures levels of more than 1 Tera Pascal (TPa), and high-temperature dense plasma states, in which the motion of electrons is close to the speed of light. The science of such extreme states is called **High Energy Density Science (HEDS)**, and has the potential of a wide range of applications, such as the development of extremely compact accelerators and radiation sources; material processing under extreme conditions; and nuclear technologies, including medical applications and laser fusion.

### Creating Novel Matters and Materials Under Extreme Conditions: The HERMES Project

One of the most interesting topics in the HED sciences is the creation of extreme states of matter with pressure levels of more than 10GPa, which can be easily attained via a strong shockwave generated by commercial product power lasers. Such strong shockwaves are now utilized in laser peening, a process through which the life time and strength of materials is improved. Utilizing this strong shockwave, high power lasers can easily generate pressures of more than 1TPa. The pressure above 0.1TPa is the energy density corresponding to the material's chemical bonding energy, and this added pressure effects an expectation of dramatic change in chemical reactions. At pressures of more than 1TPa, most materials melt in the shock wave. However, if the temperature is less than about 10000K, or lower than the melting point at pressures of more than 1TPa, novel solid state matter must be created through pressured phase transition. Carbon is one of the most interesting materials at pressures of more than 1TPa and temperatures lower than the melting point. Under such conditions the diamond structure of carbon changes to BC8, and becomes cubic at more than 3TPa. The band gap

disappears in cubic structure carbon, and semiconductor diamonds become metallic. On the other hand, BC8 carbon will still be a semiconductor and harder than the conventional diamond, and is therefore called **Super-diamond**. We have now succeeded in generating states in which the Super-diamond can be attained, and we are investigating the details of this new material. Many kinds of materials with novel structures exist at pressures above the TPa level –materials which have never existed before on the earth but could exist in the core of the **Super-earth**. We are now exploring this new field of research, called **Tera-Pascal Science**. To this end, we now have a new x-ray free electron laser, in addition to our original high power laser. We have started a new project in HEDS that utilizes the XFEL (SACLA) and other high power lasers in Japan. This is called the **HERMES (High Energy density Revolution of Matter in Extreme States)** project.

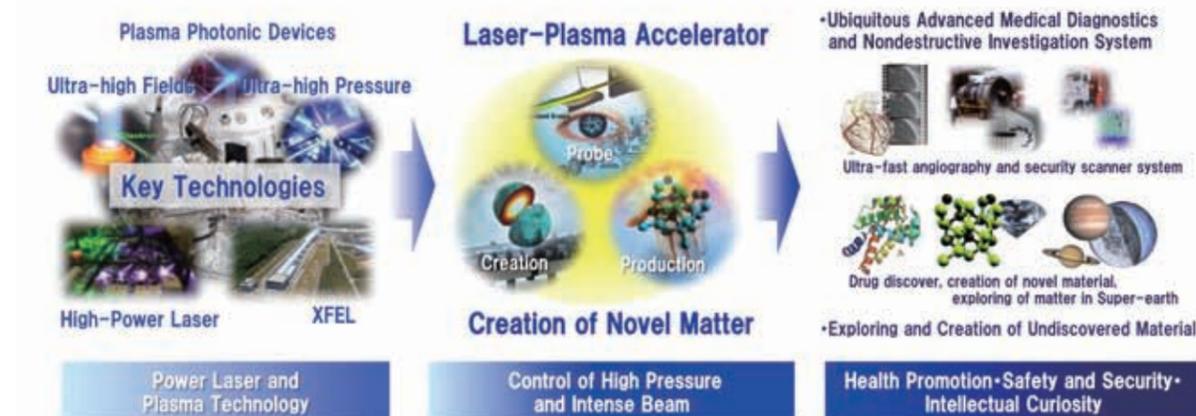
### The Laser Plasma Accelerator and Prometheus's Light (Ultimate Radiation Source)

Ultra-intense lasers can create large electric fields in plasma waves traveling near the speed of light. Particles trapped in this wave will, like a surfer, be accelerated to high energy states within the range of an extremely short distance. In order to realize this **laser-plasma acceleration**, plasma photonic devices for the effective control of plasma waves and light propagation are necessary. The pointing stability of the electron beam emitted by our plasma photonic device is now less than 0.5mrad, the best in the world. We are also developing a plasma device for the phase control and multi-stage acceleration of electrons. This technology will make possible compact mobile accelerators at the GeV ( $10^9$  eV) scale for use in security scanners, university-scale X-ray light sources, and the XFEL (for use in biological and materials research as well as ubiquitous advanced medical imaging devices); and will realize an ultimate source of radiation, which could be called as **Prometheus's Light**.

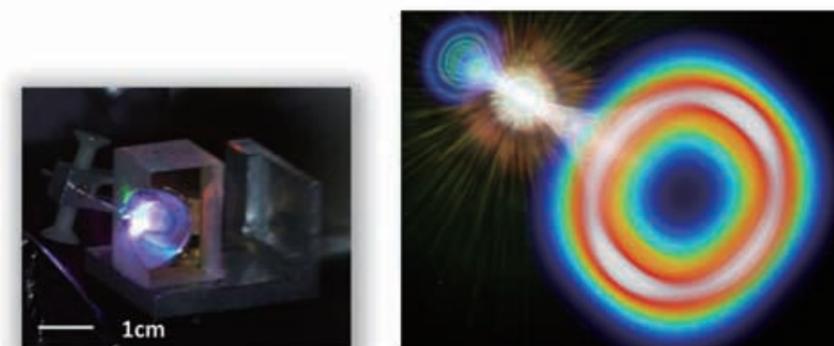
### Plasma Photonic Device for Opening Pandora's Box (Vacuum)

The combination of plasma photonic devices and high power lasers will also open up a new field of scientific research: quantum vacuum optics. One of the topics in quantum vacuum optics is the investigation of light scattering in vacuums as a nonlinear process. This is related to the quantum fluctuations in vacuum that took place at the beginning of the Universe. According to the uncertainty principle, vacuums possess quantum fluctuations, and photons can interact with vacuum. Classical analogies between quantum fluctuation and

special relativity may allow us to imagine virtual particles existing in vacuum for a short time. Intense laser light could interact with the virtual particles, resulting in nonlinear optics in vacuum. We have developed a **spheroid plasma mirror** as a fast focusing optics technology for high power lasers, with which we will be able to open the vacuum, or in other words, **Pandora's Box**. Taking account of the interaction between intense light and vacuum, this fast optics reduces the required laser power by 10 orders of magnitude, making possible the study of laser/vacuum interaction at the realistic laser power of below 10PW.



▲ Fig.1 Innovation with high power laser and dense plasma technologies



▲ Fig. 2 Simulation image of scattered light from vacuum interacted with intense light (right). Plasma spheroid mirror to realize fast focusing of ultra-intense laser light for nonlinear optics in vacuum.(right)

# Behavioral Economics

## Shinsuke IKEDA

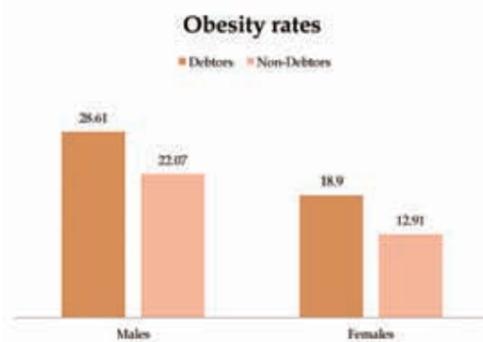
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### Understanding Self-Destructive Behavior

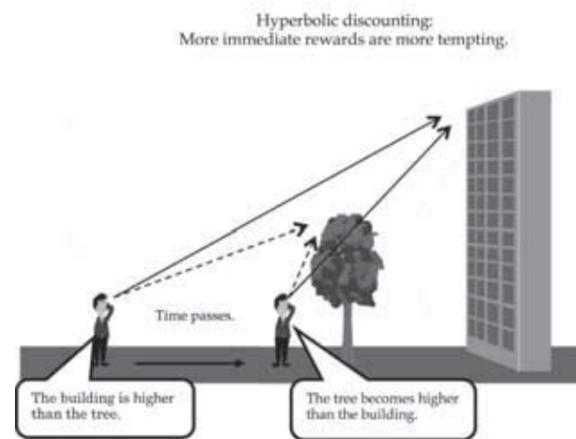
Many pathological problems that are prevalent in modern society, such as undersaving, overborrowing, credit-card bankruptcy, and lifestyle-related diseases (obesity, smoking, drug abuse, and gambling addiction), are all closely related to our own 'self-destructive choices', i.e. decisions or choices that we make that result in harm to ourselves. The main interest of my recent research is to elucidate the mechanism underlying various self-destructive decisions and the prescriptions to cope with those mechanisms from a unified viewpoint.

Such a unified approach is reasonable when one finds that there are often strong associations between different types of self-destructive behavior. Based on a nationwide internet survey in 2010, the first figure shows a typical example of the association between obesity and indebtedness. In both the male and female samples, the debtor group exhibited a higher obesity rate than the non-debtor group, and this difference is too large to



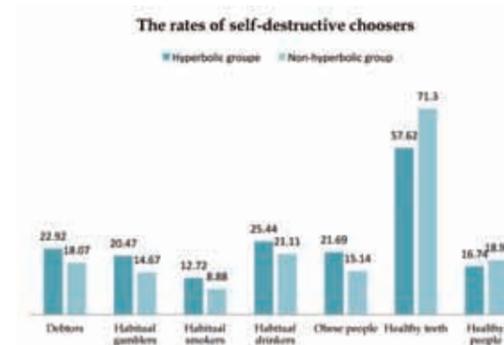
attribute solely to statistical errors. The association of the seemingly unrelated self-destructive choices implies that a latent common mechanism underlies the choices.

By conducting questionnaire survey and economic experiments, the joint research team and I have noted that people make self-destructive choices because they are



less patient when making decisions related to immediate rewards than those rewards in the distant future. This present-biased preference is called *hyperbolic discounting*. As depicted in the illustration, under hyperbolic discounting, the more immediate (temporally closer) the reward is, the more tempting it is. The most serious consequence of hyperbolic discounting on behavior is that it makes it difficult for people to carry out plans or decisions that were previously made with long-term benefits in mind. The reason is that as time passes, our degree of patience while we wait for future gratification lessens, so that previous plans or decisions that were made with long-term goals in mind become non-optimal at the moment they are performed. This leads to self-destructive behavior. The second figure shows that hyperbolic discounters are indeed more likely to exhibit self-destructive tendencies than non-hyperbolic discounters.

These findings were summarized in a book written in Japanese, entitled *Self-Destructive Choices*, which was awarded the 55<sup>th</sup> Nikkei-Economics Book Culture Award in 2012. It was translated into the Korean language in 2013, and an English translation is soon to be published.



### Toward New Economics of Willpower

Under hyperbolic discounting, there are different 'selves' at different points in time. Because each one of these selves tends to be most interested in its own immediate profit, a conflict of interest takes place. If the selves' behavior is not organized, each of them will pursue its own immediate preferential gratification. In other words, hyperbolic discounting conceives the self-control problem as a conflict between a long-term and a short-term self. Both of these selves reside inside a person: a long-term self (angel) who considers the person's long-term benefits, and a short-term self (devil) who considers the short-term benefits. The angel makes a wonderful long-term action plan with unwavering patience, but it is the devil that carries out plans on a daily basis. With low patience, the devil breaks the future-oriented, long-term plan that the angel has made, and thereby the individual falls into the intemperance and self-indulgence of pursuing his or her own short-term benefits.

Efficient economic behavior in favor of long-term well-being, especially consumption and/or saving behavior, thus needs self-control. Self-control in turn needs willpower. However, willpower is depletable: controlling tempting choices for immediate rewards depletes willpower. To incorporate this dynamic interaction of willpower and

self-control into the consideration of consumer behavior would help us understand saving behavior, intertemporal allocation of the self-control effort, and the formation of patience.

I am attempting to develop a new economic theory by focusing on the critical role of depletable willpower in dynamic consumer behavior. In the presidential address of the Association of Behavioral Economics and Finance in 2012, I showed several results that bridged the gap between economic theory and experimental insights in psychology. First, less wealthy people in the long run tend to spend less self-controlled lives and consume more tempting goods (e.g. junk food). Secondly, when needs for external self-controlled tasks increase due to unhappy events in family life and work place, etc. or when outside temptation increases due to the influence of fashion, commercial films and so on, people's self-control with regard to the consumption of tempting goods is weakened. Thirdly, people who are unaware of the critical role of willpower in the long run tend to consume more tempting goods than people who are aware of its role.



# Regenerative cell sheet technology to repair the heart ~ It's a whole new ball game ~

## Yoshiki SAWA

Professor, Graduate School of Medicine

[www.med.osaka-u.ac.jp/index-e.html](http://www.med.osaka-u.ac.jp/index-e.html)

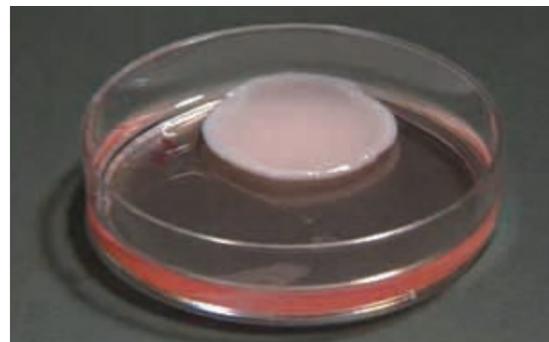
Our department, the Department of Cardiovascular Surgery Osaka University Graduate School of Medicine, is the First Department of Surgery, Osaka University Medical School, which is one of the leading groups of cardiovascular surgery in Japan. It was initiated by Prof. Herter from Germany in 1922. We actively developed the field of cardiovascular surgery as a front runner. In 1943 we initiated cardiovascular surgery and first case of open heart surgery supported by cardiopulmonary bypass in Japan was succeeded by our department in 1956. Until now, we have experienced more than 10000 cases of cardiovascular surgery. In 1999 we succeeded heart transplantation, and heart and lung transplantation in 2009. In this way, we have challenged to establish the field of heart failure surgery, such as 50 cases of heart transplantations and 200 cases of left ventricular assist devices. However, these treatments have still problems such as donor shortage, chronic rejection, lethal infection and coronary artery disease or several complications. Therefore, we performed extensive research to overcome these clinical issues.

We recognized the importance of regeneration medicine to establish the treatment system earlier, and worked on the research on myocardial regeneration treatment, making excellent use of molecular cell biology and gene transfer technique in expectation for regeneration medicine together with development of stem cell-related research (Circulation 1995, Gene Therapy 1998, J Clin Invest 1997, Circulation 1997, J Thorac Cardiovasc Surg 2005, Surgery Today 2011).

Transplantation of autologous stem cells has been shown to yield functional recovery of the failing heart *via* 'paracrine effects' that enhance the native regenerative process. However, almost all of the reported therapeutic effects are clinically modest. We developed myocardial regeneration therapy using cell sheet technology in the cooperative research with professor Okano of Tokyo Women's Medical University. We have developed the skeletal myoblast sheets without scaffold attached on the epicardial surface to

enhance the native regenerative process. This development suggests a possibility of regeneration medicine for severe cardiac failure. Based upon the 'proof-of-concept' studies, in 2007, we succeeded the first-in-man clinical trial of myocardial regeneration treatment by the myocardial sheet using the autologous myoblast, which is the world's first full-fledged myocardial regeneration medicine (Surgery Today 2012). Then, phase I Clinical Trial was launched to prove that autologous skeletal muscle derived stem cell sheets transplantation may be feasible, safe and effective for treating severe congestive heart failure.

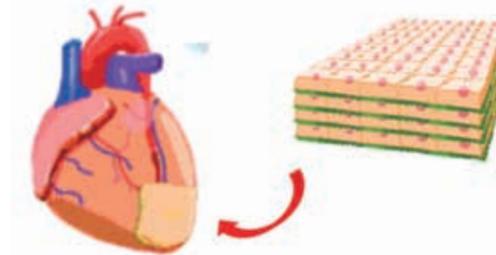
To date, we have carried out transplants in 30 severe cardiac failure patients and demonstrated that this treatment method improves the cardiac function and symptoms of severe cardiac failure patients safely and prolongs their survival including the world's first two patients released back into society without LVAD. As shown above, the candidate's global contribution enabling establishment of this treatment method which can improve the cardiac function using the autologous cells in severe cardiac failure patients cannot be overestimated. Since last year, the trial has started in Terumo Co., Ltd. after transferring the technique, enabling the development to the



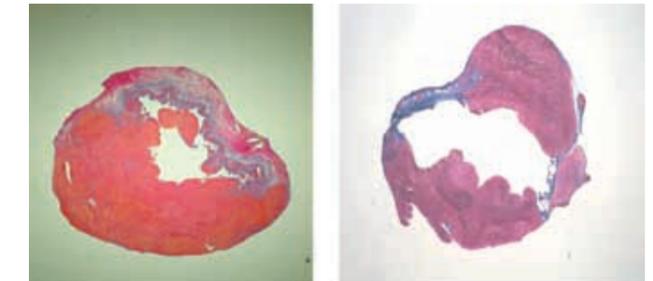
Cardiac tissue by cell sheet technology



Culture of Skeletal myoblasts and preparation of Myoblast Sheets



Implantation of myoblast sheets on the failing heart



Myoblast sheet group(left) showed recovery of thickness of wall and attenuation of cardiac remodeling with improvement of cardiac function as compared to direct injection group(right)

universal treatment method.

Furthermore, since 2008, we have performed cooperative research with professor Shinya Yamanaka on clinical application of pulsative myocardial cell sheet derived from iPS cells, clarified the effectiveness of myocardial cell sheet derived from human iPS cells in large animals, and demonstrated proof of concept (POC) (Circulation 2012). Currently his laboratory is one of four regeneration medicine bases of Ministry of Education, Culture, Sports, Science and Technology, and is challenging practical application of more effective full-fledged myocardial regeneration medicine by myocardial cells derived from iPS cells in these years, receiving aid for ten years.

From the standpoint of the leader of the academic society, we also contributed to re-regulations in Japan, establishment of regulatory science, and more recently preparation for the revised pharmaceutical affairs law to promote regeneration medicine. We have also contributed to the launch of Medical Center for Translational Research in Osaka University up to the current formation of the base in 2002, and exerted for integrated field education, business-academia collaboration, and medicine-technology collaboration.

Our achievement is highly evaluated both domestically and internationally as the useful technique with extremely high novelty and originality, and is expected to save the lives of many severe heart failure patients all over the world. On the other hand, we also put his heart into cultivation of human resources, increased the number of surgery to over 800 cases yearly, the highest in the national university, due to the predominant management of his section and

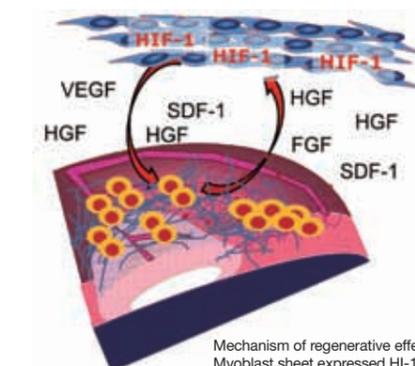


The first-in-man clinical trial of myocardial regeneration treatment

excellent surgical results, and there are many people who want to enter his department with high popularity. As shown above, we place the importance on 'the attitude to pursue what is the truth', promoted the medical research from the novel viewpoint without being entangled by the existing concept, made excellent use of molecular biology, genetics, stem cell science, and system engineering for establishment of surgical treatment system for severe cardiac failure, obtained breakthrough achievements, and greatly contributed to the promotion of medical research in our country.



Report of Success of First in man in the News Paper 15,December,2007 THE SANKEI SHIMBUN, Morning Edition



Mechanism of regenerative effect of myoblast sheet. Myoblast sheet expressed HI-1, induced HGF,VEGF, FGF and SDF-1, resulting in angiogenesis, stem cell migration, decrease of fibrosis and attenuation of cardiac remodeling.

# CiNet (Center for Information and Neural Networks)

## Takahisa TAGUCHI

Guest Professor, Graduate School of Frontier Biosciences

[cinet.jp/english/](http://cinet.jp/english/)

### CiNet Mission: From Data Communication to Brain Communication

The development of ICT (information and communications technology) has led to fast and massive data communications networks, resulting in an unprecedented impact on our lives. However, each year the volume and speed in which data is processed has increased by over 50%, which risks compromising information transmission due to network congestion, unstable connection, and excessive energy use. Furthermore, users can be overwhelmed by abundant information. Therefore, constant research is needed to sustain these over-growing demands.

One example of research focuses on organic information processing network systems like those inside the brain and biological cells. These networks function with an adaptability, autonomy, and low-energy consumption that is not seen in present ICT. As such, these systems may make a new paradigm not only for the next generation of ICT, but also for future society.

### CiNet as a center for pure and applied research on human brain function

To carry out the mission, in 2009, Osaka University and the National Institute of Information and Communications Technology (NICT) came to an agreement on a large-scale collaboration on the study of brain function and applying these results to new ICT and networks. The Advanced Telecommunications Research Institute International (ATR) has also joined to make this an even more potent partnership.

To resolve the ICT problems, the director general of CiNet, Toshio Yanagida, says "We are considering alternative strategies. The brain, for example, is always transmitting and processing new and increasing levels of information without concurrent increases in its energy demands. Research in this area, then, may offer unique and profound solutions to the continuous problem of processing more information. Our vision is to bring ICT scientists together with people from

neurosciences, psychology, philosophy, economy, and the cognitive sciences to develop brain-based applications to ICT".

### CiNet as an advanced research center

In 2013, the main building of CiNet was completed on Suita campus at Osaka University, in which about 150 researchers and students are working on a daily basis. In addition, CiNet has more than 100 of collaborative researchers from various fields in Osaka Univ., NICT and ATR. Having advanced research instruments including MRI (11.7T, 7T, 3T, 1.5T) and MEG (360ch, 110ch) which are exclusively used for basic brain function research, CiNet is now seemed to be a national research center for top-down approach in human brain science.

### CiNet Research in four major fields

To obtain outstanding outcomes, research in the following four fields is carried out.

#### 1) Understanding and applying how the brain identifies the 'heart' of a message

- applying the mechanisms for how the brain processed information to better communications
- social action in terms of brain information science
- how the human vision system works
- neural representation and information networks underlying perception
- understanding the brain's communication network
- how the brain conducts working memory and cognition
- brain function mechanisms of multisensory cognition for creating high-quality communication

#### 2) Building a low energy information and communications network based on human brain function

- energy-efficient and robust information network control based on neural and biological functions
- simple, energy-efficient network control using

- fluctuation
- modern ICT system design based on the brain
- robust information network control based on brain dynamics
- robot control based on biological fluctuation
- human interfaces utilizing brain functions

#### 3) Developing brain-machine interfaces (BMI) for human care and advanced communications

- the mechanisms for cognition and motor control and applying them to BMI
- using BMI to enhance brain function and environmental adaptability
- supporting handicapped people with advanced ICT-motor BMI
- next-generation artificial retina-sensory BMI
- computational neuroscience of human pain and aversive learning
- fundamental BMI technologies for brain science and clinical application

#### 4) Brain function measuring technologies

- a magnetic resonance method to probe the brain
- intra-cerebral neurotransmission networks: analyses with PET and MRI
- brain network dynamics by integrating multiple information sources
- brain function measuring techniques in high field MRI

To spread our outcomes, CiNet symposia has already been held three times, and the first CiNet conference on pain neuroscience was held in Dec. 2014 to make a novel international network of researchers. In CiNet, all information is bilingually distributed in English and Japanese. CiNet welcome all persons who are interested in our activities. (<http://cinet.jp>)



▲ Fig.3 7T-MRI (Magnetic Resonance Imaging instrument)



▲ Fig.5 Discussion at CiNet General Conference in 2014

### CiNet as a center for 'omoroï' research

Under the initiative of director Yanagida, it is strongly recommended for all researchers to do the 'omoroï' research. 'Omoroï' is a Japanese dialect word in Osaka area, of which meaning is extremely amazing. To perform the task, CiNet members have a lot of chances to exchange interdisciplinary information in seminars, workshops, or tea time and to plan collaborative new trials. Based on our achievements, we have already started new collaborative projects with academic research institutes or industrial companies outside of CiNet.



▲ Fig.1 Director General, Dr. Toshio Yanagida



▲ Fig.2 Main building of CiNet



▲ Fig.4 CiNet members at General Conference in 2014

# Institute for Academic Initiatives (IAI)

## The Institute of Academic Initiatives cultivates the capacity to create the future

The Osaka University Institute for Academic Initiatives (IAI) was set up in order to promote, under the leadership of President Hirano, interdisciplinary crossboundary education and research. Each of Osaka University's schools conducts education and research in professional fields; however, modern society faces many challenges that require creative approaches, approaches that require scholarship from more than one field. Thus, the IAI was set up for the purpose of promoting such cross-border, medium- and long-term learning and research, strategies for a future viewed as a whole.

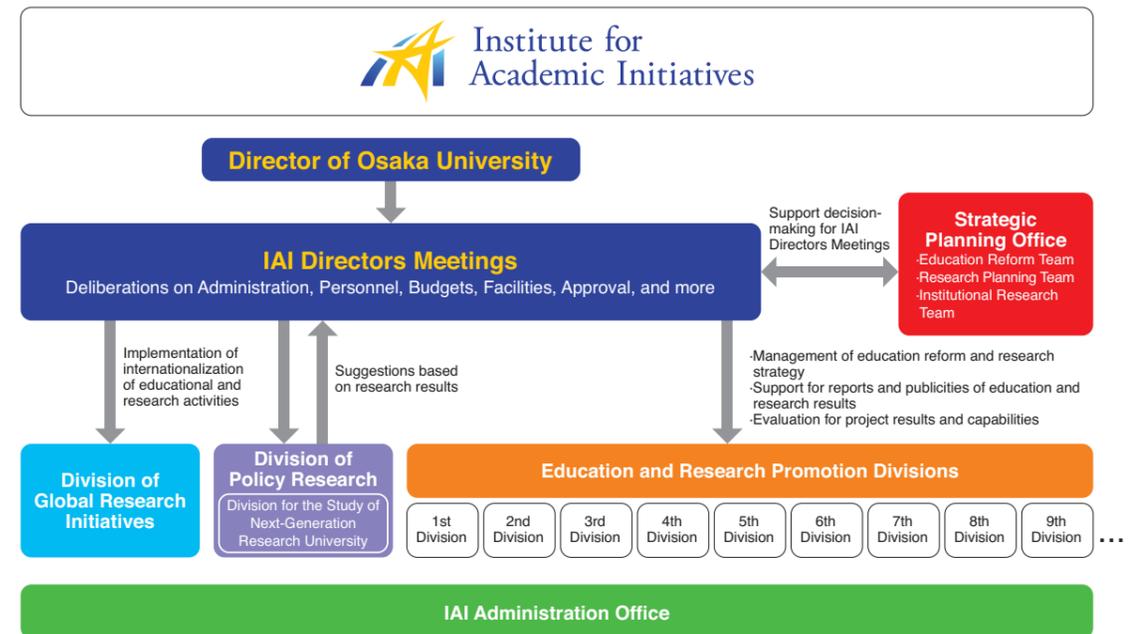
### Utilizing the entire University's expertise

Take full advantage of the entirety of the University's expertise, by balancing the combination of each departmental or institutional autonomy and competencies with cross-boundary education and research.

### Promoting cross-boundary education and research under the direct supervision of the University president

Develop cross-boundary education and research through trial-and-error approach under the direct supervision of the university executive office, including the president, and independent of individual departments and institutions.

## Role of Institute for Academic Initiatives (IAI)



2011 2016 2021 2026 2031 100th

### Strategize for the future

The Strategic Planning Office serves as a strategic headquarters of the university, formulating plans and making suggestions for educational reform, new research programs and globalization within the university.



### Cultivate global human resources and develop new areas of research

Divisions One to Five are cultivating global human resources focusing on creativity and a broad perspective, through the "Program for Leading Graduate Schools," supported by the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

Divisions Six to Nine are developing new research areas from varied and disparate fields, capitalizing on the diversity of a comprehensive research university.



### Design plans for university growth

The Division of Policy Research is carrying out policy research on science and technology as well as internationalization. The Division makes recommendations to the IAI Directors based on research results.



### Facilitate the acceptance of researchers from overseas

Division of Global Research Initiatives is preparing to accept researchers from overseas to promote the internationalization of education and research in the university. It also provides an opportunity for distinguished researchers from Japan and all over the world to gather and collaborate.

## Strategic Planning Office, Institute for Academic Initiatives (IAI)

The University has established a Strategic Planning Office for the Institute for Academic Initiatives (IAI). This planning division comprises three teams: the Education Reform Team, the Research Planning Team and the Institutional Research Team.

### The Strategic Planning Office has two primary functions:

- 1) To support the management of the IAI's education and research activities, and;
- 2) To devise and propose strategic globalization plans that will underpin educational reform and new research programs within the University, and to allow the development of recommendations for utilizing independent research administrators and external experts from industry and overseas.

### Education Reform Team:

The Education Reform Team brings together the educational resources of the University, develops and implements high-quality, cross-boundary education programs to nurture future leaders with extensive and diverse expertise who can solve various problems in modern society. Furthermore, the Team plans and develops interdisciplinary education programs and instructional methods for enhancing the quality of education to be more internationally recognized and promotes the cultivation of global human resources.

### Research Planning Team:

Based on domestic and overseas research trends, the Research Planning Team aims to develop cutting-edge research programs, promising researchers and new research fields. It also proposes future research strategies that incorporate the University's research activities. To achieve these aims, the Team researches and analyses international research support trends both inside and outside of the University. Based on these findings, the Team designs and proposes interdisciplinary research programs, and plans for the reporting and dissemination of research results. In addition, the Team supports the dissemination of the University's research results, including the findings of the education and research promotion departments.

### Institutional Research (IR) Team:

In supporting the Strategic Planning Office to design the University's educational reform and research strategies, the IR Team collects, analyses, evaluates and provides various data that contribute to the strategic management of the University.

From a technical standpoint, the Strategic Planning Office will comprehensively support and promote the educational and research activities and policies of IAI, utilizing the powerful combination of these three teams.

## Division of Global Research Initiatives

### Objectives

The "World Tekijuku" concept is the mission to become a world-class research institution and one of the top 10 universities in the world by 2031. In order to accomplish this, it is vital to develop barrier-free globalization and a fully prepared system to accept researchers from overseas.

Division of Global Research Initiatives has been established with the aim of comprehensively promoting the internationalization of research and education exchange activities that are to be supported by the university. The division will be a host department to accept overseas

researchers, and support their research and education activities in their affiliated department or institution.

### Activities

1. Comprehensively promote the internationalization of research and education exchange activities through cooperation with other departments and institutions.
2. Support the creation of an environment where distinguished human resources from Japan and all over the world to gather and collaborate.

## Division of Policy Research

### Division for the Study of Next-Generation Research University



### Mission

Today our society faces globalization progressively, and the research university is now expected to introduce the innovative research outcomes and to provide human resources to the globalized world. Division for the Study of Next-Generation Research University (NEX) has three objectives: 1) clarify visions of the research university such as "how it should be" and "what it wants to do" toward the 22nd century, 2) create a road map to achieve their visions, and 3) design scenarios to make more progress.

### Area of Research

1. Focus on research to advance the vision of how the research university should be in the 22nd century and develop the concepts representing it.
2. Design the scenarios based on research outcomes to achieve the vision and compose the concepts, and introduce them to all stakeholders around the research universities.

## Education and Research Promotion Divisions

### 1st Division:



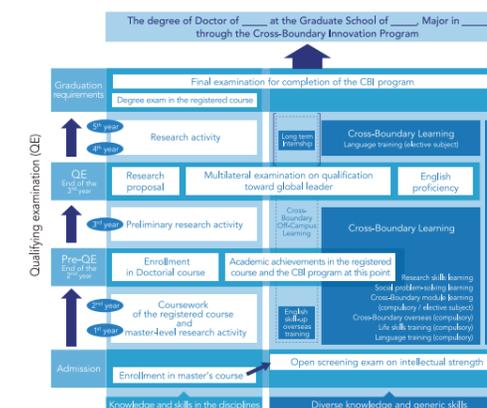
## Cross-Boundary Innovation Program

The Cross-Boundary Innovation (CBI) Program is a five-year transdisciplinary degree program. Its development has been supported by the Japanese government's Ministry of Education, Culture, Sports, Science and Technology as one of the first three programs in the "Programs for Leading Graduate Schools (All-Round Models)" since 2011. The program aims to cultivate individuals with the creative strategic skills and competencies needed to deal with diverse values and fields. **CBI graduates will be able to go beyond traditional frameworks: they will possess the power to generate what is "only possible by crossing boundaries".**

Today, global society faces a multitude of challenges in areas such as the environment, energy, poverty, ageing populations, discrimination, changes in the international economic system, and international law and order, to mention just a few. Many of these challenges need to be addressed from a global perspective and can only be solved by introducing concepts that span existing boundaries and promote collaboration among societies. Thus, a new generation of doctoral graduates capable of dealing with cross-boundary issues is required.

Crossing the boundaries of all courses, the CBI Program is open to graduate students enrolled in any graduate course at Osaka University. Enrolled students will complete the coursework of the program in addition to their professional education in their registered graduate schools, as can be seen in the figure below. The program offers innovative and unique courses, such as cross-boundary modules on diverse knowledge and generic skills, research skills, overseas training and internships, language training, and life-skills training.

For more information, please visit the website <http://www.cbi.osaka-u.ac.jp/en/>



### 2nd Division:



## The Interdisciplinary Program for Biomedical Sciences (IPBS)

The program is designed for students to acquire a comprehensive understanding of organisms required for high-quality interdisciplinary research, and to attain the communication skills essential for assuming leadership in the life science field. The IPBS is a 5-year interdisciplinary graduate program in biomedical sciences. International students admitted through recommendation will begin their enrollment from the second year and thereby, they will graduate from the program in 4 years (see the figure below). Students will receive a monthly stipend of approximately 200,000 yen (as of 2014) if eligibility requirements are met. A Ph.D. in Medical Science will be conferred upon students who successfully defend their doctoral dissertation.

The faculty body consists of acclaimed scientists from the Graduate Schools of Medicine, Pharmaceutical Sciences, Engineering, Frontier Biosciences, Science, and Dentistry at Osaka University, as well as of researchers from our affiliated major corporations.

The IPBS has devised courses that cross disciplinary boundaries in an effort to teach about the human diseases through perspectives inclusive of many biological systems. For example, the lecture series during the first year covers the latest topics in medical sciences (e.g., immunology, tissue engineering, neuroscience and pharmacology), structural biology, material science, chemical biology and imaging. Students will also study other topics such as drug toxicity, pharmaceutical administration and regulations, health economics, and intellectual property. Other devised courses consist of a hospital

visit, laboratory rotation of student choice, practicum in human anatomy and practicum in physiology.

We welcome about five non-Japanese students each academic year among the annual total of twenty new admissions. We have a friendly environment where all IPBS students meet biweekly to share their study topics; the students and staff also go on an overnight retreat every year. Each student will be assigned a junior faculty member as his or her mentor, with whom he or she may consult regarding any academic as well as non-academic concerns.

We look forward to hearing from you. Please address your inquiries about the program to:

Email: seitai@stn.osaka-u.ac.jp

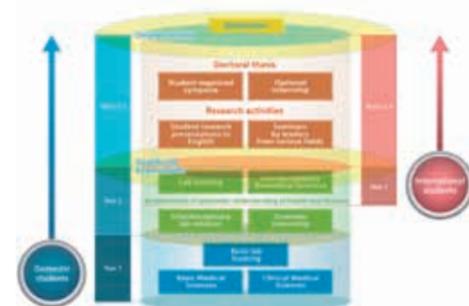
Phone: 06-6210-8230

Mailing: 2-2, Yamada-oka, Suita, Osaka 565-0871, Japan

The Interdisciplinary Program for Biomedical Sciences, Osaka University Administrative Office

Web: www.stn.osaka-u.ac.jp

Fig. The program curriculum (the curriculum for international students is depicted on the right-hand side).



### 3rd Division:



## Interactive Materials Science Cadet Program

This is a program launched as an integrated five-year doctoral course in materials science, and is promoted in an integrated manner by the Graduate schools of Engineering Science, Science, and Engineering, Osaka University. The program aims to educate **talented graduate students 'Materials Science Cadets'** who have the skills to obtain senior research positions in the materials science and production sectors, with the full support of faculty members of Osaka University from **a wide range of materials science fields including physics and chemistry**. The program is also designed to apply the concept of synergistic benefits of dialogic and interactive approaches to various facets of materials science education and research. In particular, the key concept of interactivity is applied to:

- (i) Materials - interactions and correlations within and between materials
- (ii) Research - interactive research approaches between different research fields and research methods
- (iii) Training - interactive learning by way of dialog between students and instructors, among instructors,

and between students, outside researchers and engineers.

The **multi-faceted curriculum** organically links together various interactive ideas and approaches together by combining a range of components including multiple instructor systems, laboratory rotation, liberal arts subjects, career guidance, private sector internships and overseas study opportunities. In this way, the curriculum is designed for the training of well-rounded Materials Science Cadets.

Fig. Conceptual diagram of Interactive Materials Science Cadet Program



### 4th Division:

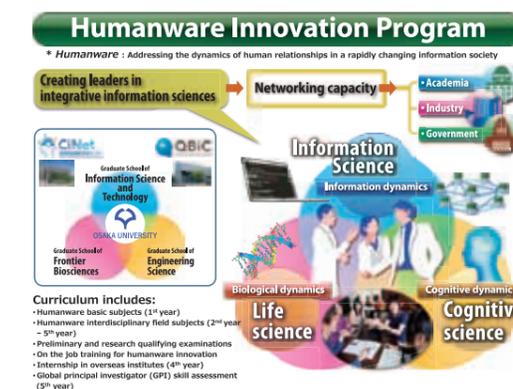


## Humanware Innovation Program

The "Humanware Innovation Program" is a doctoral program designed to spearhead the development of humanware through collaboration between the Graduate School of Information Science and Technology, the Graduate School of Frontier Biosciences, and the Graduate School of Engineering Science of Osaka University. The program aims to create leaders in integrative informatics who cultivate new arenas of research by bridging information science, life science, and cognitive/brain science. Successful graduates can change the direction of innovation and construct complex yet flexible, robust, and sustainable systems to support an ever-changing social environment. In order to achieve this aim, students develop an integrative understanding of "information dynamics," "cognitive dynamics," and "biological dynamics" together with the capacity to set their own agendas and challenges, and to organize and lead groups to address those challenges.

These curricular aims are put into practice under a principle known in Japanese as Seido Jukugi—students

from different disciplines work together to conduct intensive interdisciplinary studies. Students also undergo seminars by industry experts and learn practical issues including project planning, research and development strategies, and innovation in interdisciplinary fields. To cultivate skills of practical design, communication, and management from a global perspective, students are given research opportunities in international research institutes outside the university, including internships, summer camp, and research caravan. Graduates of this program are "networking doctors" who play a central role in industry, academia, and government with an integrated understanding of interdisciplinary areas.



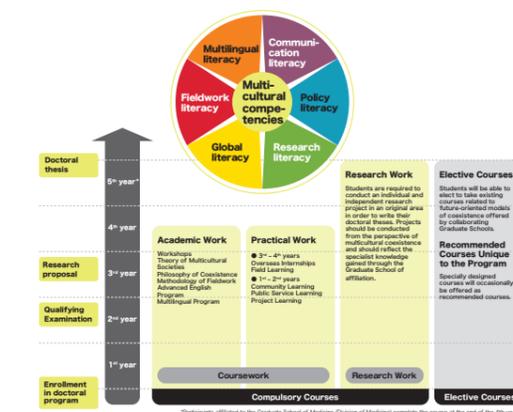
### 5th Division:



## Doctoral Program for Multicultural Innovation

This doctoral program is designed for students who strive to enhance their expertise within their relevant specialist fields, while simultaneously training to become multicultural innovators. A multicultural innovator is defined as a researcher or practitioner equipped with the knowledge, skills, principles, and ability to take the necessary actions to design and implement highly original and future-oriented models for the coexistence among people with diverse social and cultural backgrounds. These competencies will be rooted in a profound understanding of others. As it is primarily through a sense of respect for others that this program will achieve its goals of enhancing multicultural understanding and changing society for the better, we use the acronym "RESPECT" (Revitalizing and Enriching Society through Pluralism, Equity, and Cultural Transformation).

A range of rich learning experiences will be provided, including fieldwork and internship opportunities, which will encourage students to apply theory to practice, and then derive theory from practice. We place particular emphasis on exposure to field experience where the students can observe and engage with real world problems and from this create new knowledge collaboratively with diverse stakeholders.



During the five-years of the program students will develop multicultural competencies in the form of advanced-level literacy in six areas: global, multilingual, policy, research, fieldwork, and communication.

After graduation they will be well placed to take up positions as the leaders of social innovation in international organizations, global corporations, government, local authorities, universities, research institutes, and NGOs.

For more information, please visit the website <http://www.respect.osaka-u.ac.jp/en/>

6th Division:

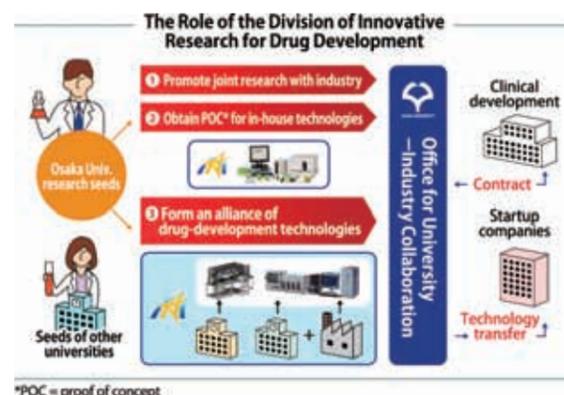
**Division of Innovative Research for Drug Development**

Osaka University promotes intensive research on drug development through diverse techniques, disease-related proteins, mechanisms of pathogens, and more. In order to recognize such efforts, agencies such as Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT), the Ministry of Health, Labour and Welfare (MHLW) and the Ministry of Economy, Trade and Industry (METI) select proposals from independent departments and cross-boundary organizations as major projects.

Based on Osaka University's research capabilities in this area and in order to promote research in life sciences, particularly in drug development, the Division of Innovative Research for Drug Development was set up in order to strengthen the development process itself through to clinical research.

The Division will become a base for innovative research into drug development by conducting research into the development of therapeutic agents for incurable diseases and new diagnostic drugs along with the gathering of information on diseases,

material and analysis technology, fundamental to research in drug development. This research will also be conducted in close collaboration with affiliated hospitals and institutes of biomedical innovation at Osaka University. Through such measures and strategy, Osaka University aims to become a world-leading research center for drug development, implementing comprehensive research from basic research through to clinical research.



7th Division:

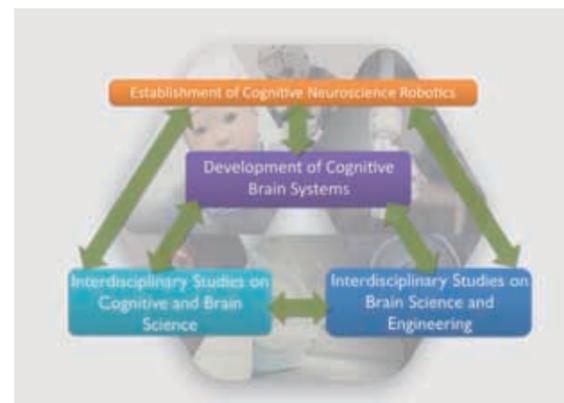
**Division of Cognitive Neuroscience Robotics**

The 7th Division of the Osaka University Institute for Academic Initiatives, Division of Cognitive Neuroscience Robotics, was founded in 2013 for further development of "Cognitive Neuroscience Robotics," a new interdisciplinary area in which cognitive science, neuroscience, and human-oriented robotics are integrated. The foundation of the division is based on the fact that activities of Osaka University Global COE "Center of Human-friendly Robotics based on Cognitive and Neuroscience" are highly evaluated. The mission of the division is to ensure the achievements of the Global COE and move Cognitive Neuroscience Robotics to the next step.

The Division of Cognitive Neuroscience Robotics consists of four interdisciplinary groups dedicated to the goals stated above.

1. The Group for Establishment of Cognitive Neuroscience Robotics encompasses all research activities in the center. Through scientific and philosophical consideration, it will establish the direction of the education and research and aim to systematize the new area of Cognitive Neuroscience Robotics.

2. The Group for Development of Cognitive Brain Systems will develop prototypes of future IRT systems that reduce the overload of the human brain that comes from the use of IRT systems.
3. The Group for Interdisciplinary Studies on Cognitive and Brain Science will aim to reveal meta-level brain functions (the "cognitive brain"), such as memory and reasoning, topics dealt with in traditional psychology.
4. The Group for Interdisciplinary Studies on Brain Science and Engineering will develop brain-machine interfaces that directly connect the human brain with IRT systems.



8th Division:

**Division of Photon Science and Technology**

Photon science and technology provide innovative approaches in broad range of the fields of basic science to industry and medicine. In recent years, there have been significant advances in the development of photonics such as nano-photonics, power photonics and plasma photonics and optics including x-ray and beam control and also in the understandings of the nature of light. Due to these advances, many new possibilities are emerging which will provide breakthroughs in various fields. Osaka University is among the most active on the photon science and technology including quantum beam technology in the world. More than 100 research laboratories or groups in the graduate schools and institutes concern the photon science and technology. Some of them are intensively developing world-class technologies on nano-photonics, power photonics, plasma photonics, x-ray optics and beam optics and some of them use the technologies for a variety of applications in the fields of high energy physics, space and astrophysics, quantum physics, solid state physics, plasma physics, geophysics, planetary physics, high pressured physics and chemistry, photo chemistry, catalyst chemistry,

quantum optics, high energy density science, material science, Information science and life science. Three institutes i.e. Institute of laser engineering, Photonics Center and Photon Pioneers Center focus especially on developing of power photonics, nano-photonics and plasma photonics in each institute and on expanding their applications to either academic innovation or industry innovation in the variety of fields as the leading laboratories in the world. Based on the advantages and potential of Osaka University on photon science and technology, the Division of Photon Science and Technology in the Institute for Academic Initiatives will promote further and higher progress of the research.

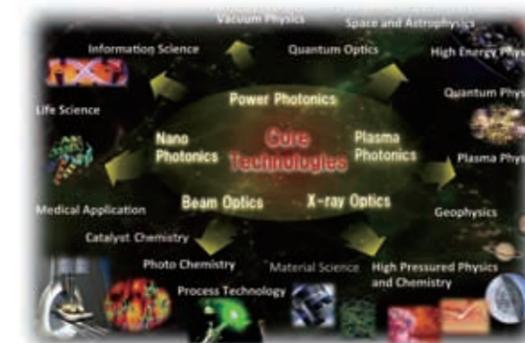


Fig. 1. State of the art technologies on photonics and optics in Osaka University impact on a broad area of the science and technology leading to academic and industry innovations.

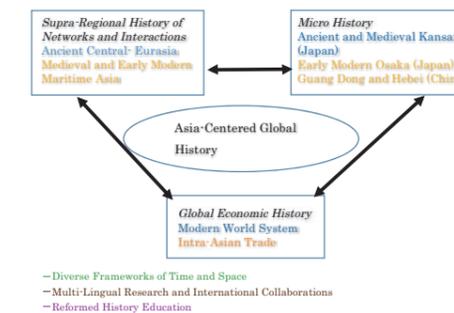
9th Division:

**Division of Global History**

The newly established 9th division aims to create 'Global History' from Asian perspectives, through interdisciplinary studies of history, international relations, economics, human sciences and cultural studies as well as area studies, on which Osaka University has inherited a rich tradition of Asian studies from the previous Osaka University of Foreign Studies. The division consists of three research groups: (a) the supra-regional history of networks and interactions in ancient central Eurasia and early modern maritime Asia; (b) micro history in medieval Kansai (Japan) and modern China; and (c) global economic history and the Modern World System. By combining these three groups, the division may cover a long range from ancient to contemporary times, and present a totally new interpretation of world history from Asian perspectives.

The division has already established close collaborating relationships not only with several Asian universities such as Ewha Womans University (Korea) and Jawaharlal Nehru University (India), but also with the Asian Association of World Historians (AAWH), an international organization for the promotion of global/world history studies in the Asia-Pacific region. From April 2015 we are also starting a three-year international joint

research program on global history with five prominent universities (Oxford, Leiden, Konstanz, Princeton and Kolkata), in order to form a wider research network for global history studies. In addition, we would like to make a strong contribution to society, by collaborating with senior high-school teachers and journalists for the reform of world history education in Japan and Asia through the publication of new text books.



# 'Osaka University Distinguished Professor'

To further promote academic initiatives aimed at making Osaka University an internationally competitive center of education and research, the university has created an official title 'Osaka University Distinguished Professor' in order to recognize individuals who play leading roles at the University coupled with outstanding achievement.

The selection committee, which includes outside members, examines the achievements of individuals recommended by educational research and education organizations and by Osaka University vice-presidents. The committee has granted the title of Osaka University Distinguished Professor to the 13 recipients noted below.

In addition to the title of Osaka University Distinguished Professor, a Distinguished Professor Allowance is granted to each recipient to help support their activities. The

title and allowance are valid for a maximum of 3 years.

This program aims to invite distinguished researchers from around the world by guaranteeing better employment conditions. We welcome any future Osaka University Distinguished Professors who conduct research on a world-class level.

### Osaka University Distinguished Professor eligibility requirements:

1. Individuals who have achieved outstanding recognition such as receiving one of these prizes: Order of Culture, Person of Cultural Merit, Japan Academy Prize, Japan Prize, Medal with Purple Ribbon, Kyoto Prize, and/or international prizes equivalent to the above.
2. Individuals who achieved some other type of outstanding achievement equivalent to the above.

## Osaka University Distinguished Professors

### New Recipient

	<p><b>YOSHIMORI Tamotsu</b> Term: July 1, 2014 – June 30, 2017                  Professor, Graduate School of Frontier Biosciences                  Achievement: Outstanding research in cell biology, especially autophagy field                  Awards: 8 awards including The Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology (2013)  <a href="http://www.fbs.osaka-u.ac.jp/labs/yoshimori/jp/">http://www.fbs.osaka-u.ac.jp/labs/yoshimori/jp/</a></p>
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President Hirano with Professor Yoshimori at a ceremony on July 1, 2014

### Previous Recipients

	<p><b>AKIRA Shizuo</b> Term: July 1, 2013 – June 30, 2016                  Professor, Immunology Frontier Research Center                  Achievement: Outstanding research in natural immunity                  Awards: 24 awards including Gairdner International Award(2011), Person of Cultural Merit(2009),Imperial Award and Japan Academy Prize(2007), Medal with Purple Ribbon(2005)  <a href="http://www.ifrec.osaka-u.ac.jp/index-e.php">http://www.ifrec.osaka-u.ac.jp/index-e.php</a></p>
	<p><b>ISHIGURO Hiroshi</b> Term: July 1, 2013 - June 30, 2016                  Professor, Graduate School of Engineering Science                  Achievement: Outstanding research in robotics and robot-human interaction                  Awards: 44 awards including Osaka Culture Award(2011)  <a href="http://eng.irl.sys.es.osaka-u.ac.jp/">http://eng.irl.sys.es.osaka-u.ac.jp/</a></p>
	<p><b>OHTAKE Fumio</b> Term: July 1, 2013 – August 25, 2013                  Professor, Institute of Social and Economic Research                  Achievement: Outstanding research in labor economics and public economics                  Awards: 11 awards including Japan Academy Prize (2008)  <a href="http://www.iser.osaka-u.ac.jp/index-e.html">http://www.iser.osaka-u.ac.jp/index-e.html</a></p>
	<p><b>KAWATA Satoshi</b> Term: July 1, 2013 - June 30, 2016                  Professor, Graduate School of Engineering                  Achievement: Outstanding research in nanophotonics                  Awards: 15 awards including Medal with Purple Ribbon(2007)  <a href="http://www.skawata.com/english">http://www.skawata.com/english</a></p>
	<p><b>KITAOKA Yoshio</b> Term: July 1, 2013 - June 30, 2016                  Professor, Graduate School of Engineering Science                  Achievement: Outstanding research in condensed matter physics                  Awards: 4 awards including Medal with Purple Ribbon(2012)  <a href="http://www.kitaokalab.mp.es.osaka-u.ac.jp/en/index.html">http://www.kitaokalab.mp.es.osaka-u.ac.jp/en/index.html</a></p>
	<p><b>SAKAGUCHI Shimon</b> Term: July 1, 2013 – March 31, 2016                  Professor, Immunology Frontier Research Center                  Achievement: Outstanding research in regulation of immune response by regulatory T cells                  Awards: 5 awards including Japan Academy Prize(2012)  <a href="http://www.ifrec.osaka-u.ac.jp/index-e.php">http://www.ifrec.osaka-u.ac.jp/index-e.php</a></p>
	<p><b>NAMBA Keiichi</b> Term: July 1, 2013 - June 30, 2016                  Professor, Graduate School of Frontier Biosciences                  Achievement: Outstanding research in structural and functional analyses of biological macromolecular nanomachines                  Awards: 8 awards including Imperial Award and Japan Academy Prize(2012)  <a href="http://www.fbs.osaka-u.ac.jp/eng/general/lab/02/">http://www.fbs.osaka-u.ac.jp/eng/general/lab/02/</a></p>
	<p><b>NISHIO Shojiro</b> Term: July 1, 2013 - June 30, 2016                  Professor, Graduate School of Information Science and Technology                  Achievement: Outstanding research in information science                  Awards: 56 awards including Medal with Purple Ribbon(2011)  <a href="http://www-nishio.ist.osaka-u.ac.jp/index-e.html">http://www-nishio.ist.osaka-u.ac.jp/index-e.html</a></p>
	<p><b>HAMADA Hiroshi</b> Term: April 1, 2014 – March 31, 2016                  Professor, Graduate School of Frontier Biosciences                  Achievement: Outstanding research in developmental biology                  Awards: Osaka Science Prize (2000), Nissan Science Prize (2003), The Naito Foundation Merit Award for Advancement of Science (2012)  <a href="http://www.fbs.osaka-u.ac.jp/labs/hamada/">http://www.fbs.osaka-u.ac.jp/labs/hamada/</a></p>
	<p><b>HARADA Akira</b> Term: July 1, 2013 – March 31, 2015                  Professor, Graduate School of Science                  Achievement: Outstanding research in polymer chemistry                  Awards: 9 awards including Medal with Purple Ribbon(2006)  <a href="http://www.chem.sci.osaka-u.ac.jp/lab/harada/eng/index.html">http://www.chem.sci.osaka-u.ac.jp/lab/harada/eng/index.html</a></p>
	<p><b>FUKUZUMI Shun-ichi</b> Term: July 1, 2013 – March 31, 2015                  Professor, Graduate School of Engineering                  Achievement: Outstanding research in functional materials chemistry                  Awards: 7 awards including Medal with Purple Ribbon(2011)  <a href="http://www-etchem.mls.eng.osaka-u.ac.jp/">http://www-etchem.mls.eng.osaka-u.ac.jp/</a></p>
	<p><b>MIURA Masahiro</b> Term: April 1, 2014 – March 31, 2017                  Professor, Graduate School of Engineering                  Achievement: Outstanding research in synthetic organic chemistry                  Awards: 5 awards including Thomson Reuters Research Front Award(2012), The CSJ Award for Creative Work(2013)  <a href="http://www.chem.eng.osaka-u.ac.jp/~miura-lab/index-Eng.htm">http://www.chem.eng.osaka-u.ac.jp/~miura-lab/index-Eng.htm</a></p>

# Osaka University and Yukawa Hideki, Japan's First Nobel Laureate

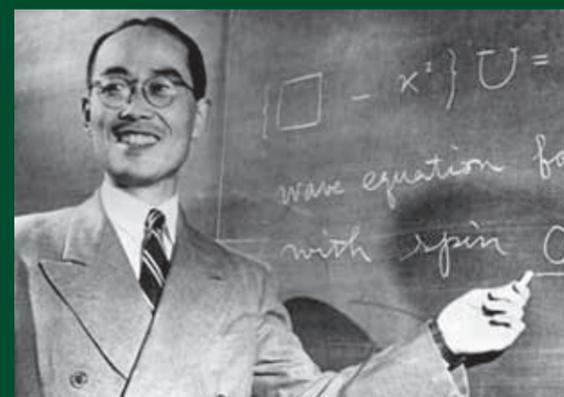


Hideki Yukawa, the first Japanese recipient of the Nobel Prize, worked as an associate professor at the School of Science in the early days of Osaka Imperial University, from 1933 to 1939.

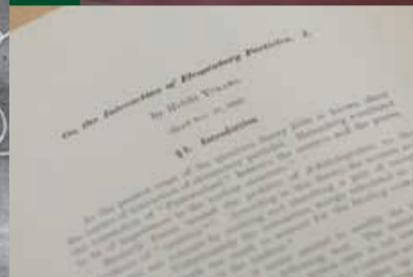
It was during this period that he conducted research and predicted the existence of mesons in a paper that eventually led to his receipt of the Nobel Prize in 1949.

1935	He published a paper in which he predicted the existence of mesons; this was a major influence on elementary particles research.
1938	Yukawa received a PhD degree from Osaka University, submitting a dissertation titled "On the Interaction of Elementary Particles." For this contribution, he received the Nobel Prize later.
1947	Cecil Frank Powell, Giuseppe Occhialini, and César Lattes discovered Yukawa's predicted $\pi$ -meson.
1949	Yukawa moved to Columbia University as a visiting professor and received the Nobel Prize in Physics.
2014	The blackboard that Yukawa regularly used in his lab at Columbia University was given to Osaka University.

Yukawa's blackboard at Osaka University in 2014.



Yukawa and the blackboard at Columbia University in 1949. (Offered by the Yukawa Institute for Theoretical Physics, Kyoto University)



Yukawa's PhD dissertation.

# International Prizes

Since the institution's founding, faculty members associated with Osaka University have been honored with several prestigious awards.

	Recipient	Year	Achievement
 Nobel Prize	Hideki YUKAWA	1949	The Nobel Prize in Physics for his theoretical prediction of mesons.
 Wolf Prize	Osamu HAYAISHI	1986	The Wolf Prize in Medicine for his discovery of the oxygenase enzymes and elucidation of their structure and biological importance.
	Mikio SATO	2002-2003	The Wolf Prize in Mathematics for foundation of algebraic analysis, theories of hyperfunction and micro-local hyperfunction, holonomic quantum field theory, and creation of algebraic analysis including a unified theory of soliton equations.
 Gairdner International Award	Shizuo AKIRA	2011	The discovery of proteins playing a key role in innate immunity.
 Lasker Award	Hidesaburo HANAFUSA	1982	Albert Lasker Basic Medical Research Award for demonstrating how RNA tumor viruses cause cancer, and elucidating their role in combining, rescuing and maintaining oncogenes in the viral genome.
 Crafoord Prize	Tadamitsu KISHIMOTO Toshio HIRANO	2009	The Crafoord Prize for their pioneering work in isolating interleukins, determining their properties and exploring their role in the onset of inflammatory diseases.
	Tadamitsu KISHIMOTO Toshio HIRANO	2011	The discovery of interleukin-6 and its applications in the treatment of diseases.
 Japan Prize	Tadamitsu KISHIMOTO Toshio HIRANO	2011	The discovery of interleukin-6 and its applications in the treatment of diseases.

# Organization

(as of December 1, 2014)

## Schools and Graduate Schools

<b>School of Letters</b> Humanities	<b>Graduate School of Letters</b> Studies on Cultural Forms / Studies on Cultural Expressions Studies on Cultural Dynamics (Master Course)
<b>School of Human Sciences</b> Human Sciences	<b>Graduate School of Human Sciences</b> <ul style="list-style-type: none"> <li>Ethological Studies Laboratory Human Sciences / Global Human Studies</li> </ul>
<b>School of Foreign Studies</b> Foreign Studies	
<b>School of Law</b> Law / International Public Policy	<b>Graduate School of Law and Politics</b> <ul style="list-style-type: none"> <li>Center for the Practice of Legal and Political Expertise Law and Political Science</li> </ul>
<b>School of Economics</b> Economics and Business	<b>Graduate School of Economics</b> Economics / Business and Management
<b>School of Science</b> Mathematics / Physics / Chemistry / Biological Sciences	<b>Graduate School of Science</b> <ul style="list-style-type: none"> <li>Research Center for Structural Thermodynamics</li> <li>Project Research Center for Fundamental Sciences Mathematics / Physics / Chemistry / Biological Sciences / Macromolecular Science Earth and Space Science</li> </ul>
<b>Faculty of Medicine</b> <ul style="list-style-type: none"> <li>Hospital</li> <li>Institute of Experimental Animal Sciences Medical School / School of Allied Health Sciences</li> </ul>	<b>Graduate School of Medicine</b> <ul style="list-style-type: none"> <li>Center for Medical Research and Education</li> <li>Center for Twin Research</li> <li>PET Molecular Imaging Center</li> <li>Center of Medical Innovation and Translational Research</li> <li>Medical Education Center</li> <li>Center for International Relations Medicine / Medical Science (Master Course) / Health Sciences</li> </ul>
<b>School of Dentistry</b> <ul style="list-style-type: none"> <li>Hospital</li> <li>Dental Technology Institute Dentistry</li> </ul>	<b>Graduate School of Dentistry</b> Oral Sciences
<b>School of Pharmaceutical Sciences</b> Pharmacy / Pharmaceutical Sciences	<b>Graduate School of Pharmaceutical Sciences</b> <ul style="list-style-type: none"> <li>Experimental Institute for Medicinal Plants</li> <li>Center for Advanced Education and Research in Pharmaceutical Sciences</li> <li>Drug Innovation Center Advanced Pharmaco-science / Medical Pharmacy</li> </ul>
<b>School of Engineering</b> Applied Science / Mechanical, Materials and Manufacturing Science / Electronic and Information Engineering Sustainable Energy and Environmental Engineering Global Architecture	<b>Graduate School of Engineering</b> <ul style="list-style-type: none"> <li>Research Center for Ultra-Precision Science and Technology</li> <li>Center for Atomic and Molecular Technologies</li> <li>Frontier Research Center</li> <li>On-site Research Center for Sustainability Design</li> <li>Continuing Professional Development Center</li> <li>Education and Research Center for the Advanced Structural and Functional Materials Design Advanced Science and Biotechnology / Applied Chemistry Precision Science &amp; Technology and Applied Physics Adaptive Machine Systems / Mechanical Engineering Materials and Manufacturing Science / Electrical, Electronic and Information Engineering Sustainable Energy and Environmental Engineering Global Architecture / Management of Industry and Technology</li> </ul>
<b>School of Engineering Science</b> Electronics and Materials Physics Chemical Science and Engineering / Systems Science Information and Computer Sciences	<b>Graduate School of Engineering Science</b> <ul style="list-style-type: none"> <li>Center for Science and Technology under Extreme Conditions</li> <li>Center for Promotion of Advanced Interdisciplinary Research Materials Engineering Science Mechanical Science and Bioengineering / Systems Innovation</li> </ul>
	<b>Graduate School of Language and Culture</b> Language and Culture / Language and Society / Japanese Language and Culture
	<b>Osaka School of International Public Policy</b> International Public Policy / Comparative Public Policy
	<b>Graduate School of Information Science and Technology</b> Pure and Applied Mathematics / Information and Physical Sciences Computer Science / Information Systems Engineering / Information Networking Multimedia Engineering / Bioinformatic Engineering
	<b>Graduate School of Frontier Biosciences</b> Frontier Biosciences
	<b>Law School</b> Legal Practice
	<b>United Graduate School of Child Development, Osaka University, Kanazawa University, Hamamatsu University School of Medicine, Chiba University and University of Fukui</b> <ul style="list-style-type: none"> <li>Molecular Research Center for Children's Mental Development Child Development</li> </ul>

## Research Institutes

- Research Institute for Microbial Diseases
  - Animal Resource Center for Infectious Diseases
  - DNA-chip Development Center for Infectious Diseases
  - Research Center for Infectious Disease Control
  - Genome Information Research Center
  - International Research Center for Infectious Diseases
  - Center for Genetic Analysis of Biological Responses
- The Institute of Scientific and Industrial Research
  - Nanoscience and Nanotechnology Center
  - Comprehensive Analysis Center
  - Research Laboratory for Quantum Beam Science
  - Center for Collaborative Research Education and Training
  - International Collaborative Research Center
  - Nano-Macro Materials, Devices and System Research Alliances
- Institute for Protein Research
  - Research Center for State-of-the-art Functional Protein Analysis
- Institute of Social and Economic Research
  - Research Center for Behavioral Economics
- Joining and Welding Research Institute
  - Smart Processing Research Center

## University Libraries

- Main Library
- Life Sciences Library
- Science and Engineering Library
- International Studies Library

## Joint-Use Facilities

- Low Temperature Center
- Research Center for Ultra-High Voltage Electron Microscopy
- Radioisotope Research Center
- Research Center for Environmental Preservation
- Center for International Education and Exchange
- International Center for Biotechnology
- Research Center for Solar Energy Chemistry
- The Museum of Osaka University
- Health Care Center
- Global Center for Medical Engineering and Informatics
- Center for the Study of Communication-Design
- Center for the Study of Finance and Insurance
- Center for Scientific Instrument Renovation and Manufacturing Support
- Global Collaboration Center
- Center for Japanese Language and Culture
- Center for Environmental Innovation Design for Sustainability (Known as Sustainability Design Center until October 2010)
- Institute for NanoScience Design
- Intellectual Property Center (IPrism)

## National Joint-Use Facilities

- Research Center for Nuclear Physics
- Cybermedia Center
- Institute of Laser Engineering

## World Premier International Research Center (WPI)

- Immunology Frontier Research Center

## Institute for Advanced Interdisciplinary Research

- Center for Information and Neural Networks

## Education & Research Support Organizations

- Institute for Academic Initiatives (IAI)
- Center for Education in Liberal Arts and Sciences
- Office for University-Industry Collaboration
- Teaching and Learning Support Center
- Kaitokudo for the 21st Century
- Tekijuku Commemoration Center
- Department of Safety and Hygiene
- Department of Environment and Energy Management
- Support Center for Campus Life

## Overseas Centers

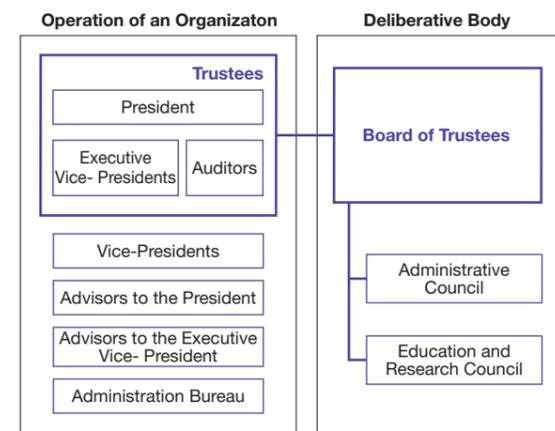
- North American Center for Academic Initiatives (San Francisco Office)
- European Center for Academic Initiatives (Groningen Office)
- ASEAN Center for Academic Initiatives (Bangkok Office)
- East Asian Center for Academic Initiatives (Shanghai Office)

## Osaka University Nakanoshima Center

## Administration Bureau

- Office of the President
- Office for Academic Initiatives
- Department of Publicity and University-Community Collaboration
- Department of General Affairs and Planning
- Department of Research Promotion
- Department of Finance
- Department of Information and Communications Technology Services
- Department of Education Development
- Department of Facilities
- Audit Office
- Office for the Proper Usage of Research Grants
- Environment and Energy Management Division
- Housing Division

## Governing Structure



# Liberal Arts and Sciences

## Liberal arts and sciences education is a requisite for cultivating sophisticated judgment, a strong sense of ethics, and international-mindedness in students at Osaka University

General education at Osaka University is managed by the Center for Education in Liberal Arts and Sciences (CELAS) with the participation of all faculties. The liberal arts and sciences education provided by this center is designed to educate future professionals and scholars who have not only preeminent knowledge in a wide variety of fields, but also demonstrate comprehensive judgment.

For freshmen and sophomores, the liberal arts and sciences education constitutes a significant part of their studies. For seniors and graduate students, this education is also considered crucial in order to help students to balance their specialized knowledge with a broader perspective.

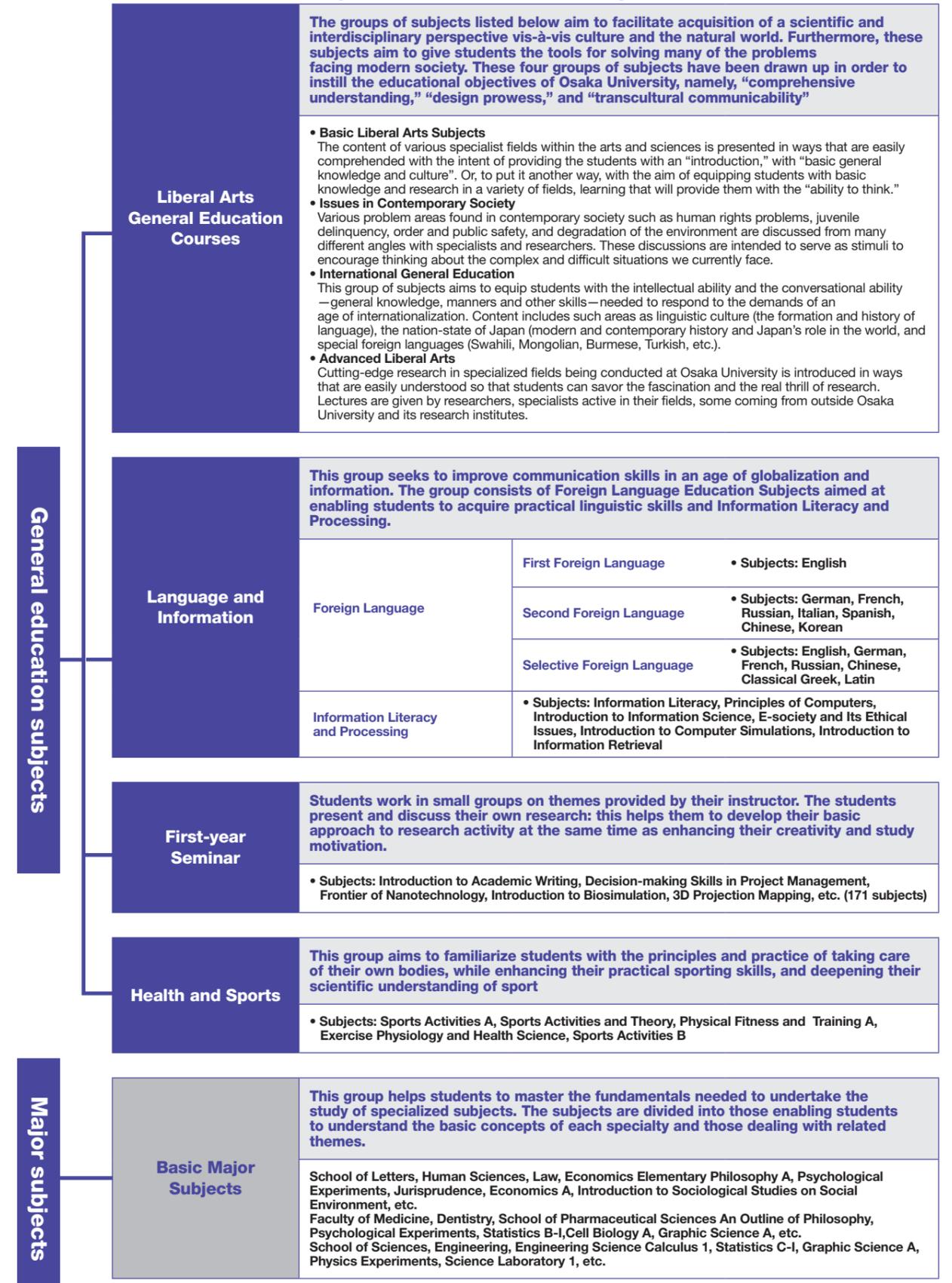
In April, 2012, CELAS was founded to promote a cohesive liberal arts and science education for all



students from freshmen to graduate students. General education was previously conducted by several institutions: the Institute for Higher Education Research and Practice (IHERP, abolished March 2012), the Graduate School of Language and Culture, the Center for the Study of Communication-Design (CSCD), the Center for Interdisciplinary Research and Education, and the Global Collaboration Center (GLOCOL). CELAS was built in order to conduct our coherent general education through the unification of these institutions and to encourage students to acquire "comprehensive understanding," "design prowess," and "transcultural communicability," which are the educational goals of Osaka University.



## Liberal Education Subjects for Freshmen and Sophomores



# Letters

## Graduate School of Letters

### – Studies on Cultural Forms

- Philosophy and History of Philosophy
- Studies on Modern Thought and Culture
- Clinical Philosophy
- Chinese Philosophy
- Indian Philosophy and Buddhist Studies
- Japanese Studies
- Japanese History
- Asian History
- European and American History
- Archaeology
- Human Geography

### – Studies on Cultural Expressions

- Japanese Literature
- Comparative Literature
- Chinese Literature
- English and American Literature
- German Literature
- French Literature
- Japanese Linguistics
- English Linguistics
- Aesthetics and Science of Literary Arts
- Musicology and Theatre Studies
- Art History

### – Studies on Cultural Dynamics(Master Course)

- Cultural Coexistence
- Arts and Media
- Literature and Environment
- Ecological Linguistics

## School of Letters

- Philosophy and History of Philosophy
- Ethics
- Chinese Philosophy
- Indian Philosophy
- Japanese History Major
- Asian History
- European and American History
- Archaeology
- Japanese Literature and History of Japanese Language
- Comparative Literature
- Chinese Literature
- English and American Literature and English Linguistics
- German Literature
- French Literature
- Aesthetics and science of Literary Arts
- Musicology and Theatre Studies
- Art History
- Japanese Studies
- Human Geography
- Japanese Linguistics

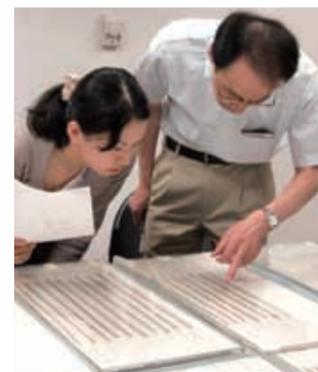


Armour (Archaeology) / Excavation (Archaeology)

The Graduate School of Letters and the School of Letters were established as an independent faculty in 1949. The graduate school has two programmes, one awarding a Master of Arts degree and the other both MA and PhD degrees. The MA programme includes four fields of study and the MA and PhD programme includes 23 fields of study. The graduate programmes aim to cultivate in students a high level of knowledge of the humanities by engaging in research in order to develop a multifaceted understanding of issues and subjects under investigation. The undergraduate programme offers 20 fields of study. Its educational goal is to provide students with the kind of knowledge in the humanities that will enable them to understand issues and subjects under investigation from multiple perspectives. We also put priority on encouraging students to go beyond the mere acquisition of knowledge and develop their abilities to think and express their views in their own words.

## Interdisciplinary approaches to Japan, Japanese Language, and Japanese Literature

The Graduate School of Letters and the School of Letters are well established as offering Japan-related fields of study. Japanese Studies proposes to study Japanese history, religion, thought and culture in the context of cultural exchanges and conflicts with and among heterogeneous cultures. Japanese Linguistics studies Japanese in terms of its linguistic features, sociolinguistic variations, and acquisition/learning within the broader frameworks of general linguistics and applied linguistics.



Museum visit in Shanghai (Chinese Philosophy)

Japanese Literature covers from ancient times up to present day literary work. In addition to detailed reading of individual works, various approaches are taken to study authors and cultural trends in each epoch. These approaches are strongly connected with findings in art history, history, and philosophy.



A small group discussion (Japanese Linguistics)

## Some fields of study rarely found elsewhere

Although all of our fields of study are unique in their own regard, some of them are particularly noteworthy as they are not found in other universities. Musicology and Theatre Studies deal with a wide variety of genres of music - classical, traditional, popular and folk - in various nations, and an equally wide variety of performing arts, including European classical and modern plays, Japanese traditional and contemporary plays, musicals and ballets. In addition to music and theatre themselves, the relationship of music and theatre with other disciplines such as anthropology, sociology, aesthetics and literature is also studied.

Clinical Philosophy is a new discipline originally conceived by



Korean traditional dance (Musicology and Theatre Studies)

our faculty. It has stemmed from ethics and poses questions generated by analyzing Western and modern Japanese ethical thought, moral theory, contemporary social philosophy and cultural theory about contemporary social issues, including medical treatment and care, education, performing arts and sexuality.

## Campus on a historic site

The Toyonaka Campus of Osaka University, in which the Graduate School of Letters and the School of Letters are situated, is on a historic site that yields abundant ancient relics dating back to the Yayoi Period (3rd century BC to 3rd century AD). The Office of Archaeological Heritage Management, operated by our faculty members under the direction of the university's Committee of Archaeological Heritage Management, is responsible for excavation and preservation of those archaeological finds and relevant data.

## Kaitokudo: Our roots

Kaitokudo was one of the earliest colleges in Osaka established by and for wealthy tradesmen in the 18th century and mainly taught Chinese philosophy. Osaka University took over Kaitokudo when it ceased to operate after World War II and the faculty of letters, in cooperation with Kaitokudo Commemorative

Society, has organized educational programmes for the general public.



Fieldwork at a festival (Japanese Studies)

## International education and research exchanges

We encourage a variety of forms of international exchanges. We have more than 100 international students from over 20 countries (137 students from 21 countries and regions as of May 2014), who are supported by a specialized instructor for international students, Advisor's Office, and a range of activities and events to facilitate their acclimation on campus. The faculty includes some non-Japanese tenured faculty and quite a few research fellows are accepted from abroad each year (19 in the 2013 academic year). The Graduate School of Letters and the School of Letters have an inter-faculty agreement of exchange with 12 faculties of 11 universities in eight countries and one region as of September 2014. We have had numerous education and research collaboration projects. Among them are Euroculture Programme within the Erasmus Mundus Programme funded by the European Union and the ISAP Programme in collaboration with Heidelberg University funded by the German Academic Exchange Service (Deutscher Akademischer Austausch Dienst).



Fieldwork (Human Geography)

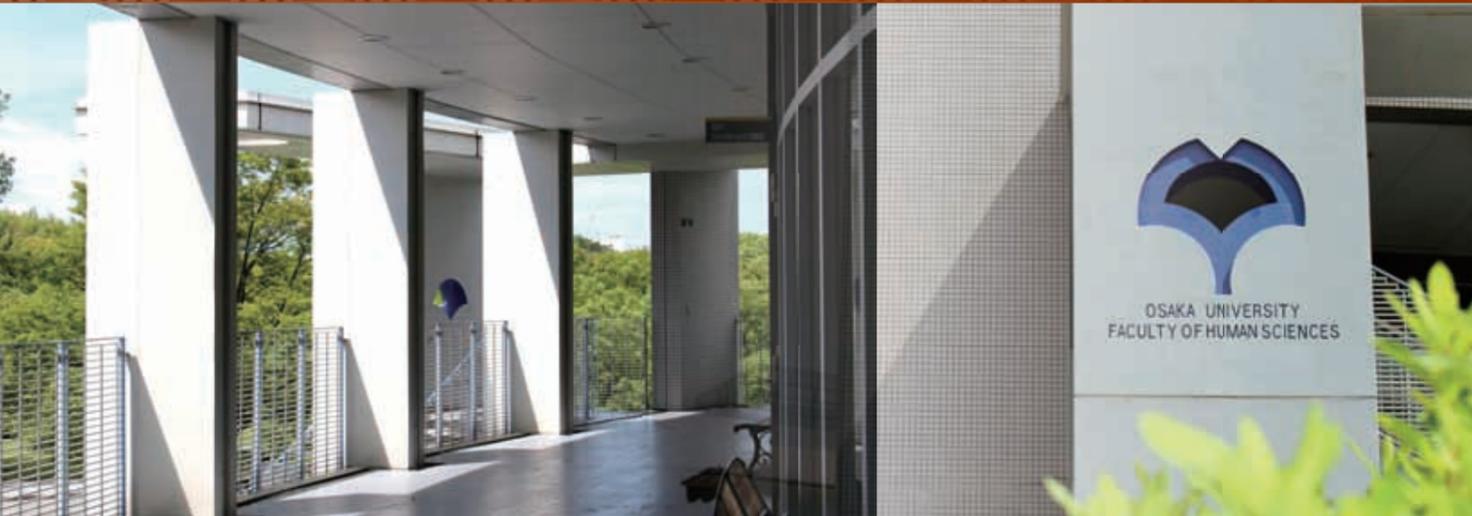
# Human Sciences

## School of Human Sciences – Human Sciences

- Behavioral Sciences
- Sociology, Modern Thought and Anthropology
- Education
- Global Human Studies

## Human Sciences International Undergraduate Degree Program

- Global Citizenship Major
- Contemporary Japan Major



The School of Human Sciences was established in 1972 covering three academic disciplines: psychology, sociology and education. It was the first school or faculty to carry the name 'human sciences' in the country. In 1976 the Graduate School of Human Sciences was created offering Master and Doctoral level programs. Today areas of study include behavioral sciences, psychology, sociology, biological and cultural anthropology, education, philosophy, development studies and area studies.

Our main mission in the School and Graduate School of Human Sciences is to contribute to the betterment of societies (local, national and global) by cultivating students who are inquiring and creative thinkers with a strong sense of public service, and by producing high quality research that will help us better understand and thus address the complex social, economic, health and environmental problems that we face in the early 21st century. In this endeavor, we are strongly committed to an interdisciplinary and evidence-based approach.

## Graduate School of Human Sciences

Since the Graduate School of Human Sciences was established, it has followed the groundbreaking path of integrating the sciences and the arts conceptually and practically to generate a comprehensive and relevant understanding of human beings and the societies that they create around them. To realize our mission, the Graduate School has emphasized the utilization of



Sandplay technique for psychotherapy

empirical, practical, and in some fields, clinical research methodologies that feed directly into the learning environment. The focus is firmly on studying real people

and real societies through fieldwork, interviews, and questionnaire data collection. The School also conducts research observing nonhuman primates in their natural environment.

In order to provide students and faculty with a cutting edge research and learning environment, we have successfully secured additional support from the Ministry of Education, Culture, Sports Science and Technology (MEXT) for two major projects in recent years: 2005-2007 for the project Human Science Education Aimed at



Driving simulator for psychological study of driver's behavior

## Graduate School of Human Sciences

### – Human Sciences

- Advanced Studies of Human Sciences
- Psychological Sciences
- Behavioral Sciences
- Sociology
- Modern Thought and Anthropology
- Clinical Inquiries in Education
- Social Inquiries in Education

### – Global Human Studies

- Human Development Studies
- Area Studies

Producing Practical Researchers and 2007-2010 for the Promoting the Use of Human Science Data in General and Professional Education Project. In addition to supporting students in research and other scholarly activities, including funding for international conferences and publications, a number of new courses were developed out of these projects. These include some foundational and advanced courses in quantitative and qualitative data processing and analysis, as well as the popular Academic Writing and Presentation Skills Seminars. Our aim is to further enhance the graduate research environment to

enable students to develop to an even higher level generic and subject specific skills that will enable them to contribute to wider society in a variety of fields, as well as social and cultural settings.



Eight-year-old females with their infants in a free-ranging group of Japanese monkeys

## Human Sciences International Undergraduate Degree Program

The Human Sciences International Undergraduate Degree Program is an innovative program that enables students to major in one of two tightly integrated majors: Global Citizenship and Contemporary Japan. The program features highly interactive and innovative teaching with students having close contact with international professors across a wide range of human science disciplines. The program aims to cultivate internationally aware graduates able to think and act effectively both locally and globally.

### • Global Citizenship Major

The Global Citizenship Major is a degree program that explores the limits and potential of citizenship in a world of massive global migration and huge demographic shifts within nations and communities. This major is particularly aimed at those students who are hoping to work in international agencies including the UN, NGOs, municipal agencies and Corporate Social Responsibility (CSR)



Two students discussing a class assignment

sections of global and Japanese businesses. Students will have a solid grounding in how to ethically identify, investigate, analyze and advocate solutions to problems of a multidimensional and global nature.

### • Contemporary Japan Major

The Contemporary Japan Major is an area studies program that takes multidisciplinary and interdisciplinary approaches to studying Japan. While focusing on Japan as an area of study, this program also aims to reflect on the process of globalization. The approach taken will enable students to gain an in-depth understanding of the social, cultural, economic, political and linguistic aspects of the country. We expect that students will be able to integrate a variety of approaches to formulating and solving problems, and utilize diverse materials and information sources to investigate different issues pertaining to Japan and its position in the region and world. Graduates of the Contemporary Japan Major, as area studies specialists, will be well placed to seek employment in Japan or the wide globalized job market.



Volunteer Activities in the Area affected by the Great East Japan Earthquake

# Foreign Studies

## School of Foreign Studies – Foreign Studies

- Chinese
- Korean
- Mongolian
- Indonesian
- Filipino
- Thai
- Vietnamese
- Burmese
- Hindi
- Urdu
- Arabic
- Persian
- Turkish
- Swahili
- Russian
- Hungarian
- Danish
- Swedish
- German
- English
- French
- Italian
- Spanish
- Portuguese
- Japanese



## “Culture through Language, Language through Culture”

Learning culture through language and learning language through culture—that is the core of what it means to do foreign studies. One without the other is never complete. We teach both language and culture. The School of Foreign Studies is an ideal place for those of you who aim to become experts in both.

### Educational Goals

Our goals are to promote education and research in foreign languages and cultures, both in theory and practice, to instill broad knowledge in the students so that they can contribute to the world community, and to nurture their deep understanding of foreign affairs.

To achieve these goals, SFS offers 25 modern languages as majors and many other ancient and modern languages as minors. During the first and the second years, the students are to take one foreign language as their major language, together with core introductory subjects in various academic disciplines.

In the final two years they will study their major language at a more advanced level, along with a problem-oriented research related to a particular academic discipline of their choice.

### Historical Description

The School of Foreign Studies (SFS) was first established in December 1921 as Osaka School of Foreign Languages at Uehonmachi, Osaka, committed to international peace and amity. It was financially helped by the donation of ¥1,000,000 by Choko Hayashi, an Osaka businesswoman. Having survived the Second World War, it moved to Takatsuki and then



back to Uehonmachi, Osaka. In 1979 it moved again to a new location in Minoh City for more extensive academic activities. On October 1, 2007, it became part of Osaka University as School of Foreign Studies.

## “Let Language be your Wings to the World”

What is “Foreign Studies”? Why are we not just called “School of Foreign Languages”? Well, there are good reasons.

Globalization has been going on in many ways; people, capital, and information, they never stay put in a single place but circulate on a global level. We witness changes in businesses, politics, and cultures almost on a daily basis. The changes certainly are not



taking place just at remote places far from where we live. They are right in front of us and all around us, and we are in the middle of them, be it in our workplaces, in our neighborhoods, or in our city streets. Look around. Visible signs are everywhere. We see an increasing number of people of different nationalities or cultural backgrounds every day and everywhere. Japan is in the middle of all this, as many other countries are, and that is what it means to be living in today’s world—internationalization within and without.

Within—As different cultures come into contact or even mingle together, our minds and attitudes get influenced and become richer in kind, our ways of living improve, and many other not immediately foreseeable good things may take place. Yet, at



the same time, we may witness frictions, pressures, and collisions because of cultural differences. The more multicultural we become, the more need there will be for people who can act as cultural bridges, whose job it is to help different people understand each other.



Without—These days, military conflicts arise almost routinely in many parts of the world, or poverty strikes, and environmental problems beleaguer many nations. Consequently, there is need like never before for coordinated global cooperation and aid through international organizations, governments and NPOs. In turn, these groups need employees who can function in at least two languages and cultures if they are to help different peoples work together.

Within and without, there is a need—urgently felt—for more qualified people to help those of different



cultural backgrounds and nationalities understand each other and communicate with each other. Locally and internationally, we need people who have a deep understanding of both language and culture.



# Law / Law and Politics

School of Law – Law – International Public Policy

Graduate School of Law and Politics – Law and Political Science

- Public Law and Policy
- Intellectual Property Law
- Comparative Law and Politics



The Faculty of Law offers an undergraduate program, officially called the School of Law. The Faculty of Law also offers a graduate program, officially called the Graduate School of Law and Politics. As a leading academic institution in both legal education and research, we aim to contribute to the wider society by developing human capital, ideas, and intellectual innovations that are essential for evolution and increasing welfare everywhere.

## Solid Tradition and Innovative Spirit

The Faculty of Law has a solid tradition that goes back 60 years. The Faculty of Letters and Law was established at Osaka University in 1948, only three years after the end of World War II. Five years later, in 1953, as part of a fundamental restructuring of the university, the Faculty was divided into three separate faculties, being the faculties of Law, Letters and Economics. Since then, the Faculty of Law has developed steadily, maintaining a healthy respect for both tradition and innovation as it has grown. Now the Faculty of Law, which started with only 16 professors in 1953, has about 60 full-time professors and is widely recognized as one of Japan's top-ranking institutions for legal education and research. In 2008, the Faculty celebrated its 60th Anniversary.

The Faculty of Law offers an undergraduate program, officially called the School of Law. In 2008, it was divided into two departments, the Department of Law and the Department of International Public Policy. Two hundred and fifty students enroll every year and the student faculty ratio of the program is ideal. The Faculty of Law also offers a graduate program, officially called the Graduate School of Law and Politics. Currently, there are 92 students in the master's program, of which 31 are international students, and

there are 47 students in the doctorate program, 12 of whom are international students. The master's program of the Graduate School of Law and Politics consists of three sub-programs with different goals and curricula: Public Law and Policy, Comparative Law and Politics, and Intellectual Property Law. As a leading academic institution in both legal education and research, we view it as one of our missions to contribute to the wider society by developing human capital, ideas, and intellectual innovations that are essential for evolution and increasing welfare.



## Toward a Globally Attractive Law School

The School of Law and the Graduate School of Law and Politics are actively promoting international exchanges with fifteen prestigious law faculties around the world based on inter-faculty academic exchange agreements. Among the most essential objectives of these agreements is to expand the student exchange program. Every year, the School of Law and the Graduate School of Law and Politics attract a large number of international students, from other Asian countries in particular, those who are interested in acquiring knowledge of Japanese law and adapting it for use in their own countries. We are currently working to offer more courses on Japanese law taught in English in the spring semester, so that more students may obtain easier access to the Japanese legal system



and legal culture. Courses such as “Japanese Legal/ Political System and Culture,” “Topics in Japanese Law”, and “Topics in Comparative Law” are scheduled for the 2015 spring semester. Many Japanese students also attend the courses taught in English, and these courses provide a forum for interaction and exchange of ideas among students from Japan and those from abroad that matches the mainstream classes taught in Japanese. To meet the needs of international students, the School of Law and the Graduate School of Law and Politics have set up an International Student Consultation Room. Here, an experienced counselor, who are in charge of taking care of international students, provide advice and support upon request, on issues such as their research and everyday studies as well as personal issues or problems relating to life off campus. This helps students to focus on their studies safe in the knowledge that a system exists to assist them if problems occur. In addition, we have an assigned tutor system. Each new international student will be provided with his or her own Japanese undergraduate or graduate student as a tutor who can provide assistance with the academic demands of the program.

# Economics

## School of Economics – Economics and Business

### Graduate School of Economics – Economics

- Economics Course
- Applied Economics Course
- Economic History and Business History Course

### Graduate School of Economics – Business and Management

- Management Research Course
- Management of Technology (MOT) Course
- Business Course
- Global Management Course



The Graduate School of Economics at Osaka University has placed Modern Economics at the core of its education and research program since its inception, and has consistently been at the forefront of studies in Modern Economics. Because of its many cutting-edge achievements, it has come to be known as the Place of Origin of Modern Economics in Japan. The School offers undergraduate and graduate programs. The undergraduate program features a systematic curriculum that allows students to choose from the disciplines of economics and business. The School offers two kinds of graduate programs: one aims to foster excellent researchers in economics, economic history, and management and business; and the other aims to nurture human resources based on highly professional knowledge.

## Introduction and Overview

The School of Economics at Osaka University was founded in 1948. At that time, so-called "Marxian Economics" was the mainstream paradigm in Japan. However, the School has placed Modern Economics at the core of its education and research program since its inception, and has consistently been at the forefront of studies in Modern Economics. In regard to management and business studies, the School has been spearheading the field of management science with the most advanced analytical and mathematical techniques. In the field of economic history, the School has enjoyed some detachment from scholarly dogma, adhering to our firm belief in empirically based historical science, which rests on documental proofs and scientific analyses. As a result, the School has a reputation as a world-class research organization.

The Graduate School of Economics at Osaka University demonstrates its academic excellence by publishing the latest findings to the world. The Institute of Social and Economic Research, which plays an



important part in the graduate program, edits one of the world's most authoritative economic journals, the "International Economic Review," in collaboration with the University of Pennsylvania.

The Graduate School operates in an environment conducive to internationalization of students. In the disciplines of economics and business administration, it is indispensable to acquire a cosmopolitan outlook in response to the economic globalization. The Graduate School has close relations with overseas universities

under our academic Exchange Programs. A number of international students are regularly enrolled in the School. They are from various countries including Australia, China, Indonesia, Mongolia, Russia, South Korea, Taiwan, Thailand and Vietnam. There are now around 160 foreign students enrolled in both the School of Economics and the Graduate School of Economics.



## Undergraduate program

The School of Economics at Osaka University features a systematic curriculum that allows students to choose from the two disciplines of economics and business administration. Following the tradition of learning practically, emphasis is placed on quantitative methods such as statistical analysis and information processing to promote empirical education and research. Course subjects are offered in suitably small classes, which is one of the most attractive features of the school.

The School offers rich academic resources that are unique among undergraduate economics schools. The four-year undergraduate program consists of widely integrated economics and business administration courses with liberal arts and sciences, leading to the Bachelor of Science in Economics degree.

## Graduate program

The Graduate School of Economics offers two major programs: Economics, and Management and Business. The School provides three courses: Economics, Applied Economics, and Economic History and Business History as the Economics Program. The Economics Course, and the Economic History and Business History Course are designed to nurture excellent academic researchers and feature the study

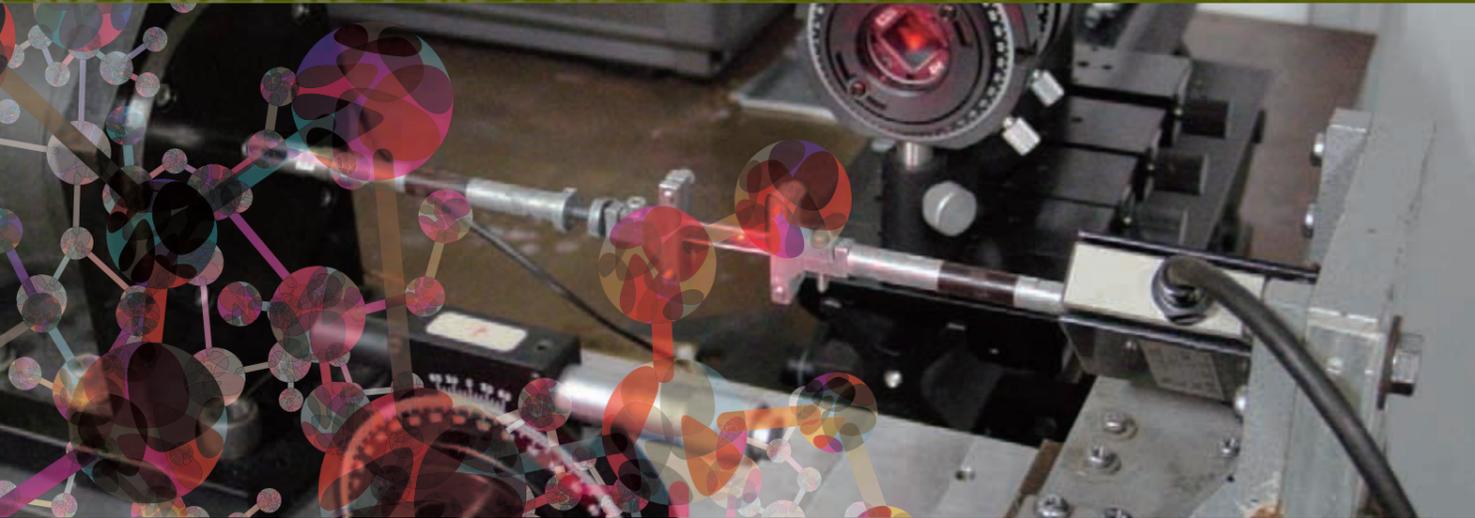


of Modern Economics as well as economic history and business history with emphasis on the quantitative approach, creativity and rigor in logic. The Applied Economics Course is designed for those who wish to pursue careers as economists or analysts outside academia and it aims to foster the ability to apply the tools of Modern Economics to the analysis of real-world problems.

The Management and Business Program emphasizes corporate management through a scientific approach. This Program aims at training students, not only to become top researchers through the Management Research Course, but also analytical specialists who can play vital roles in the business world through the MOT Course, the Business Course and the Global Management Course. Notably, the three-year MOT Course, offered jointly with the School of Engineering, allows students to obtain two master degrees, in engineering and business, at the same time. In 2008, we started a new area of research in the Major of Management and Business: the Global Management Course, which aims to foster capable individuals who have a thorough grounding in global perspectives and strong management skills to manage urban and regional developments as well as technological advancement.



# Science



An instrument to measure simultaneously optical and mechanical properties of plastics newly developed for optical devices such as optical discs, lens, and retarders for liquid crystal display panels.

The study of Science at the Graduate School of Science includes a variety of disciplines, as can be seen from such diverse Departments as Mathematics, Physics, Chemistry, Biological Science, Macromolecular Science, and Earth and Space Science, affording a wide range of research topics for graduate study. The tradition at our department, since its foundation in 1931, is academic freedom with emphasis on the quest for the truth of nature. In 2009, Osaka University was selected as one of the core universities of the "Project for Establishing Core Universities for Internationalization (Global 30)", a project of MEXT. Under this project, we have established English degree courses, Chemistry-Biology Combined Major Program at the undergraduate level, and physics, chemistry and biology courses at the graduate level.



A showcase displaying 3D projection models of regular 4D polytopes and the 4D soccer ball, along with a mechanical calculating machine.

Mathematics originated in the prehistoric age, from the need of handling concepts like numbers, magnitudes, and forms, and has been developing ever since.

On the one hand, mathematics develops for its own sake, without aiming at specific applications.

Meanwhile, because of its abstract and logical nature, mathematics is

the foundation of various other disciplines, including the natural sciences, engineering, medicine, and the social sciences. In reality, there is no clear dividing line between pure and applied mathematics, and their interaction sometimes brings us unexpected breakthroughs.

The department of Mathematics consists of 6 research groups, all of which have been making substantial contributions to the developments of mathematics. Our

department is ranked among the top three in the country.

The Department of Physics was established in 1931 when Osaka University was founded. The tradition of originality in research was established by the first president of Osaka University, Dr. NAGAOKA Hantaro, a prominent physicist who proposed a planetary model for atoms before Rutherford's splitting of the atom. Dr. YUKAWA Hideki created his meson theory for nuclear forces when he was a lecturer at Osaka University, and later became the first Japanese Nobel laureate.

Since then, our department has expanded to cover a wide range of physics. Many faculty and students in the department collaborate with other laboratories in Japan and abroad, such as KEK, J-PARC, RIKEN, SPring8, CERN, FNAL, TRIUMF, RAL, and PSI. In 2010, the "International Physics Course (IPC)" was created to offer classes in English to students from abroad.

Electromagnetic calorimeter for the J-PARC KOTO experiment.



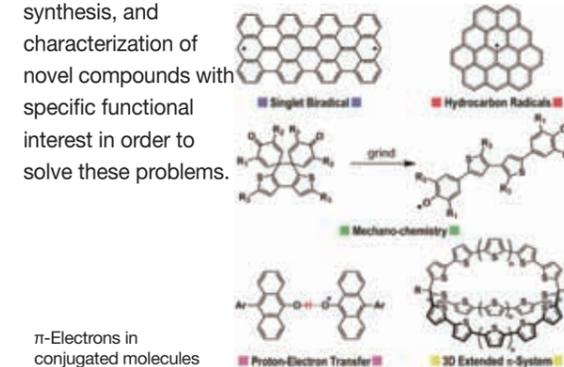
## School of Science

- Mathematics
- Mathematics
- Physics
- Physics
- Earth and Space Science
- Chemistry
- Chemistry
- Macromolecular Science
- Biological Sciences
- Biology

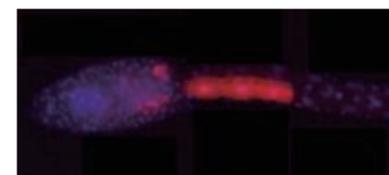
## Graduate School of Science

- Mathematics
- Algebra
- Geometry
- Analysis
- Experimental Mathematics
- Global Geometry and Analysis
- Applied Mathematics
- Physics
- Condensed Matter Physics
- Physics of Particles & Nuclei
- Fundamental Physics
- Quantum Physics
- Interdisciplinary Physics
- Chemistry
- Inorganic Chemistry
- Physical Chemistry
- Organic Chemistry
- Interdisciplinary Chemistry
- Biological Sciences
- Molecular and Cellular Biology
- Cellular Biology
- Adaptation Biology
- Correlation Biology
- Structural Biology
- Macromolecular Science
- Macromolecular Synthesis and Reactions
- Macromolecular Structure, Properties, and Functions
- Macromolecular Assemblies
- Earth and Space Science
- Astrophysics and Planetary Science
- Earth and Planetary Material Science
- Extreme Material Science

Chemistry is a science dealing with the structure, synthesis, and properties of substances, particularly at the molecular level. We are surrounded by chemical products; e.g., food, clothing, housing, drugs, and so on. In addition, new materials have been playing an essential role in the recent progress of technology and culture. Some chemicals, on the other hand, tend to give rise to serious environmental problems, whose solutions will depend upon chemistry research and education in future. Therefore, researches in the department focus on molecular design, synthesis, and characterization of novel compounds with specific functional interest in order to solve these problems.



The Department of Biological Sciences is currently in the midst of a revolution in Biology. Fifteen years ago, no one imagined that we could unveil the human genome. Yet, in 2001, the draft sequence of the human genome was completed, and we now know the genome sequence of hundreds of living things. Brand-new technologies and approaches, bioinformatics and systems biology, to name but two, are being introduced at a breathtaking pace.



A tadpole larva of Oikopleura. DNA is stained in fluorescent blue showing nuclei of cells.

New phylogenetic trees have been proposed using currently accumulating genome data. Students keep up with these developing areas and make new exciting findings with the help of members of the department.

In the Department of Macromolecular Science, basic studies are carried out on macromolecular syntheses and reactions, as well as structures, functions, and properties of both individual macromolecules and their assemblies. These studies are a prerequisite for the development of novel plastics and functional polymers utilized in daily life, and to understand the functions of biopolymers that play important roles in biological systems.



The scene of a mathematics class

The Department of Earth and Space Science is a unique department established in 1995, whose aim is to develop a new horizon in the research and the education of earth and space science from a physics-based perspective.

The department attempts to go beyond the traditional framework of science to develop a new frontier of interdisciplinary science, and construct a new style of earth and space science as an integrated science. Such research will open up new perspectives on the problems of the Earth's environment, the diversity of planets including extrasolar planets, and the evolution of the universe.

# Medicine



The Faculty of Medicine comprises the Medical School and the School of Allied Health Sciences. Whilst the Medical School offers 6-year courses for future doctors, the School of Allied Health Sciences provides 4-year curricula in Nursing, Radiological Technology and Biomedical Engineering as well as Laboratory Sciences for prospective Nurses, Public Health Nurses, Midwives, Radiology Technicians and Laboratory Medical Technologists. The Medical Science Department trains proficient experts in Medical Professional Jobs such as Doctors, Nurses, Radiological Technicians, and Laboratory Medical Technologists who can provide increasingly sophisticated treatment appropriately and accurately as a team.

Promoting “Medical Care Team” has become essential to Medical Practice. The Medical School produces highly competent doctors who are able to diagnose and treat patients accurately. The School of Allied Health Sciences is committed to training highly competent Nurses, Radiology Technicians and Laboratory Medical Technologists who are able to work side by side with doctors.

## World-leading Pioneering Research

Graduate School of Medicine produces numerous world-acclaimed research results, as well as outstanding researchers. In addition to an exceptional number of Grants-in-Aid for Scientific Research being awarded to our students by the Ministry of Education, Culture, Sports, Science and Technology and the number of Contract Research, Joint Research and Donation for Research and Education from private companies accorded to our students being among the highest in Japan, our students are also among those who produce the largest number of published theses in Japan and submit a substantial number of theses to renowned scientific magazines.

## Responding to Globalization

Graduate School of Medicine is particularly proud of its cutting edge research in such fields of study as Immunology, Molecular Cell Biology, Molecular Genetics,

Microbiology, Neuroscience, and Gene Therapy Science. Therefore, our Medical Graduate Course actively invites foreign researchers, promotes Joint Research and calls for foreign students to come and study at our facilities. Furthermore, in the spirit of academic exchanges and international collaboration, we participate and actively promote international personnel exchanges. We especially like to welcome foreign researchers under Joint Research programs with overseas Universities and Institutions.

The international exchange program of Graduate School of Medicine, Osaka University grows every year.

The department invites foreign researchers, sends faculty members abroad and promotes various international exchange programs, such as overseas studies for Osaka University graduates and undergraduates. It also welcomes overseas students.

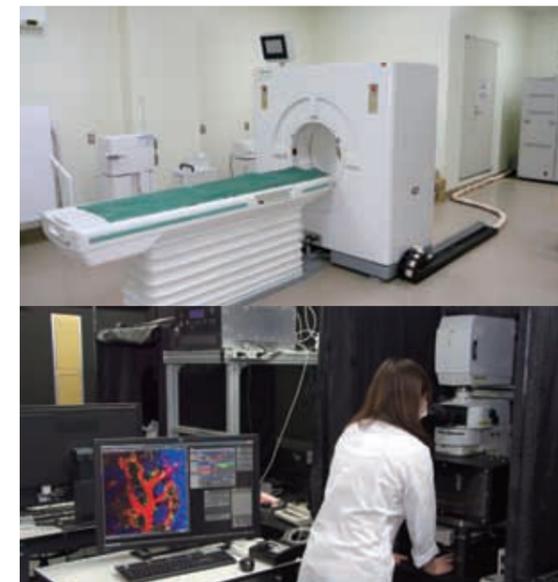
As part of international exchange, the School has established an International Exchange Fund for overseas students and students who have stayed on after their term of study expired. In addition, the School promotes Joint Research with overseas researcher. In addition, we have set

## Faculty of Medicine

- Medical School
- School of Allied Health Sciences
- Nursing
  - Fundamental Nursing
  - Reproductive and Pediatric Nursing
  - Adult and Geriatric Nursing
  - Community Health Nursing
- Medical Physics and Engineering
  - Medical Physics
  - Medical Engineering
- Laboratory Sciences
  - Basic Laboratory Sciences
  - Clinical Laboratory Sciences

## Graduate School of Medicine

- Medicine
  - Anatomy
  - Physiology
  - Biochemistry and Molecular Biology
  - Pathology
  - Pharmacology
  - Medical Engineering
- Social Medicine
- Microbiology and Immunology
- Genome Biology
- Health and Sport Sciences
- Internal Medicine
- Integrated Medicine
- Radiology
- Surgery
  - Acute Critical Medicine
  - Organ Regulation Medicine
  - Neural and Sensory Organ Surgery
  - Global and Innovative Medicine
  - Pharmaceutical Information
  - Infection Control and Prevention
- Medical Sciences (Master Course)
  - Health Sciences Nursing Science
    - Evidence-Based Clinical Nursing
    - Children’s and Women’s Health
    - Health Promotion Science
  - Medical Technology and Science
    - Functional Diagnostic Science
    - Medical Physics and Engineering
    - Biomedical Informatics



up an International Exchange Grant for young researchers, such as graduates willing to study at foreign universities or research institutes. Additionally, in an effort to nurture physicians with broad international experience, we offer our students an opportunity to follow courses at overseas medical institutions and strongly promote international exchanges.

Graduate School of Medicine, Osaka University has an interdepartmental exchange agreement with overseas universities. Participating universities and institutions are currently establishing Joint Research programs, as well as exchange programs available to researchers and students.

Furthermore, the Academic Exchange Program set up between Osaka University Graduate School of Medicine and a number of foreign universities and institutions, allows selected graduate and undergraduate students to receive research guidance and follow courses overseas for up to one year without losing an academic year.

## CENTER FOR TWIN RESEARCH, Osaka University Graduate School of Medicine

Center for Twin Research, Osaka University Graduate School of Medicine, was established in April, 2009 as the very first research institution in Japan specializing in twin research.

In collaboration with other institutions inside and outside Japan, we aim to promote Japan's twin research and advance it to a higher level of innovative new research.

Multidisciplinary approach is central to our research values; we work in harmony with researchers of diverse fields at Osaka University, not only from medicine and health science, but also from dentistry, economics, human science, pharmacology, and others.

We specialize in twin research. Our center was established based on research activities by Professor Hayakawa, Center Director, over the last three decades. We study twins from infancy to later adulthood, hoping to contribute to the society and help people achieve better health and longer quality life.

Our core activities are:

- Research activities: Research and education of twin research
- International activities: Collaboration with overseas twin research institutions
- Social contribution activities: Offering symposiums, seminars, and twin festival to public in order to raise awareness of twin research

Twin research is a promising approach toward preventive medicine for all, and we are committed to make a difference!



# Dentistry

## School of Dentistry – Dentistry

- Oral Anatomy and Developmental Biology
- Oral Physiology
- Molecular and Cellular Biochemistry
- Pharmacology
- Oral Pathology
- Oral Microbiology and Infectious Diseases
- Dental Materials Science and Technology
- Oral Health and Preventive Dentistry
- Restorative Dentistry, Endodontology and Periodontology
- Prosthetic Dentistry
- Oral and Maxillofacial Surgery
- Orthodontics
- Pediatric Dentistry
- Dental Anesthesiology
- Oral Radiology

## Graduate School of Dentistry – Oral Sciences

- Pathogenesis and Control of Oral Diseases
- Oromaxillofacial Regeneration
- Functional Oral Neuroscience
- Oral Infections and Disease Control
- Oral Biology and Disease Control
- Oral Developmental Biology
- Diagnostic Dentistry
- Community Dentistry and Informatics
- Craniofacial Development Biology
- Advanced Bio-Dental Research for Drug Development



The School/Graduate School of Dentistry have been engaged in producing leading dental professionals who have research-oriented mind and perform an important role in global dental society. We are committed to continue exploring the new technologies and developments in oral science in the 21st century.

We are extensively focusing on the innovative dental research philosophy “Frontier Bio-Dentistry”, that implies fusion of traditional dentistry and the molecular/cellular biology-based sciences. We aim to develop the advanced dental care through tissue regeneration based on biological principals and establish personalized therapies. Our research achievements are internationally well-known and we continuously obtain high prestige. The project “Challenge to Intractable Oral Diseases” is one of our recent attempts to develop new diagnostic/preventive/treatment methods for refractory oral diseases in the modern medicine.

## Dental Research in the 21st Century

The mouth can be called “the entrance” to a living organism. Eating, speaking and facial expressions performed by the maxillo-facial system, are indispensable not only for life maintenance but also for psychosocial health.

Most people may think that dentist is a practitioner skillfully drilling and filling the teeth and may have a mental image of dentistry as a kind of art. However, such ideas are out-of-date. Molecular biology techniques introduced in the 1980s have brought new understanding of life phenomena



in terms of molecular function. As a result, dental research has drastically changed, with inclusion of new challenges to research of molecular functions as well as understanding of the phenomena of heredity, immunity, and neurology at the molecular level. Thus, modern dentistry now includes the field of bioscience. In addition, high-profile regenerative medicine (medical

procedures used for regeneration and reconstruction of lost tissue) has greatly advanced in dental fields. Genomic dentistry also has the great potential for development in the foreseeable future.

Oral function is indispensable for humans to have a satisfactory and happy life. Future developments in dental research will search for solutions for not only dental caries and periodontal diseases but also problems related to eating and speaking, which are largely concerned with quality of life. We aim to provide dental health care that allows our patients to have “a better life, to eat and live better,” which is more than simply treating dental diseases.

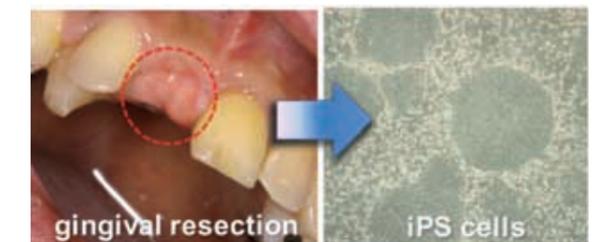
Based on such background to focus on “Frontier Bio-Dentistry”, Osaka University Graduate School of Dentistry provides an outstanding environment for those who are interested in bioscience study.

## “Frontier Bio-Dentistry”, a paradigm shift in Dentistry

Osaka University Graduate School of Dentistry has set the large goal of not only training skillful clinicians, but also producing leading researchers in the most advanced areas of oral health care. We aim to realize a “better life, to eat and live better” for our patients by promoting and developing bioscience research projects, and to bring a paradigm shift in dentistry.

With these missions in mind, we are pushing forward the projects to create an advanced field of dentistry, which we name “Frontier Bio-Dentistry”. This means a fusion of traditional dentistry, with its focus on technical aspects, and molecular/cellular biology-oriented oral sciences. Our research has attained the highest level in Japan and our school is one of the top five oral research institutes in the world. Taking advantage of the position as a graduate school belonging to a large university, we are actively engaged in joint research projects with other schools and research institutes, such as Medicine, Engineering, and Frontier Biosciences in our university. In addition, a special project termed “Challenge to Intractable Oral Diseases” was inaugurated in 2011. This project aims to create a new field of predictive dentistry

by promoting research on development of new diagnostic methods for refractory diseases, as well as developing novel preventive methods for dental caries and periodontal diseases through analysis of the relationships between intractable oral diseases and systemic illness at a molecular level.



iPS cells generated from the patient's gingiva which was resected during a dental treatment.



# Pharmaceutical Sciences

## School of Pharmaceutical Sciences

- Pharmacy
  - Clinical and Biological Pharmacy
- Pharmaceutical Sciences
  - Chemical Pharmaceutical Sciences
  - Biopharmaceutical and Environmental Sciences

## Graduate School of Pharmaceutical Sciences

- Advanced Pharmaco-Science
- Medical Pharmacy



Pharmaceutical sciences is an academic discipline with the mission of helping to develop a bountiful society through comprehensive scientific research into the chemical substances which are related to all kinds of life on earth, and by contributing to the health of humanity through the creation of pharmaceuticals. At human history, many diseases have been overcome by the developments of new medicines and treatments. Pharmaceutical research has mainly contributed to these advances. The School and Graduate School of Pharmaceutical Sciences at Osaka University aim to educate and train future leading pharmacists with a researcher's mind or world-leading researchers to develop health sciences.

### Pharmaceutical Sciences to Improve Human and Welfare through Drugs Challenge to Post-Genome Science in the 21<sup>st</sup> Century

Drugs and human being have long shared a mutually beneficial relationships.

Humans have experienced, chosen and used natural drugs derived from animals, plants and mineral for several thousands of years. The 20th century was the era when fine chemistry developed remarkably on the basis of organic chemistry and physicochemistry, which resulted in the dramatic improvement of technology to produce novel drugs successfully.

In addition to such chemical pharmaceutical sciences, biopharmaceutical sciences are necessary to understand pathological condition and medicinal effects on the molecular level, which help us explain how drugs and their targets interact in the body.

Furthermore, development of biotechnology makes it easy to prepare large amounts of physiologically active substances whose concentration in vivo might be extremely low.

However, there are still many diseases that are difficult to cure with drugs: these intractable diseases include not only cancer and AIDS, but also hypertension, heart disease and diabetes, in addition to senile dementia. People long for specific medicines prescribed towards these inveterate diseases. Since the entire human genome has been deciphered, we will hopefully be able to unveil the function of each gene and molecular basis of pathophysiology.

Such rapid evolution of genome science further assists the revolutionary advancement of drug development. Novel research fields, such as computer-



based molecular design, genome informatics, and drug delivery systems will also accelerate it.

Moreover, pharmaceutical sciences are expected to solve various environmental problems, since chemicals in our environment and ecology are closely related to human health. Thus, the pharmaceutical sciences will be a very attractive study area for coming generations willing to contribute to the health and welfare of human beings. Finally, it should be noted that we started two new Departments in our Faculty in 2006: one, the "Department of Pharmacy" where future researchers in the field of medical pharmacy and pharmacists are educated, and the other, "Department of Pharmaceutical Sciences" that trains specialists who can take active roles in various areas with their knowledge of drugs.



### Individual Guidance to Meet the Needs of Students from Abroad Studying with Students from a Broad Range of Nations

Every year there are about 20 students from about ten nations, mainly in Asia, studying at the School of Pharmaceutical Sciences. Over 90 percent of these students are in the Graduate School, pursuing research in their respective fields. Individually supported by Japanese students as tutors, they engage in the research activities as a member of the laboratory.

The supervisors of each student emphasize individual support to meet each student's objectives and wishes.

At the same time, there is a need to provide a common education in an efficient manner, and the School of Pharmaceutical Sciences International Students Committee was formed to handle education programs for the students from abroad.

Supervisors provide advice in Japanese on the



research conducted by students starting at the preparation stage of a thesis. The students present the results of their research in Japanese, and this is followed by a discussion by instructors and students. In this way, they learn how to write their theses and discuss, all in Japanese.

There are also research seminars and discussion held in English by instructors of researchers. The aim is to allow those students, whose ability to use Japanese is limited, to acquire advanced knowledge about pharmacology efficiently through education in English, the international language.

The School of Pharmaceutical Sciences hopes to further expand the circle of international exchange by attracting students from not only Asia, but a broader range of nations.

At present the School has signed exchange agreement, on the faculty level, with the College of Pharmacy of the University of Arizona, in the U.S.A., with which there is an active exchange of students and researchers, and seminars and symposiums held in each location.



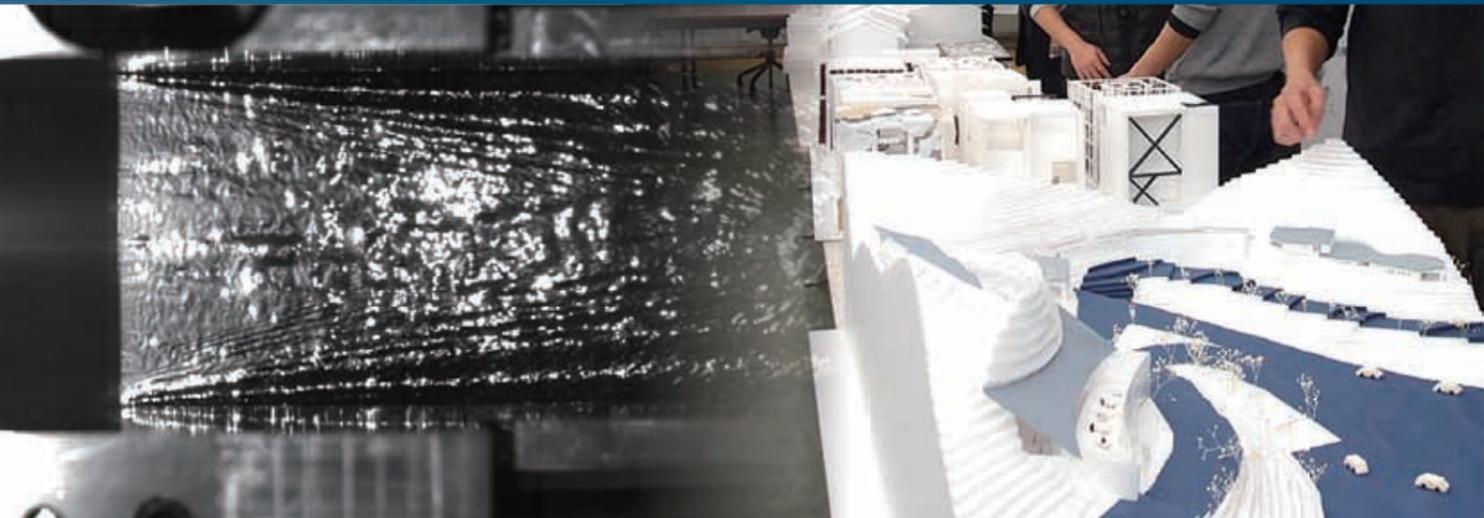
# Engineering

## School of Engineering

- Applied Science
- Mechanical, Materials and Manufacturing Science
- Electronic and Information Engineering
- Sustainable Energy and Environmental Engineering
- Global Architecture

## Graduate School of Engineering

- Advanced Science and Biotechnology
- Applied Chemistry
- Precision Science & Technology and Applied Physics
- Adaptive Machine Systems
- Mechanical Engineering
- Materials and Manufacturing Science
- Electrical, Electronic and Information Engineering
- Sustainable Energy and Environmental Engineering
- Global Architecture
- Management of Industry and Technology



The School of Engineering of Osaka University has a history of more than hundred years and has grown and sent a number of students into the society who are now playing a leading role in the various fields of academic and commercial worlds in Japan and abroad. The School and the Graduate School have trained and provided students and faculty members with unique personalities and outstanding originality.

In order to help the School and the Graduate School develop to be a worldly finest class institute, both faculty members are diligently working to achieve the following three visions: (i) Trustworthy education (ii) Unparalleled intellectual achievement (iii) Contribution to society through education and research appreciated by society.

## The School of Engineering

The School of Engineering is composed of five divisions listed herein: Division of Applied Science; Division of Mechanical, Materials, and Manufacturing Science; Division of Electronic and Information Engineering; Division of Sustainable Energy and Environmental Engineering; and Division of Global Architecture. These divisions are subdivided into several departments by particular academic field.

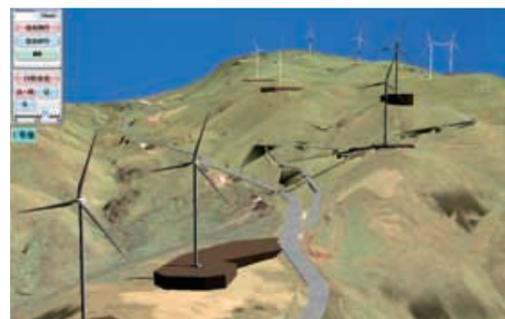
In order to educate students for cultured persons, who have a deep expertise and wide range of useful knowledge, various educational programs are planned, prepared, and provided. Fresh students in each division study one year in a general educational course. Then, students join in a department of each division at the beginning of the third semester (Note: The Division of Sustainable Energy and Environmental Engineering is not subdivided.) and study in a more specialized course. When the students reach the fourth year, each student joins in a research group and begins for his or her graduation thesis.

The School of Engineering offers a special English course (the Chemistry-Biology Combined Major Program). After

graduation, most of students remain in their departments and go up to their related divisions available in the Graduate School of Engineering in Osaka University.



Radiation survey in decontamination site in Fukushima



Virtual Reality Simulation of Wind Power Plants Using Sound and 3D Animated Graphics

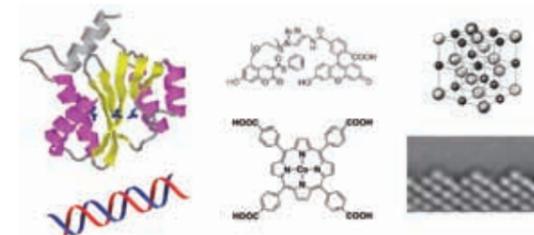
## The Graduate School of Engineering

The Graduate School of Engineering aims to educate and produce a creative type of researchers and advanced level engineers who have attained a very high level of specialized knowledge. The Graduate School of Engineering has following ten divisions.

- (1)The Division of Advanced Science and Biotechnology provides a wide spectrum of advanced research and educational opportunities in newly developing interdisciplinary research fields encompassing biology, chemistry and physics.
- (2)The Division of Applied Chemistry aims at cultivating students' creativity and originality and makes them acquainted with comprehensive chemistry and adjacent fields.
- (3)The Division of Precision Science & Technology and Applied Physics covers interdisciplinary fields of advanced science and technology, such as surface science and technology, device

physics, nanomaterials, nanophotonics, nanoelectronics, and nanobioengineering and provides an education to produce graduates who can lead science and technology in academia and industries. (4)The Department of Adaptive Machine Systems has an integrated education-research program to develop advanced products and systems with adaptive intelligence and functions in materials science, device engineering, manufacturing science, mechanical engineering and robotics. (5)The Division of Mechanical Engineering aims at developing technologies, such as robotics, micro-machinery, low-emission vehicle and aerospace engineering, thereby resolving safety, security and human-related issues such as global environment, energy, medical-care and welfare. (6)The Division of Materials and Manufacturing Science offers both basic education and field leading research into the physical and chemical properties of materials, the development of new structural/smart materials, and their processing and recycling, and into advanced design/manufacturing systems. (7)The Division of Electrical, Electronic and Information Engineering conducts advanced and creative research/education in the areas of system engineering, control and power engineering, advanced electromagnetic energy engineering, information and communication technology, and quantum electronic device engineering. (8)The Division of Sustainable Energy and Environmental Engineering is intended to conduct education and research for environmental engineering and nuclear engineering which support the sustainable civilization of human society. (9)The Division of Global Architecture consists of departments of the naval architecture and ocean engineering, civil engineering, and architectural engineering and seeks the technology and design for sustainable development, national land conservation and development of marine resources and transportation. (10)The Department of Management of Industry and Technology aims to cultivate next-generation leaders and/or managers who can cover processes through engineering to business and enhance the company's global competitiveness. By the collaboration with the Graduate School of Economics, the department offers a special course to take double major master degrees of engineering (ME) and business administration (MBA) in 3 school years.

Some divisions have unique programs for international

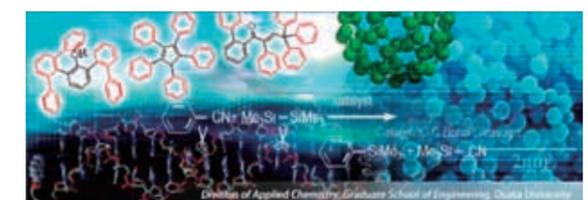


Advanced research in biology, chemistry, and physics

Field Survey on Dug Pool Eroded and Formed by Tsunami Flood



students. There are four English courses (Biotechnology Global Human Resource Development Program, International Priority Graduate Program of "Quantum Engineering Design Course", International Course of Maritime and Urban Engineering for Master's and Doctor's Degrees, "Erasmus Mundus Course (MAPNET: MASTers on Photonic NETWORKS Engineering)" international program for Master's Degree). International Student from Asia to seek for Master's degree as career development fits well in an Advanced Educational Program in "Career Development" offered by Department of Management of Industry and Technology aimed at learning Japanese business and culture through case studies and on-the-job type internship programs at Japanese companies.



## International Academic Exchange and visiting international students in the School of Engineering and the Graduate School of Engineering

As of May 2014, a total of four hundred and sixty five international students have stayed at the School and the Graduate School of Engineering, and the School has established the Inter-Faculty Academic Exchange Agreements with seventy two universities to promote mutual international exchanges. The Center for International Affairs offers supports and advice for international and Japanese students who wish to study abroad. It conducts three Japanese language courses: "Scientific engineering in Japanese for presentations", "Scientific engineering in Japanese for writing research papers", and "Survival Japanese language Course". "English for Engineering" course is also offered to develop students' international communication skills.

# Engineering Science



## What is the Graduate School of Engineering Science? Where is the Graduate School of Engineering Science going?

Since its foundation in 1961, our faculty has continuously created interdisciplinary research fields congruent with social needs, and has made a great contribution to academy and industry through research and education, emphasizing our cardinal motto : “The faculty, aiming at devoting the fundamental developments of technology through a fusion of science and engineering, contributes to the creation of the true culture of mankind”.

In April 2003, the Graduate School of Engineering Science started its new history. All departments were comprehensively reorganized into three new departments: Materials Engineering Science, Mechanical Science and Bioengineering, and Systems Innovation, in order to adjust and contribute to new frontier and future research fields in the multi- and inter-disciplinary areas. The new, challenging themes of these three departments are “fusion of physics and chemistry”, “fusion of bioengineering and mechanics”, and “fusion of humanity and engineering”, respectively, with a strong faculty-driven orientation in multidisciplinary research and education.

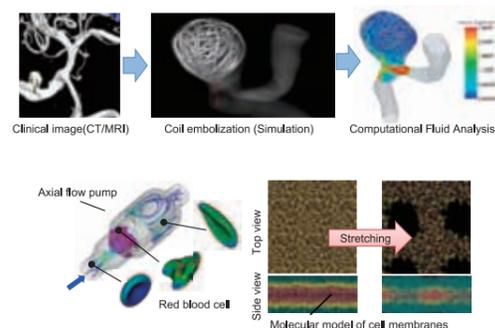
The School of Engineering Science has ten courses and provides a characteristic curriculum based on basic subjects (mathematics, physics, chemistry, biology, informatics) for cultivating wider viewpoints and the flexibility to foster new ideas.

### Fusion of Chemistry and Biology

Living organisms are made up of various organic molecules, and life is a series of chemical reactions. Professor Iwai's group in the Division of Chemistry, the Department of Materials Engineering Science, is aiming at elucidation of various phenomena of life from a viewpoint of chemistry. Molecular recognition and reaction mechanisms of nucleic acids and proteins, especially in the field of DNA repair, are major subjects, and applications of the findings to the development of functional molecules that can be used for medical research are also intended. Based on several original methods of DNA synthesis, many collaborative studies with domestic and foreign research groups have been conducted. Approximately 15 students, including an overseas student belonging to the Osaka University Chemistry-Biology Combined Major Program, are actively involved in the research projects.

### Computational biomechanics

Biomechanics is a multidisciplinary field that links mechanics and biology, which is applied in medicine as well as in engineering such as biomimetic design. Recent advances in computational approach have enabled to simulate mechanical behaviors of biological



systems at various scales from cells to organs. In order to understand the underlying interactions between mechanics and biology in the multiscale system and how mechanics contributes to regulating physiological functions, it is essential to develop the modeling and simulation methodology to link the computational analyses with the experimental and clinical observations. Professor Wada's group in the Department of Mechanical Science and Bioengineering is developing various computational approaches including image-based simulation to assist the clinical diagnosis and treatments in the cardiovascular and the respiratory systems, rule-based simulation to predict the progression of vascular diseases, and molecular dynamics simulation to reveal the mechanism of membrane rupture by mechanical stresses.

### School of Engineering Science

- Electronics and Materials Physics
- Chemical Science and Engineering
- Systems Science
- Information and Computer Sciences
- Electronics
- Chemistry
- Mechanical Science
- Computer Science
- Materials Physics
- Chemical Engineering
- Intelligent Systems Science
- Software Science
- Biophysical Engineering
- Mathematical Science

### Graduate School of Engineering Science

- Materials Engineering Science
- Mechanical Science and Bioengineering
- Systems Innovation
- Electron Correlation Physics
- Mechanics of Fluids and Thermo-fluids
- Solid State Electronics
- Quantum Physics of Nanoscale Materials
- Mechanics of Solid Materials
- Advanced Quantum Devices and Electronics
- Synthetic Chemistry
- Propulsion Engineering
- Optical Electronics
- Molecular Organization Chemistry
- Mechano-informatics
- System Theory
- Chemical Reaction Engineering
- Biomechanical Engineering
- Intelligent Systems
- Environment and Energy System
- Biophysical Engineering
- Mathematical Modelling
- Bioprocess Engineering
- Biomedical and Biophysical Measurements
- Statistical Science
- Frontier Materials
- Mathematical and Statistical Finance
- Dynamics of Nanoscale Materials
- Theoretical Systems Science

### Statistical Science

Professor Shimodaira in Division of Mathematical Science is working on statistical science, machine learning, and bioinformatics. His laboratory and neighbor labs constitute one of the largest research groups of statistical science in Japan, covering wide range of research fields including data science and mathematical and statistical finance. In particular, he has been working on a computer simulation method, called bootstrap resampling, for assessing confidence level of complicated data analysis. He proved mathematically a unique theorem bridging the two statistical approaches, called Bayesian and frequentist. The new statistical procedure turned out to be very useful in analyzing DNA sequences, and the four key papers have been cited more than 6000 times world wide, mostly from life sciences. Another challenging topic in his lab is statistical analysis of complex networks. Students from Bangladesh and Vietnam, as well as past students from China, Korea and Canada, play important role in his lab.

- ✓ Development of THz frequency domain spectrometer for protein dynamics
- ✓ Understanding of mechanism in megakaryocytic differentiation of hematopoietic stem cell for enhanced platelet production
- ✓ Development of system for real-time sensing of oil/gas spill in deep water
- ✓ Development of Mechano-Biomicrowide and its Application for Stem Cell Culture
- ✓ Development of new catalytic system by using cooperative effect
- ✓ Development of Functionalized Biomimetic Molecules Based on Nucleic Acid Aptamers
- ✓ Development and application of the real-time local chemical stimulation system for cell analysis
- ✓ 3-D Surface Reconstruction from a Sparse Point Set Based on Texture Synthesis
- ✓ Direct Observation of Channel Region of Electrical Double Layer Transistors
- ✓ Experimental study on external-field control of crystal chirality

### Multidisciplinary Research Laboratory System for Future Developments (ΣMRL)

With its rich experience in developing newly emerging interdisciplinary fields, the Graduate School of Engineering Science established in 2002 a unique system called the Multidisciplinary Research Laboratory System for Future Developments (MIRAI LAB) which supports and incubates various research projects which are aimed at the future development of creative research fields as well as the education of young researchers and engineers with global standards of knowledge and expertise in these fields, in cooperation with conventional basic engineering science. Selected research projects in 2013 are:

- ✓ Towards a hub of activities for research and education on mathematical and statistical finance
- ✓ Formation of Research Center for hierarchical material dynamics by ultra-broadband spectroscopy
- ✓ Creation of New Current in Materials Research based on Bulk Material Synthesis
- ✓ Homogeneous Multi-metal Catalysts with Metal-metal Cooperative Interaction
- ✓ Developments of bio-tools composed of living cells and evaluation technologies using them for drug discovery research
- ✓ Development of rare-metal free white light-emitting diodes based on silicon nanomaterials
- ✓ Development and application of big data analysis based on information-theoretical hierarchy

### Worldwide Interdisciplinary Course in English for International Students

The Graduate School of Engineering Science welcomes not only researchers from overseas universities but also students from overseas to whom the Graduate School offers Master and PhD Courses (full-time) taught in English, as well as short-stays as internship students for a couple of months or semesters (FrontierLab program and short-stay program supported by JASSO). For promoting the acquisition of a cosmopolitan outlook and improving the communication ability of Japanese students, all departments provide a series of lectures and colloquia in English and a short-visit program supported by several financial sources such as JASSO and JSPS.

Our School's international activity is carried out by increasing the number of Academic Exchange Agreements with more than 30 Internationally distinguished Universities in Germany, France, U.S.A., China, and so on; are involved in international collaboration, and a lot of students are studying abroad for short-term with in this tuition-free exchange scheme.

The international students currently enrolled in the Graduate School of Engineering Science represent 24 nations from around the world. The Advisement Office for International Students of the School of Engineering Science offers consultations and support services to the students in their daily life and studies, and holds a variety of events every year.

It is our hope that all students studying here will grow up to be leaders accepted worldwide.

# Language and Culture

## Graduate School of Language and Culture

- Language and Culture
- Comparative Studies in Language and Culture
- Systems in Language and Culture
- Interdisciplinary Cultural Studies
- Language and Communication
- Education in Language and Culture
- Language and Information Science
- Language and Cognitive Science
- Language and Society
- Area Studies of Language and Culture
- Professional Course
- Japanese Language and Culture



## Expanded and Reorganized in 2012

The Graduate School of Language and Culture was established in 1989 as the first graduate school in Japan that specializes in this field. It was expanded and reorganized into seven courses in 2005. In 2007, to better adapt itself to social changes in Japan and the world at large, the School was extended to two divisions. The newly established Division, the Division of Language and Society, has its origin in the Graduate School of Integrated Studies in Language and Society, established in Osaka University of Foreign Studies in 1997. In 2012, the School was expanded and reorganized into three divisions, with the new Division of Japanese Language and Culture.

## Admission of International Students

The Graduate School of Language and Culture opens its door widely to international students so that it will produce high-level professionals and researchers who can meet the demands of the world of the 21st century, which will no doubt be characterized by intensifying globalization on one hand, and multi-linguistic and multiethnic social environment on the other. International students admitted to the School numbered 160 in 2012, 163 in 2013 and 169 in 2014, with students from Asian countries constituting the majority.



## Fusion of Linguistic and Scientific Research, Language and the Human Mind

One of the most important research programs pursued at the Division of Language and Culture is to explore relationships between language and the human mind, with a special reference to cognitive linguistics.

It is also a leading institution in corpus linguistics. It investigates various aspects of language by using computers to process an enormous amount of linguistic data.

Among the related areas of research are theoretical and applied linguistics, communication studies, sociolinguistics, and information sciences of language.

## Navigating between Globalization and Localization Pioneer Studies in Language and Culture

An equally important research program of the Division is to investigate the complex relationships between language, culture and society in the present-day world.

The world of today involves a tension between two forces: on the one hand, its culture is becoming more uniform and homogeneous under strong influences of globalization, but on the other hand, multi-linguistic and multi-ethnic tendencies are being accentuated in many parts of the world. In order to face up to these problems, and to explore the productive ways to overcome them, the Division of Language and Culture is engaged in various educational and research programs, such as Language and Culture in International Relations, Comparative Studies in Language and Culture, Transnational Cultural Studies, Gender Studies, and Media Studies.

The main objective of the Division of Language and Society is to explore languages of the world and cultures and societies based on these languages. Its two courses aim to pursue an advanced study in this field, to facilitate students' research, and moreover, to provide them with high professional skills.

Area Studies of Language and Culture focuses mainly on two areas—Asia and Africa, and Europe and America. Faculty specializing in these areas investigate a variety of subjects taking a world-wide



and interdisciplinary perspective: foreign languages, cultural representations, language and cultural resources, and languages and societies. The course gives a prominent research opportunity to students who hope to follow their academic goals.

Professional Course is intended for English and Chinese teachers currently working in secondary education. It aims to equip teachers with both up-to-date academic scholarship in relevant fields and communicative fluency in the language they teach.

The Course of the Japanese Language and Culture Division comprises research and education in these



fields. It encourages students to acquire knowledge and skills for effective performance in academic and professional fields. It also aims to create human resources who can transmit and convey Japanese language and culture. The course offers a wide range of subjects such as a Special Seminar in Japanese Language and Culture.

## Toward the Innovation of Education in Language and Culture

Another important activity of the Graduate School of Language and Culture is to explore new frameworks and methodologies for education in language and culture, and to put them into practice. On the basis of the researches mentioned above, the School seeks to provide new perspectives and methods of language education (for example, computer assisted language education and e-learning), and to put them into practice in language classes given to the students of Osaka University. All of the staff members of the School participate in language teaching in the University.



# International Public Policy

Osaka School of International Public Policy

– International Public Policy

– Comparative Public Policy



## OSIPP Offers a Unique Program Designed to Train Students to Become Policy Experts and Skilled Professionals

The Osaka School of International Public Policy (OSIPP) was founded to facilitate research on issues and policies that transcend national, cultural and any other kinds of boundaries that divide us, and on the actions that will be necessary to preserve the lives and aspirations of people around the world. Another mission of the School is to foster the development of policy experts and skilled professionals who are dedicated to improving public welfare at all levels, from the local to the global. We train our students to acquire cross-disciplinary knowledge and advanced analytical capabilities to resolve complex social problems, in ways that are creative, level headed, and empathetic to the situations of others.

### Producing Future Leaders

Knowledge and ideas that go beyond the conventional framework of existing disciplines are indispensable qualities for meeting the demands of a rapidly advancing borderless world, and for solving increasingly complex international problems. It is the mission of OSIPP to train students to become professionals with specialized knowledge and leadership skills to meet these demands, and to carry out path-breaking interdisciplinary research. OSIPP brings together academic staff specializing in both theory and applied knowledge, as well as representatives from international organizations, government, the media and private think-tanks, in order to educate students and researchers to become active leaders in the international arena. In addition to core courses where students obtain a basic knowledge and understanding of methodologies, and seminars on more concrete topics, OSIPP offers classes which focus on providing students with hands-on learning experience.



Examples of such hands-on classes are a negotiation class where students actually practice negotiation skills through case studies, a class where project implementation and leadership in organizational operations are addressed both theoretically and practically, and a class for obtaining internship experience.



### Flexible Curriculum

Two majors are currently offered: International Public Policy and Comparative Public Policy.

The International Public Policy major is committed to research and education covering public policy matters in the international community, such as law and diplomacy, international politics and security, human rights, international finance, trade and economy, development and environmental issues.

The Comparative Public Policy major focuses on research and education relating to a comparative analysis of the international community, as well as policy issues that are relevant to Japan's political, legal, and economic systems. Students, regardless of their major, are free to choose their supervisor and courses from among the array of professors and courses from either major. Credit exchanges with other graduate schools of Osaka University and with other universities (universities who are party to academic exchange agreements) are also available. For the OSIPP entrance examination, students are required to demonstrate English proficiency, submit a written research proposal, and be interviewed by faculty members. Enrollment for the Master's and Ph.D. programs is held in April, although Ph.D. students are also permitted to enter in October.

### Academic Staff

The faculty members of OSIPP are active in the academic world and renowned in their respective fields.



They have diverse academic backgrounds, such as economics, international politics, law, foreign studies, public policy and sociology. Many of them have work experience at international organizations. OSIPP not only works closely with the Graduate School of Law and Politics, the Law School, the Graduate School of Economics and the Institute of Social and Economic Research of Osaka University, but also actively invites professional staff from institutions outside the University, such as international agencies and academic institutions overseas. Most faculty members are able to give lectures in English.

### Diverse Students and Their Career Options

OSIPP takes on students from a variety of fields, backgrounds, ages and research interests. In addition to students who are fresh from Osaka University's undergraduate programs, there are those with vocational experience who seek to obtain a higher level of expertise, and those from other domestic and overseas universities. About one-third of OSIPP students are from overseas. Students are highly motivated, possessing an acute sense of awareness of the issues that they confront, and have a clear sense of purpose. They take an active interest in fieldwork, internship programs, NGO/NPO activities, and opportunities to study abroad.

OSIPP graduates pursue their careers in a variety of areas: academic institutions, international organizations (United Nations agencies and the World Bank, for example), central government ministries and government-related agencies, think-tanks, mass media, foreign-affiliated companies and private corporations. There are also many graduates who study abroad, or work for non-governmental and non-profit organizations.



# Information Science and Technology



## Advanced information society rapidly taking shape in 21st century

As the advanced information society rapidly takes shape in the 21st century, this opens the way for people to engage in a much wider range of social activities. To support these developments, the Information Technology (IT) field must break out of its old academic constraints and create new technologies and systems that support the transformation to a new society. More specifically, a strong demand has emerged for a fundamental updating and reform of the curricula and coursework in these areas.

### Graduate School of Information Science and Technology

- Pure and Applied Mathematics
- Combinatorics
- Applied Geometry
- Discrete Structures
- Applied Analysis
- Mathematical Science
- Computer Assisted Mathematics
- Information Systems Engineering
- Integrated System Design
- Information Systems Synthesis
- Integrated Systems Diagnosis
- Dependability Engineering
- Integrated Media Environment
- Advanced System Architecture
- Bioinformatic Engineering
- Genome Information Engineering
- Metabolic Engineering
- Bio-System Analysis
- Symbiotic Network Design
- Human Information Engineering
- Information and Physical Sciences
- Operations Research
- Nonlinear Systems, Modeling and Optimization
- Information Photonics
- Systems Engineering
- Architecture for Intelligence
- Information Networking
- Advanced Network Architecture
- Intelligent Networking Systems
- Information Sharing Platform
- Mobile Computing
- Ubiquitous Network
- Cyber Communication
- Computer Science
- Algorithm Engineering
- Software Design
- Software Engineering
- Supercomputing Engineering
- Intelligent Media Systems
- Multimedia Engineering
- Multimedia Data Engineering
- Information Security Engineering
- Big Data Engineering
- Business Information Systems
- Applied Media Engineering
- Multimedia Agent Systems

### Research Topics:

By providing high-quality research and education, the graduate school aims to advance the fields of information and network technologies. One of the mottos of our school is the fusion of life science and information technology, where advanced information science and technologies are developed by learning from living organisms; in other words, we aim to explore “bioinspired information technology.” Toward achieving this motto’s ends, we conducted the Global COE program entitled “Center of Excellence for Founding Ambient Information Society Infrastructure,” the Formation of Innovation Centers for the Fusion of Advanced Technologies and then have promoted several projects. The projects include the ERATO (Exploratory Research for Advanced Technology) project entitled “YOMO Dynamical Micro-scale Reaction Environment” and the Information and Neural Research Project at the Center for Information and Neural Networks which have been established by Osaka University, NICT (National Institute of Information and Communication Technology) and ATR (Advanced Telecommunications Research Institute International).

The establishment of an ambient information society is approached as a central theme of our work. In the ambient information society, not only can the user access information in a flexible manner, as in the ubiquitous information society, but also can the environment’s computers provide the desired information to the user according to his/her circumstances (i.e., current time, place, and personal preferences). For example, information systems in such a society could provide guidance to users to help them avoid dangers and hazards. To realize such a society, sophisticated breakthrough technologies are needed to tackle the expected technological challenges. As a result of five year initiatives, the Global COE program developed a set of ambient information environment prototypes, i.e. context-aware ambient information accessing, ambient office,

communication assistance by ambient room, etc. Now we are leveraging the observations and results and working toward Humanware Innovation by combining knowledge of IT, bio, and robotics fields.

In addition, many of specialized research projects have been coordinated in the graduate school including a CREST project entitled “Harmony of Groebner Bases and the Modern Industrial Society.”

### Education Principles:

The graduate school offers curricula with the following strengths:

- (1) The curricula broadly cover studies from math-related basic theories to advanced application technologies and include various information media as the target, covering a range from hardware and software to the content itself.
- (2) The curricula give full attention to the human interface based on advanced IT, such as multimedia engineering, and bioinformatics engineering.
- (3) The curricula fully address various social issues inherent in the cyber society supported by advanced information networking technologies.

Based on the above academic strengths, we have been conducting high-level education programs. These include the Fostering Advanced Human Resources in Information and Communication programs entitled “Cloud Spiral: Cloud Specialist Program” and “IT Keys: IT specialist program to promote Key Engineers as security Specialists.”

We newly launched “Humanware Innovation Program” in cooperation with Graduate Schools of Frontier Biosciences and Engineering Science under MEXT Leading Program in Doctoral Education. We foster leaders who can create a paradigm shift toward productive and sustainable directions by bridging information science, life science, and cognitive science and cultivating new arenas of research.

# Frontier Biosciences

## Graduate School of Frontier Biosciences – Frontier Biosciencesics

- Nanobiology
- Organismal Biosystems
- Special Research Promotion Group
- Biomolecular Networks
- Neuroscience
- Biomedical Engineering
- Integrated Biology
- Biophysical Dynamics
- Collaborative institutes (Immune Regulation)



Life is much more than just an assembly of its components. Their dynamic interactions are crucial for many complex systems like our genetics, mechanisms of development, immune system, and brain.

Our graduate program looks to give greater understanding to these systems by bringing together researchers from biology, medicine, physics, engineering, and other fields with the greater aim of producing the leaders in the next generation of life science research. To facilitate the research and education in our school, we have started extensive collaborations with two outstanding research organizations, National Institute of Information and Communications Technology (NICT) and Institute of Physics and Chemistry (RIKEN).

## Fusion of Diverse Disciplines from Nanobiology to Brain Science

Graduate School of Frontier Biosciences is a new graduate school dedicated to advancing forefront of life sciences.

Established in April 2002, the school has assembled, from within and outside Osaka University, top-level researchers and educators who are experts in a wide variety of disciplines, including medicine, biology, physics, and engineering. The creation of the new department is based on our strong belief that humans and animals are not merely a simple aggregate of genetic materials, molecules, and biological structures. It is rather an ever-changing complex dynamical system, whose understanding necessitates a true interdisciplinary systems approach. Graduate School (and Department) of Frontier Biosciences consists of 6 main groups of laboratories, and affiliated laboratories. The graduate program in Frontier Biosciences offers a unique 5-year intensive training culminating in a doctoral degree upon successful completion of the program. Our goal is to nurture students and scientists in our active research environment so that they become fully equipped for taking biosciences to the next height.

The school approaches its research by seeing life as an ever-changing complex dynamical system whose understanding necessitates a true interdisciplinary systems approach. From an education perspective, the FBS offers its students and scientists in an active and fully resourced research environment so that they are prepared to take the life sciences to its next height.

All life is composed of basic biological elements like nucleic acids, genes, proteins, and membranes. Over several decades, our understanding of the life sciences has greatly advanced by bringing together an assortment of different fields including genetic engineering, molecular biology, physiology, and medicine. The next stage is to clarify how these different elements dynamically interact and change to establish the diverse and complex function seen within all biological systems.

For this, a new framework for life sciences research is needed. The FBS has broken this task into three: understanding the function of individual biological systems; understanding the basic properties of the elements involved in these systems; and clarifying how the environment helps determine function. To achieve this, the FBS puts an emphasis on quantitative fields like physics and engineering, along with traditional biological fields. The school, therefore, has brought in the best minds from the life and physical sciences to create a new standard for research and education.

In this regard, the school is composed of seven core research themes, with several other complementary ones. The Ph.D. program, which normally takes five years, is designed so that a student becomes proficient in different fields ranging from medicine to engineering in order to become a leader for the next generation of researchers. Like our teaching staff, we recruit students with undergraduate (and sometimes graduate) backgrounds of many different fields. To ensure multidisciplinary training and research, each student chooses multiple advisors from different disciplines to provide a broad training in diverse research areas, although their research is concentrated in one laboratory. We are also emphasizing collaboration with industry to help prepare our students for careers outside the university by interacting with industrial researchers, developing various industrial liaison programs, and soliciting endowed chairs.

The FBS aims to an international leader in the life sciences in two ways. First and foremost, it seeks to understand how dynamic interactions between different elements and environments lead to life. This shall be achieved by our second goal, which is to develop new techniques and technologies to accomplish this first goal. To do this, we need a mix of different people, both in terms of education and cultural backgrounds, to foster an ambitious and collaborative scientific environment.

# Law School

Law School - Legal Practice



Osaka University Law School (OULS) is designed to educate professional lawyers. The school not only provides profound legal instruction to its students, but also educates them for broader attainments in society and culture, for working ethically and enriching humanity. Furthermore, OULS emphasizes the training of business lawyers with profound knowledge of culture, society, ethics, and humanity.

## One of the Nucleus Educational Institutions for Japan's Judicial Reform

The increasing number of lawsuits in Japan shows that the Japanese have come to rely on legal procedure to settle their disputes as much as the Americans. In addition, the complexity and diversity of these actions necessitate legal professionals playing an important role. Despite the increasing demand, lawyers who have enough ability and expert knowledge are in short supply, and such shortage has caused delays in many suits. To supply sufficient quantity and quality of legal specialists to meet the diversifying demands of the society, Osaka University Law School (OULS) is designed to educate professional lawyers.

## Fairness and Diversity

Since its establishment in 2004, OULS has not only provided profound legal instruction to its students,



but also educated them for broader attainments in society and culture, strict ethics and rich humanity. The number accepted each year is 80. A part of them belong to a 3-year study course while those who have already earned the law degree belong to a 2-year course. For admission, there is no restriction on age, profession, and knowledge of law. Whether an

applicant has graduated from the Law Faculty or not, any university graduate can apply for admission.

## Curriculum Designed for Systematic Learning

The curriculum is composed of four courses: "Basic Law Courses", "Basic Courses in Legal Practice", "Fundamental Legal Study and Adjacent Courses", "Advanced Courses". The "Basic Law Courses" provide students with the fundamentals of law, such as constitutional law, administrative law, civil law, criminal law, commercial law, civil procedure law, and criminal procedure law. The "Advanced Courses" and the "Fundamental Legal Study and Adjacent Courses" give students diverse knowledge, which has not been covered by the "Basic Law Courses". The "Basic Courses in Legal Practice" are designed to put the theory into practical use. Students can study each category systematically. Moreover, the curriculum, throughout the study of the basic subjects, is well designed to provide enough legal knowledge to those who study law for the first time. Subsequently, abundant practical education will improve the student's legal skills.

## Educating Business Lawyers

The most noteworthy characteristics of the curriculum of OULS are the following: All lessons are conducted by the Socratic Method in small classes. Basically, all classes are limited to less than 50 students. These classes are not simply one-way lectures, but interactive discussions between professors and students (Socratic Method). Therefore, our lessons have high efficacy in legal training. Besides, in order to introduce the latest outcomes of study into the education, OULS cooperates with the Graduate School of Law and Politics of Osaka University and Osaka School of International Public Policy. OULS emphasizes the training of business lawyers. Taking advantage of the geographic feature of being located in one of the most prosperous commercial areas in Japan, the School arranges various subjects requiring solution of legal matters, which occur during the foundation, operation, and dissolution of a corporation; for example, corporate law, tax law, law on corporate reorganization, intellectual property law, and international transaction law.

In addition, to satisfy the demands of a "legal-



oriented" society, OULS encourages students to acquire professional knowledge. In order to provide practical training, the School has internship programs in law firms or in legal departments of corporations.

## Being in the Spearhead of the New Era

Outside the classroom, ALEC—Center of OULS (Advanced Legal Education and Career Center) has some projects for grappling with up-to date matters. Every year, we hold symposiums and guidance on forehead issues of lawsuits or disputes. These projects can help students to decide on their own direction as a legal expert.

## Success in Bar Exam and in Business

The new bar exam for law school graduate students has been planned to be less competitive than the long-established exam. It is assumed nevertheless to be highly competitive. Succeeding in the new bar exam is, of course, our primary goal.

However, OULS aims to provide students with sufficient legal knowledge and skills whatever legal profession they might choose. Therefore, the students' successful future is the School's final goal.

# United Graduate School of Child Development, Osaka University, Kanazawa University, Hamamatsu University School of Medicine, Chiba University and University of Fukui

United Graduate School of Child Development, Osaka University, Kanazawa University, Hamamatsu University School of Medicine, Chiba University and University of Fukui - Child Development

- Developmental Neuroscience (Osaka University)
- Socio-Cognitive-Neuroscience (Kanazawa University)
- Neuropsychological Development and Health Sciences (Hamamatsu University School of Medicine)
- Cognitive Behavioral Science (Chiba University)
- Developmental Higher Brain Functions (University of Fukui)



One of the most important missions of our society is “To grow up and keep Children’s mind in good health.” However, children face a lot of dangerous situations; Increase of children suffering for mind problems such as developmental disorder, major depression and eating disorder.

To struggle with the problem, Osaka University, Kanazawa University, Hamamatsu University School of Medicine, Chiba University and University of Fukui have united and established the United Graduate School of Child Development, which provides integrated educational platform of arts and science, with the purpose of “nurture of child specialists with diverse backgrounds” and “elucidation of causes of the child’s mind and developmental diseases to develop new remedies for them.”

Finally, we promise to contribute for “Healthy developments of children” by the achievement of our missions; (1) to cultivate researchers specialized in “The Child’s Mind and Developmental Brain Science,” a novel research field, (2) to cultivate specialists with an interdisciplinary background in order to meet the social requirement, and (3) to create tight networks between relevant specialists.

## Mental Health of Children is at a Crisis Point

The biggest challenge of present-day Japan in a time of low birthrates is how to raise children with sound minds. The reality is, however, that children’s mental health is at serious risk of being damaged. Juvenile crimes caused by children with mental damage, suicidal cases from being bullied, and the number of children

with developmental disorders such as pervasive developmental disorders (PDD) or attention-deficit hyperactivity disorder (ADHD) are increasing. Psychiatric disorders like major depression and eating disorders are increasingly common among younger people, and elementary school cases with schizophrenia are reported at a high level.

## Development of Human Resources in a Matched Manner to Social Requirement

In addition to the absolute shortage of the number of specialists in child mental health, these specialists, either psychologists, nurses/health nurses or teachers, deal with problems utilizing their own training and educational backgrounds. There is no formalized way for treating problems of children’s minds; these specialists often lack enough medical knowledge.

In order to overcome these problems, it is most reasonable that we try to re-educate these specialists with an integrated field of study consisting of brain science, psychology and education. However, a



huge obstacle for this education in a given institute is the complexity of mental health and the diversity of specialists required.

This is why Osaka University, Kanazawa University and Hamamatsu University School of Medicine have united and established the United Graduate School of Child Development in 2009, which provides integrated educational platform of arts and science. Our faculty has executed several education and researches with the medical background at the aim of “nurture of child specialists with diverse backgrounds” and “elucidation of causes of the child’s mind and developmental diseases to develop new remedies for them” with invited researchers from the field of social psychology and special support education. In 2012, Chiba University and University of Fukui joined our graduate school to promote our education and research.

The purposes of our reformed graduate school consisted of 5 universities are (1) to cultivate researchers specialized in “The Child’s Mind and Developmental Brain Science,” a novel research field, (2) to cultivate specialists with an interdisciplinary background in order to meet the social requirement, and (3) to create tight networks between relevant specialists.

## The Long-Standing Tradition and Achievement of our Universities

Osaka University, Kanazawa University, and Hamamatsu University School of Medicine are highly rated by long-standing achievements in brain research, the tradition of communicational education in the clinical setting, and the world’s most advanced products about clinical psychiatric research, respectively. Chiba University, newly joined institute, is the only medical facility in Japan where the science based cognitive-behavioral therapy is treated for Child’s mind disorders and University of Fukui, another newly joined institute, is very famous for the education and research about the Child’s depression and the family support for children. The United Graduate School of Child Development was established by the close alliance and cooperation of these five academic institutes, which are located in the metropolitan areas of Kanto, Kinki, Hokuriku, and Toukai districts.

In order to get the best of these five universities, to integrate brain research (utilizing molecular biology, neuroimaging and electrophysiology) and sociopsychological method (based on large-scale epidemiological survey), and to investigate how to make a tight network by which specialists cooperatively care for problems of child mental health, we have created five research horizons: Psychological Support



for Child Development (Osaka University), Human Communication Science & Intervention (Kanazawa University), Social Services for Developmental Disabilities (Hamamatsu University School of Medicine), Mental Health Support & Early Intervention (Chiba University) and Psychosocial Support for Nurturing (University of Fukui). We aspire to the dynamic expansion of our activities from these five bases to all over Japan.

## 3-year Doctoral Course is Started for the Next Leap Forward

The goal of the United Graduate School of Child Development is to cultivate and mentor specialists of child mental health with diverse backgrounds and leading-edge researchers on “the child’s mind, developmental brain and its disturbance” into indisputable leaders via an interdisciplinary field consisting of medicine, psychology and education.

Therefore, admission to our 3-year doctoral graduate school will require students to have obtained a master’s degree in psychology, education, health sciences, nursing science, or social welfare; otherwise, students are required to have comparable work experience as a medical doctor, school teacher, school counselor, nurse, speech therapist, or clinical psychologist.

By graduation, students are expected to have jumped from a specialist in their own background to multidisciplinary leaders.



# Student Voices



My advice for junior fellows who are eager to study in Japan is to be open to new experiences, acknowledge and embrace cultural differences, and work hard, because all of that is going to benefit you in the end. Japan is a very unique and amazing country, and if you're open enough to let its cultural vibes flow through you, I think your time spent here will become the most valuable experience of your life.

## Ekaterina Obsokova

Graduate School of Letters (1st year Master's)  
Russia

Key figures of Osaka University are committed to transforming the education system through university-wide reforms which means things are constantly changing for the better. Our president is striving to make Osaka University a globalized center of scholarship which makes this place an ambitious boat to sail on. In hindsight, as a student privileged to be at one of Japan's top universities at this moment, I am happy to see the change, be part of the change and contribute to the change.

## Varun Khanna

School of Human Sciences (2nd year Bachelor's)  
India



While studying Japanese, my goal became clear. People around the world tend to believe Japanese is a tedious and hard language to learn, but I find it different. Instead of studying how to teach Japanese, I want to perfect a way of learning it, and share it with the world. For that purpose, I have already bought a website, and I think about the Japanese language every day. It never seems to get boring, and I hope to spend the rest of my life sharing my love for the language and its kind country with the rest of the world.

## Johannes Klev

School of Foreign Studies (1st year Bachelor's)  
Norway

I have learnt a lot about Japanese society. The Japanese way of thinking about law took a lot to get used to, especially since I come from a common law country. Listening to the type of Japanese used in lectures, and talking with the Japanese students has broadened my language skills.

## Hayden Needs

School of Law (2nd year Bachelor's)  
New Zealand



My first impression of Osaka University was that it is a place filled with strong international character. Ever since I got enrolled, I have had many chances to meet people from different countries, with different cultural backgrounds and get a glimpse of their interests and ideas. Also, there is always new information about foreign exchange programs, club activities and events, aiming to attract international students.

## Stefan Hadjiev

School of Economics (2nd year Bachelor's)  
Bulgaria

Name  
School/Graduate School at Osaka University (Grade)  
Home Country



The atmosphere at Osaka University opened my eyes to the fact that I have to be grateful and drove me to do something useful for other people by initiating a new activity together with the Indonesian Students Association of Osaka and Nara. It resulted in the creation of a foundation for education and society, named Taiyou Indonesia Foundation (TIF). Our aim is to encourage less fortunate individuals in the younger generations by stimulating them to persevere in their study and to achieve their higher education in order to get better futures.

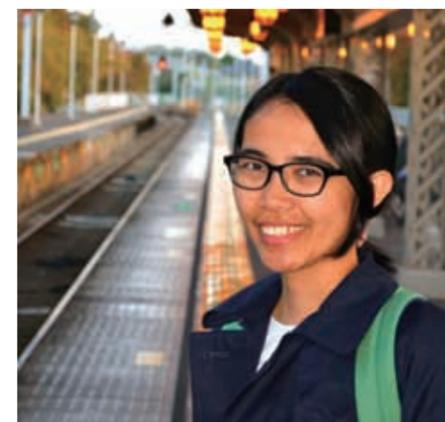
## Murni Handayani

Graduate School of Science (2nd year Doctoral)  
Indonesia

Several times, I attended the Basic Biology Forum of Young Scientists which is held 2 times a year by the Graduate School of Medicine, Osaka University. Fortunately, this year I had an opportunity to participate in the poster session as a poster presenter at that forum. I had nice experiences, to communicate with other researchers and scientists, to develop my way of thinking in doing research.

## Erda Avriyanti

Graduate School of Medicine (4th year Doctoral)  
Indonesia



I can cooperate with those in other medical fields by participating in conferences on radiology, oral surgery and oral pathology. I'm busy every day, but I feel rewarded and motivated in my study of oral pathology.

## Katsutoshi Hirose

Graduate School of Dentistry (1st year Doctoral)  
Japan

# Student Voices



When I came to Japan five years ago, I could hardly speak Japanese. Therefore, I signed up for the six-month intensive Japanese language course offered by Osaka University. I worked hard during the lessons and practiced after class as much as possible. Finally, I can now communicate with Japanese people and enjoy my life in Japan without the language barrier.

## Shubin Qin

Graduate School of Pharmaceutical Sciences (3rd year Doctoral)  
China

With several years study in Osaka University, I am deeply convinced that I will be qualified as an architect, who enjoys the capability to make high-standard designs to protect buildings from earthquakes. Furthermore, in order to spread the Japanese advanced seismic resistance technology to China, I will become the bridge between the Japanese and Chinese construction companies, which will accelerate the advancement in China's anti-seismic development and protect people from the threaten of the earthquakes.

## Xiao Zhai

Graduate School of Engineering (2nd year Master's)  
China



It's been almost 3 years since I came to Japan to start my study as an undergraduate student. I spent one year learning Japanese in Tokyo and moved to Osaka. With little experience about Japanese universities back then I visited some of the top universities here and found out that there was balance between academic and social life in Osaka University. With great number of international students here and a very supportive international student support center, you will find an easy start to begin your life as an international student in Japan.

## Cosmas Adiputra

School of Engineering (2nd year Bachelor's)  
Indonesia

While I was a student at Chimie ParisTech, one of the requirements for the graduation from the master's program was to spend at least 6 months as an intern in a foreign country. Since my university and Osaka University had a very good exchange program named FrontierLab@OsakaU, I decided to come here for 6 months. Now, nearly 4 years later, I am still here as I was given the chance to pursue my research as a Ph.D. student.

## Marine Fayolle

Graduate School of Engineering Science (3rd year Doctoral)  
France



The diverse cultural aspects of Japan and its deeply rooted and still strongly living traditions truly fascinate me. That is the reason why I ended up choosing cultural anthropology as my main field of study. The university offers great facilities to aid the studies of the students. But there is also much to learn outside of the campus. One needs to travel a lot to truly understand a foreign culture, and the University goes great lengths to support that.

## Peter Szalay

Graduate School of Language and Culture (3rd year Doctoral)  
Hungary

Name
School/Graduate School at Osaka University (Grade)
Home Country



OSIPP provides us with a global academic environment, trains us to analyze a public policy issue more critically and fashionably, enhances our ability of critical thinking, and above all, enables us to be sound researchers. All these are significant to me.

## S. M. Ali Reza

Osaka School of International Public Policy (OSIPP) (3rd year Doctoral)  
Bangladesh

I received great support under kind supervision during my research work here, while enjoying top-level experimental devices. My laboratory in Osaka University supported not only my academic activities, but also my life in Japan.

## Jiachen Yang

Graduate School of Information Science and Technology (2nd year Doctoral)  
China



Beyond studying, we can also take part in various activities on campus to really enjoy school life. For example, students can join our tennis club or other sports clubs and can also opt for more traditional activities like Japanese tea ceremony or even join our orchestra. Since I like to communicate and discuss with people from other countries I used to be a member of an English discussion group when I was an undergraduate. There are over a hundred groups focusing on specific activities so I believe you can find something that interests you.

## Mayuka Abe

Graduate School of Frontier Biosciences (1st year Master's)  
Japan

# University Libraries



Osaka University Library has one of the largest university library collections in Japan. The library holds more than 3.9 million volumes and 72,000 periodical titles. We also provide electronic materials for research and education such as e-journals (16,236 titles), e-books (17,443 titles) and databases (more than 40 types). Students and faculties can access these e-resources in campus and off campus.

The Library works on digitalization of the rare and valuable materials collection. For example, we have Kaitokudo Collection, the Akagi Collection, and so on. Kaitokudo is one of the two old schools that the spirit and roots of Osaka University reach back to. Some of the collections are available online.

The Library offers the digital archive of research results of Osaka University, that is OUKA, the Osaka University Knowledge Archive. We provide over 26,000 items, including degree theses and University journals in OUKA.

We have "Learning Commons" in each library (Main Library, Life Sciences Library, Science and Engineering Library, and International Studies Library). Learning Commons is an area which brings together library services, IT services and group learning. Students and faculties can discuss and collaborate there, not only just reading. We also provide staff and Teaching Assistants so that students can find their way on their academic projects. In 2015, group discussion space will be expanded for active learning.



## Main Library

The Library in Toyonaka Campus is one of the largest national university libraries in Japan. It has a total area of 18,930 square meters, over 1,600 seats, and over one million volumes of printed materials.

The Library plays a central role in providing research information. It serves the educational needs of all fields and the research needs of schools in Toyonaka Campus such as letters, law, economics, science, engineering science, etc.

The library has various spaces to support university member's study and research: group study rooms, private study rooms, computer area, silent area, Learning Commons, and Global Commons. The Global Commons, which opened in November 2012, is collaborative learning space for comprehension of multiple languages and multiple cultures. It is equipped with the world news browsing system and electronic blackboards, etc.

## Life Sciences Library

The Life Sciences Library on the Suita Campus was established in 1992 as a general library for biosciences such as medicine and biology. It plays a central role in the provision of academic information in biosciences. Since 1977, it has been serving as a designated library for the National Center for Overseas Periodicals (NCOP). Currently, it has about 18,800 journals, including about 1,000 current titles of foreign journals.

## Science and Engineering Library

The Science and Engineering Library on the Suita Campus, was established in 1970, with the East Building annexed in 1986. It contributes to the education and research activities of the Graduate School / School of Engineering, the Graduate School of Information Science and Technology, and other related research institutes.

The Learning Commons opened in 2009. It provides seamless access to scholarly print and electronic resources and contains a meeting table and whiteboard space for group discussion. In order to support students-led activities, library staff and Teaching Assistants are available for consultation. Library also has enough space for quiet study.

Presently, the Library holds about 422,000 books and 8,600 journals on science and engineering.

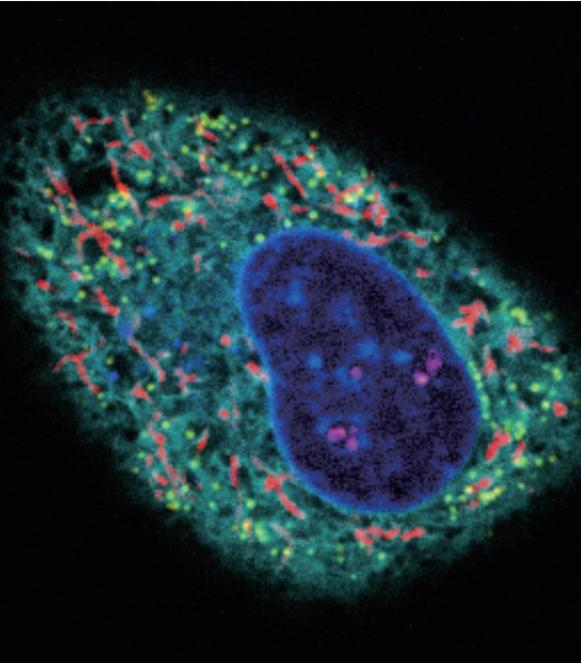
## International Studies Library

The International Studies Library was established in 1921 as Osaka University of Foreign Studies Library. The library was renamed and reorganized after the merger of Osaka University and Osaka University of Foreign Studies in October 2007.

Holding an abundant collection of about 609,000 volumes, it is one of the nation's top libraries in the fields of International studies and linguistics.

"LUX" (The Learning Commons) was opened in April 2012. In the new space with meeting tables, whiteboards, and computers, students can actively discuss and learn in groups.

# Research Institutes



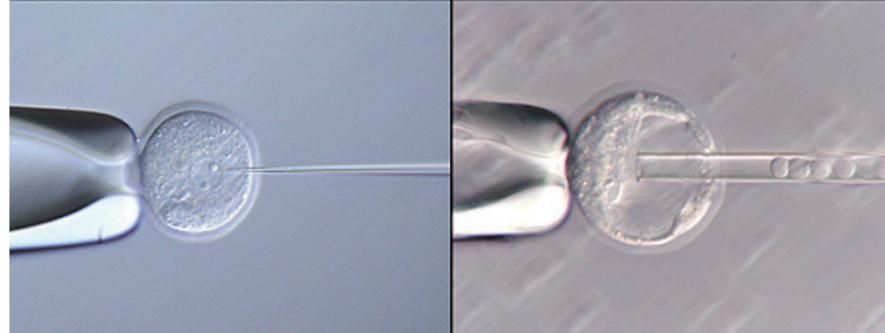
▲ The Institute of Scientific and Industrial Research



▲ Institute of Social and Economic Research

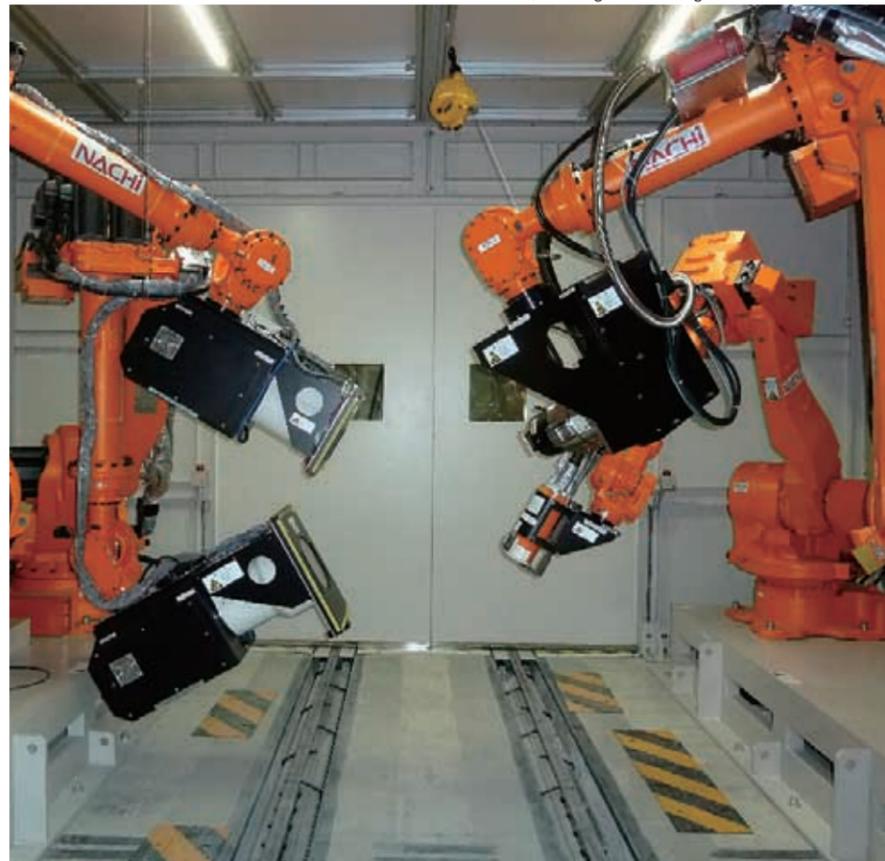


▲ Institute for Protein Research



▲ Research Institute for Microbial Diseases

▼ Joining and Welding Research Institute



## Research Institute for Microbial Diseases

[www.biken.osaka-u.ac.jp/english/](http://www.biken.osaka-u.ac.jp/english/)

The Research Institute for Microbial Diseases was originally established as a five-department "Research Center for Communicable Diseases" in 1934. Basic research on infectious disease, immunology, and cell biology is the Institute's principal focus. The results of research in these fields at the Institute have contributed considerably to the diagnosis, prevention, and treatment of infectious diseases, immunological diseases and cancer, as well as to progress in basic biomedical science. In 2005, the Institute was reorganized to constitute three research divisions that represent 15 departments together with three attached centers for specialized research on infectious disease and genome information. Moreover, the Research Collaboration Center on Emerging and Re-emerging Infections was founded in Bangkok in collaboration with the National Institute of Health, Thailand, to defend people against possible emerging and re-emerging infections. The Institute was selected as "the 21st Century COE programs" on the theme of "Combined program on microbiology and immunology" (2003-2007). The Institute was also selected as "Global COE programs" on the theme of "Frontier Biomedical Science Underlying Organelle Network Biology" (2008-2013).

The Institute accepts and trains Master and Ph.D. candidates in the medical and biological sciences. At present, more than 300, associate, and assistant professors, research associates, graduate students and research fellows pursue studies in microbiology, oncology and molecular biology at the Institute.

## The Institute of Scientific and Industrial Research

[www.sanken.osaka-u.ac.jp/index\\_e.html](http://www.sanken.osaka-u.ac.jp/index_e.html)

The Institute of Scientific and Industrial Research (ISIR) was founded in 1939 as a part of Osaka University with the aim of promoting basic science for the development of industry. Since then, ISIR has conducted interdisciplinary research in the fields of materials, information, and biological sciences. We play a leading role in the nanoscience and nanotechnology research through our Nanotechnology Center, which was established in 2002 and is Japan's first such center attached to a university.

As a nationwide research collaboration system, ISIR established the Network Joint Research Center for Materials and Devices and works in conjunction with five university-attached research institutes. The Japan's first nationwide network research center provides a new framework for facilitating the inter-institute collaboration.

For industrial applications of innovative achievements, we have promoted cooperation between academia and industry through Industry-On-Campus in the newly constructed Incubation Building. To promote the globalization of basic innovative research, a research-collaboration agreement was reached between the Interuniversity Microelectronics Center (imec) — one of the world's largest nanotechnology research institutes — and ISIR in 2011.

Our world-level innovative basic research efforts address problems related to the environment, energy, medicine, and security and safety on studies in the fields of materials, information, and medical sciences along with those in nanotechnology and nanoscience. ISIR pursues a target-driven basic research leading to real innovation.

## Institute for Protein Research

[www.protein.osaka-u.ac.jp/index\\_e.php](http://www.protein.osaka-u.ac.jp/index_e.php)

Institute for Protein Research (IPR) was established in 1958 as an inter-university joint-use facility attached to Osaka University. Protein research has made a remarkable progress for the past 50 years to lead a deep understanding of structures and biological functions of proteins and their complexes. IPR has made a significant contribution to the progress and its organization has been expanding through strong supports from the science community. Now IPR consists of four divisions of Protein Chemistry, Protein Structural Biology, Integrated Protein Functions and International Collaboration Research, and Research Center for State-of-the-art

Functional Protein Analysis in affiliation with IPR. About 50 faculty members, 65 postdocs and 70 supporting staffs are working in a total of 20 laboratories. We are heavily involved in the education at Graduate School of Science, Graduate School of Medicine and Graduate School of Frontier Biosciences to supervise about 90 graduate students. IPR has been operating Worldwide Protein Data Bank (wwPDB) and BioMagResBank (BMRB) as one of three worldwide centers. Several large and unique facilities of IPR, such as synchrotron beam line (SPring-8) and the superconducting NMR (800 and 950 MHz) are opened for joint usage/research. Every year, IPR conducts collaborative works with a total of nearly 100 researchers and graduate students from outside institutions including overseas and holds 15 seminars for over 1,500 participants.

## Institute of Social and Economic Research

[www.iser.osaka-u.ac.jp/index-e.html](http://www.iser.osaka-u.ac.jp/index-e.html)

ISER was founded in 1954 as a research institute attached to the Faculty of Economics, and in 1966 became independent of the faculty. Since its inception, ISER has employed first-rate researchers and has conducted internationally recognized research in modern economics. In 2010, ISER was designated as Joint Usage Research Center for behavioral economics by the Ministry of Education, Culture, Sports, Science and Technology.

ISER faculty members engage in both theoretical and empirical research on a wide variety of topics ranging from microeconomics, macroeconomics, game theory, and experimental economics to problems facing Japan such as the recession, the financial crisis, industrial policy, and business strategy. A newly created the Research Center for Behavioral Economics affiliated with ISER aims to establish the first hub of research in behavioral economics in Japan. ISER edits and publishes the International Economic Review, one of the most highly ranked scholarly journals of economics in the world, in conjunction with the Department of Economics at the University of Pennsylvania.

ISER has two visiting research scholar positions, and roughly five foreign researchers are invited every year to Osaka to engage in joint research with ISER faculty members.

## Joining and Welding Research Institute

[www.jwri.osaka-u.ac.jp/en/](http://www.jwri.osaka-u.ac.jp/en/)

The major objective of JWRI, one of the Nationwide Joint-Use Research Institutes, is to promote the research on the fundamental mechanisms of welding and joining processes and to develop the industrial applications of the processes. In 2014, about 200 researchers conducted the joint works in JWRI. The processes are absolutely essential not only for production of large constructions but also for micro and nano-sized structures. Corresponding to the recent research trends, JWRI established Smart Processing Research Center (SPRC) by reorganizing the two attached Centers. The Institute has three research divisions with ten departments and SPRC with seven departments. The research divisions are Materials Processing System (four departments), Materials Joining Mechanism (three departments) and Functional Assessment (three departments).

Obviously, the welded and joined structures are required to have high performance in the field of mechanical, physical and chemical properties irrespective of the materials used. To secure the high reliability of joined structures, JWRI is actively promoting the research at joining interface that offers the adequate joining conditions and microstructures. To correspond to the social needs, computer simulation, information technology, environmentally conscious processing and nano-technology are widely applied to reveal the many characteristics of joints and interface. The materials used for joining and welding are a variety of metals, ceramics, organic materials, and composites.

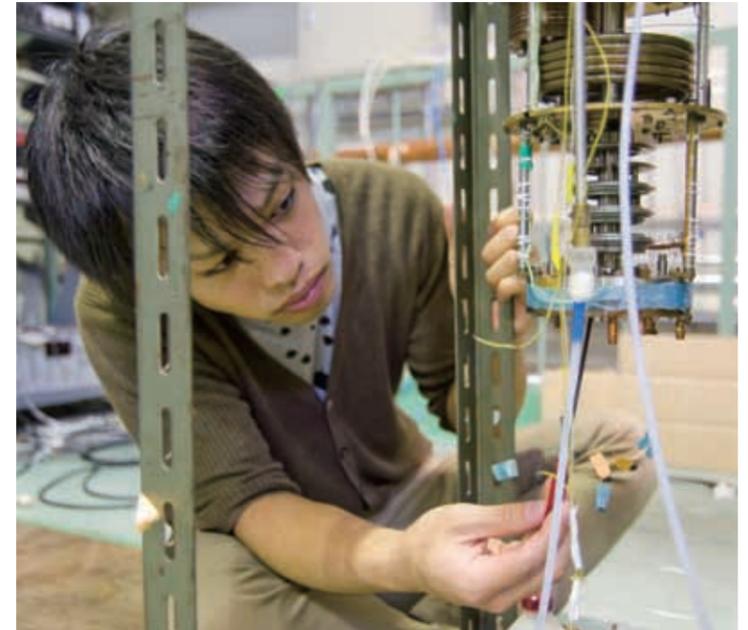
# Joint-Use Facilities



▲ Research Center for Ultra-High Voltage Electron Microscopy



▲ The Museum of Osaka University



▲ Center for Quantum Science and Technology under Extreme Conditions



▲ International Center for Biotechnology



▲ Global Collaboration Center



▲ Center for Scientific Instrument Renovation and Manufacturing Support



▲ Low Temperature Center

## Low Temperature Center

[www.ltc.osaka-u.ac.jp](http://www.ltc.osaka-u.ac.jp)

The low temperature center was established in 1971 as the joint-use facility and has been managed by the two branches of Toyonaka and Suita campus. The main purpose of the center is a stable supply of liquid refrigerants, such as liquid nitrogen and liquid helium, at a low price in order to support the researches at low temperatures. Liquid nitrogen and liquid helium are necessary for the experiments at low temperatures and they are widely used in various research areas. In the low temperature center, liquid helium is produced by using the helium liquefier equipped in the center, by obeying the High Pressure Gas Safety Law. Since helium is extracted from the natural gas, and Japan imports 100% of its use, the market price of helium is very high. In order to reduce the research expense, helium is recycled in Osaka University. Namely, all the evaporated helium gas is recovered and liquefied again by using the helium liquefier. The recovered gas purity is strictly observed so as not to cause damages to the liquefier. In this way, we can use liquid helium much cheaper than the market price.

In order to support the researches at low temperatures, the low temperature center not only supplies the liquid refrigerants but also lends vessels (liquid refrigerant storage), vacuum components and test equipments to the researchers. The low temperature center also provides experimental space for co-operative researches. In addition, the low temperature center performs its own research at low temperatures and also gives training programs for safety use of liquid refrigerants as well as high pressure gasses.

## Research Center for Ultra-High Voltage Electron Microscopy

[www.uhvem.osaka-u.ac.jp/en](http://www.uhvem.osaka-u.ac.jp/en)

The Research Center for Ultra-High Voltage Electron Microscopy (UHVEM), Osaka University, has been playing an important role in the progress of instrumentation and application of UHVEM. A 3MV UHVEM, which was developed by the staffs of the center in collaboration with Hitachi Co. Ltd., is installed in the center and is used quite effectively in research in the fields of material science, medicine, and biology.

The maximum accelerating voltage of the UHVEM is 3.5 MV, the world's highest accelerating voltage. The most important advantage of the UHVEM is the remarkable increase (about ten times as large as that of conventional electron microscopes) of the maximum observable thickness of specimens.

Namely, in the case of biological samples, 6 $\mu$ m-thick specimens can be observed. Even in the case of nonbiological samples, it is possible to use 5 $\mu$ m-thick specimens, depending upon materials and objects of study. This UHVEM thus overcomes the limitations of conventional 0.1 MV class electron microscopes; the properties of bulk materials under various conditions can be studied in situ in atomic scale. In order to carry out these in-situ studies, many sorts of devices for in-situ specimen treatment, such as for heating, cooling, stressing and current feeding, have been developed in the center. The center is open not only to researchers at Osaka University, but also to those from other institutions. Several projects in which scientists remotely control and operate the UHVEM via internet, to study the microstructure, are in progress and successful results have been accumulated.

## Radioisotope Research Center

[www.rirc.osaka-u.ac.jp](http://www.rirc.osaka-u.ac.jp)

Radioisotopes are used not only for basic science but also widely in medicine and industry. At Osaka University, more than a third of staff working in science, medicine, engineering and pharmaceuticals deals with radiation and radioisotopes in their works. And this trend is increasing every year.

The center secures radiation safety in the radiation facilities within the campus by imparting training to those who work at these facilities, while promoting their own advanced research and technology concerning radiation.

The center performs research covering a wide range of topics from science, engineering, medicine, and pharmaceutical science, such as nuclear physics and nuclear chemistry using radioisotopes, radiochemistry, material science, analytical chemistry, radiation chemistry, life science, dosimetry, and radiation protection. Every year, there are more than 40 topics of joint research and over 500 people utilize the facility. Several hundred students use the facilities every year for practical training.

## Research Center for Environmental Preservation

[www.epc.osaka-u.ac.jp/english/eng\\_home.png/home.htm](http://www.epc.osaka-u.ac.jp/english/eng_home.png/home.htm)

Through today's dizzying pace of scientific and technological development, we have come to enjoy a rich and abundant culture and social lifestyle. As a result, we have come to use not only the resources that exist within the natural environment but a huge number of man-made substances as well. While on the one hand humankind has reaped the benefits, we are also faced with complex and ever-widening environmental and energy-related problems and other issues. Based on such conditions and on the proposal of the Environmental Protection Commission, the Research Center for Environmental Preservation was founded in 1994 as the administrative organ that plays a central role in the research, education and instruction related to the environment and the safety on an all-campus level.

Green chemistry is the foundation of strategies that respond to various environmental issues, which are continuing to grow in complexity and diversity.

This center is currently involved in the development of environmental benign method in organic synthesis, and highly selective and sensitive methods for the analysis of hazardous chemical substances.

Furthermore, this center executes planning, advice and management strategies for treating wastewater and other wastes that are generated by the educational and research activities taking place at this University, administers the processes for rendering them harmless, and maintains the "Osaka University Chemical Communication System (OCCS)".

## Center for International Education and Exchange

[www.ciee.osaka-u.ac.jp/en/](http://www.ciee.osaka-u.ac.jp/en/)

This center was established in 1994 as International Student Center, renders useful services to international students, including various Japanese language programs, consultation and advice on everyday life and schoolwork, as well as coordination of short-term student exchange programs. This has also offered a variety of cross-cultural exchange programs to promote communication and exchange among international students, Japanese students and near-by communities.

At the heart of Suita Campus, the Intercultural Collaboration Hall (IC Hall) opened in April 2002. Then in April 2010, International Student Center was reorganized as Center for International Education and Exchange (CIEE).

CIEE offers various kinds of Japanese courses such as Intensive Japanese Language Course, Elective Japanese Language Course, and ICHO Japanese Language Program to promote Japanese proficiency of international students and researchers.

Support Office for International Students and Scholars and IRIS (Information Room for International Students) belong to CIEE and are located at the second floor as well as lecture rooms for Japanese language classes. Both offices also host a monthly orientation for newly arrived students and scholars from overseas.

The Support Office offers various types of assistance for international students, scholars and their families before and after their arrival at Osaka University, such as mainly visa procedures and housing information.

The IRIS maintains information on schoolwork and daily life as well as consultation and guidance.

Students can broaden friendships and communication with both international and Japanese students, as well as faculty and volunteer workers, by actively participating in a variety of the center's support programs and exchange programs for international students.

At CIEE, professors, associate professors and welfare advisors in cooperation with Mental Health Counselors are available to provide consultation and offer sound advice. Supervisor from the Japanese Language Education and Research Team, administrative staff from International Student Affairs Division and Special Academic Advisors for International Center are also available to advise and to guide students in close cooperation with the Center.

## International Center for Biotechnology

[www.icb.osaka-u.ac.jp/index\\_e.html](http://www.icb.osaka-u.ac.jp/index_e.html)

While offering education and conducting research in the field of biotechnology from international perspective, the International Center for Biotechnology, together with an established Cooperative Research Station in Bangkok, is promoting academic exchange with neighboring countries in an attempt to become a leading biotech center in Asia.

The main area of research is industrial biotechnology rooted in microbial engineering, while centering on the sustainable use of agricultural and forest resources in resource-rich countries such as those in Southeast Asia. Research is underway into the field of cell engineering with the objective of analyzing the cellular functions of bacteria, fungi and plants, and developing and using functions of these cells for management of biological resources with the aim of developing and utilizing the biological resources that exist on our planet.

In the field of international exchange, the center is cooperating with the Department of Biotechnology of the Graduate School of Engineering in order to promote academic exchanges with universities in Southeast Asia. We are also taking part in many large-scale joint research projects related to biotechnology and producing results of international importance.

Moreover, the center, along with the University of Tokyo and others, has conducted for the past years the UNESCO Postgraduate Training Course in the fields of Microbiology and Biotechnology to offer specialized training for young scientists and professors from UNESCO member countries in the Asian region. New UNESCO training course termed "UNESCO Biotechnology School in Asia" has been launched in 2012.

## Research Center for Solar Energy Chemistry

[www.rcsec.osaka-u.ac.jp/english/index.html](http://www.rcsec.osaka-u.ac.jp/english/index.html)

The development of a basic strategic response to our continually dwindling energy resources and especially to those environmental problems which are prevalent on a global scale is perhaps the most important research theme for present day science and technology. The Research Center for Solar Energy Chemistry was established in 2001 under the expressed purpose of advancing the research that will resolve these issues through the use of solar energy. The Research Center consists of 4 Fields and a joint-use laboratory. The research areas of the 4 Fields are as follows:

Field of Solar Energy Conversion: Fundamental and mechanistic studies on photochemical and photophysical processes for solar energy conversion.

Field of Photovoltaic and Photocatalytic Materials: Development of new materials for solar cells and photochemical hydrogen production.

Field of Environmental Photochemical Engineering: Fundamental studies on photocatalytic conversion and production of materials.

Field of Nanophotochemistry: Development of chemical sensors and photofunctional materials based on nanoscience and nanotechnology.

## The Museum of Osaka University

[www.museum.osaka-u.ac.jp](http://www.museum.osaka-u.ac.jp)

The origins of Osaka University are to be found in "Tekijuku" (founded in 1838) and "Kaitokudo" (founded in 1724). Over this long period a large archive of precious materials (in excess of 2 million artifacts) has been assembled in the university. This archive is catalogued and held by The Museum of Osaka University (MOU) established in April 2002.

MOU is a "comprehensive academic museum" that corresponds variously to a history museum, a natural history museum, a science museum, and an archive. In August 2007, the new exhibition has been started on Machikaneyama museum, which houses numerous priceless specimens surviving from every field of research from many departments and laboratories. Exhibition introduces the intellectual tradition of the university, researchers made world-class discoveries, and the latest frontiers of science in Osaka University. We also hold an annual exhibition every year, which introduces the results of advanced research in Osaka University. MOU is also a driving force behind the University's project of remaining linked in with society, on the basis of the university's motto of "Live Locally, Grow Globally".

In addition, construction of database (Universal Database on The Museum of Osaka University) is in progress, which is recording useful

and valuable information on precious materials.

The Museum of Osaka University will play an important role in research and general education at Osaka University. Our ultimate goal is to make the collection accessible, informative and useful to society in Japan and the world.

## Health Care Center

[www.healthcarecenter.osaka-u.ac.jp/english.html](http://www.healthcarecenter.osaka-u.ac.jp/english.html)

The Health Care Center including the Student Counseling Center offers consultation services on health, personal troubles and career options for students, as well as medical care (internal medicine, orthopedic and psychiatry). Every year, all students and staff members of Osaka University are encouraged to take regular medical checkups given at the center. The center also provides other special medical checkups obligated by laws and regulations. Furthermore the center also gives after-checkup services to students and staff members when any ailments and abnormalities are discovered. Anyone feeling concern about or discomfort in their physical or mental condition is encouraged to receive counseling and to learn what is health or bad health, i.e. health education at the center. Privacy is strictly reserved.

The center contributes to campus safety and hygiene through safety and hygiene committee activity. Medical doctors and counselors at the center concurrently commit the clinical study for promotion and management of health as well as prevention of disease. Ongoing research themes covered are cardiac dysfunction, metabolic syndrome, overweight, kidney disease, sleep disorders, and social withdrawals.

## Global Center for Medical Engineering and Informatics (MEI Center)

[www.mei.osaka-u.ac.jp/en](http://www.mei.osaka-u.ac.jp/en)

The Center for Advanced Medical Engineering and Informatics (MEI Center) was reorganized as Global Center for Medical Engineering and Informatics (MEI Center) in 2015. Originally, the MEI Center has been established since 2004 as the first university center after the beginning of a system of independent administrative corporations. The MEI Center aims at enhancing collaboration between researchers in the fields of medicine, engineering, and information science, leading to center core of advanced medical engineering and informatics as interdisciplinary and integrated life sciences. Integrated research projects of the center will exploit the new era of biological, medical, and clinical sciences, and contribute to improving people's health and welfare and to developing new industries. By maintaining interdisciplinary and international activities, the center will play a role as a flexible system for research and education suitable for the integration of sciences.

With the supports from inter-faculty academic staff, the center offers several educational programs in the interdisciplinary fields of biomedical engineering and informatics in order to develop high-level human resources who will be leading a new consortium for advanced welfare society. The programs include introductory and advanced courses for graduate students, both residential and extramural, the reeducation courses for working people. These programs provide opportunities for students to think about social, medical, clinical and patients' demands and technologies with their engineering bases necessary to address the demands. It is the policy of the center that researches, development, and education to address those demands will lead to emergence of new technologies and industries that may contribute to welfare and sustainable society.

The center conducted a global center for excellence program supported by MEXT to promote research and education for the physiome and systems biology for establishing "in silico medicine" as the basis of "predictive medicine." With the developed "in silico medicine" platform technology, the center proceeded the academic-industrial joint project for development of hybrid organ with medical engineering and informatics that was also supported by MEXT to enhance the academic-industrial cooperation for the creation of new industries. On the basis of the product of these activities, the center was reorganized to realize the development of leaders in global medical/healthcare innovation for contributing to welfare and sustainable society this year.

### Center for the Study of Communication-Design

[www.cscd.osaka-u.ac.jp/english/](http://www.cscd.osaka-u.ac.jp/english/)

The Center for the Study of Communication-Design (CSCD) was founded in April 2005. Communication-Design refers to layout of communication networks between experts and non-experts (citizens), between people with different interests and positions. The objectives of CSCD include: (1) training of graduate students in communication capability with citizens, (2) training of science and technology communicators and mediators with skills in dialogue facilitation as well as conflict management, (3) research and development of communication-design especially for consensus building in public affairs, and (4) building of communication networks in collaboration with NPO/NGOs and active citizens.

CSCD consists of five sections (Science & Technology, Human Care in Practice, Community Design, Art and Communication-Design). The background of staff members is various, from philosophy, sociology, psychology and anthropology to art, media design and drama. Thus, in ten years, our research activity became interdisciplinary by collaborating with each other.

As for education programs or updated liberal arts, CSCD offers a set of subjects called communication-design courses for graduate students, which include introduction to science and technology communication and performing arts workshops, among others. Social alliance is a very important theme for us. There are a couple of training program for students, NPO/NGOs and active citizens, such as those for mediators in medical settings, coordinators of community developments, coordinators of various workshop and art coordinators. CSCD also offers Graduate Program for Advanced Interdisciplinary Studies in "Studies of Communication-Design," "Science and Technology Policy in Public Sphere," and Graduate Minor Program in "Science and Technology Policy in Public Sphere." In addition, a science shop is organized for interested citizens to make contact with researchers and graduate students and to have their science-related problems solved.

### Center for the Study of Finance and Insurance

[www.csfi.sigmath.es.osaka-u.ac.jp/en](http://www.csfi.sigmath.es.osaka-u.ac.jp/en)

Activities such as finance and insurance expand in mature economies. This is clearly reflected in recent economic trends in developed countries and has become an important issue to prepare for risks in the Japanese economy. Under these circumstances, importance of educating and training of individuals familiar with leading-edge knowledge of finance has much increased. In response to such social situation the Center for the Study of Finance and Insurance was established at Osaka University in April, 2006 jointly by the University's four graduate schools, the Graduate Schools of Engineering Science, Science, Information Science and Technology, and Economics to develop and implement an interdisciplinary, integrated program in social and natural sciences. The Center offers an educational program which corresponds to the graduate level. The program includes three courses, Mathematical and Statistical Finance, Financial Economics and Engineering, and Insurance. The Center's objective is to establish, with the cooperation of the professors in the four graduate schools and business world as well, the world's most advanced educational and research site.

### Center for Scientific Instrument Renovation and Manufacturing Support

[www.reno.osaka-u.ac.jp](http://www.reno.osaka-u.ac.jp)

Center for Scientific Instrument Renovation and Manufacturing Support was founded in April 2014 based on the Osaka University master plan policy, as a result of reorganization of the former Renovation Center of Instruments for Science Education and Technology.

The Center consists of renovation office and workshop.

Renovation office aims at establishing a database of the instruments available for shared use and promoting both reuse and shared use of scientific instruments throughout the university.

This is based on a concept of active and effective utilization of already-used equipment on the whole university scale.

Workshop is composed of machine shop, glass shop and chemical analysis shop, aiming at technical assistances and apparatus-making

supports for research and education.

User's workshop is provided for machinery works, as well as teaching safety and technical skills in machinery to university researchers, staffs and students.

### Global Collaboration Center

[www.glocol.osaka-u.ac.jp/en/](http://www.glocol.osaka-u.ac.jp/en/)

Global Collaboration Center (GLOCOL) is an academic institution dedicated to research, teaching and social engagement in global and local agendas involving transcultural, transnational and transregional issues. Founded in 2007, its 13 full-time researchers currently work under the directorship of Professor HIRATA Kazumasa.

We at GLOCOL believe that one of humanity's crucial goals is to attain symbiotic coexistence among the various human politico-economic and socio-cultural institutions as well as the diverse geo-environmental and bio-ecological life forms all over the globe. This goal cannot be achieved solely by means of purely scientific, technological investigations. Comprehensive, holistic, inclusive, interdisciplinary approaches are required in order to take into account not only the multiplicity of human values and practices, but also the diversity of geological, ecological, biological phenomena on earth.

GLOCOL's research foci are firmly grounded on cross-disciplinary methods, combining inspirations from the arts and the sciences in unique ways to explore the issues at hand from manifold perspectives. Academic staff at GLOCOL work in joint research projects in collaboration with researchers all over the world. Our current large scale international and interdisciplinary research projects include one funded by SATREPS (Science and Technology Research Partnership for Sustainable Development), which aims to investigate the social, ecological and biological factors leading to the outbreak of multi-drug resistant bacteria in Viet Nam and to develop effective monitoring procedures for combating the problems they cause. We have also undertaken a major project on Food Security funded by Grants in Aid for Research (KAKENHI).

GLOCOL takes full advantage of Osaka University's wide range of expertise in diverse disciplines in the fields of natural sciences, including medicine, pharmacology, engineering, and in the fields of social sciences and humanities, including global languages and literature, philosophy, history, sociology, anthropology, psychology, law, economics and political science.

In the area of education, we offer students opportunities to develop transcultural communication skills and global outlooks through interactive, discussion-based, learner-centered teaching schemes. In order to further expand our aspirations in transforming the current conditions of university education in Japan, we launched FIELDO (Fieldwork, Internship and Experiential Learning Design Office) in August 2010 for the purposes of designing and offering field-study and internship programs abroad. These study and internship abroad programs provide students with opportunities to put the theories they learn in classrooms to test in amongst the real-life complexities. Our programs have sent to date a total of 263 undergraduate and graduate students to project field sites and internship destinations overseas. Regular seminars are organized to encourage students to develop knowledge and skills for future career paths in international organizations.

GLOCOL offers six programs in Osaka University's Graduate Program for Advanced Interdisciplinary Studies in collaboration with the university's science and arts faculties, namely Global Coexistence, UN Policy Expert Development Program, Global Health Environment, Legal Interpreting and Translation, Issues and Research on Contemporary China, and Local Environment of East Asia. All these programs combine courses from diverse disciplines, thereby allowing graduate students to acquire the state of art knowledge from experts belonging to different departments and centers at Osaka University.

One of the unique features of GLOCOL as an academic institution can be found in its combination of research, education and commitment to social engagement. We seek to serve society by not only conducting research and education, but also by getting closely involved in activities outside the academia in order to translate our research and teaching into social engagement practices and to gain feedback from the wider world. We have collaborative projects with Japan International Cooperation Agency (JICA) for international cooperation in post-conflict and developing countries. In partnership with non-governmental organizations, we were involved in relief efforts immediately after the Great East Japan Earthquake (Tohoku Earthquake) in 2011, and

continue to support those affected in the Tohoku region (Fukushima, Miyagi and Iwate prefectures). Particular attention is paid to migrant communities in these areas to provide the people with information regarding disaster prevention in their own languages, and to offer the Japanese residents opportunities to befriend their hitherto alien neighbors. We host and participate in social-cum-academic events to foster transcultural communication all over Japan to support the country in its path towards global coexistence.

### Center for Japanese Language and Culture

[www.cjlc.osaka-u.ac.jp](http://www.cjlc.osaka-u.ac.jp)

The Center for Japanese Language and Culture (CJLC) was first established as the Special Course for Foreign Students at Osaka University of Foreign Studies in 1954. Since then, CJLC has supported our country's policy to accept foreign students by acting as a benchmark institution for more than half a century for the education of Japanese language and culture for Japanese Government Scholarship Students. CJLC has recently been authorized as a "Joint-usage Education Center" by the Japanese Ministry of Education, Culture, Sports, Science and Technology.

In addition, CJLC has also contributed to the reinforcement and development of Japanese language and culture learning around the world by establishing partnerships with 20 institutions for Japanese studies overseas.

Meanwhile, CJLC offers three main programs: the Undergraduate Students Program, the Japanese Studies Program and the Maple Program.

The Undergraduate Students Program is a preparatory program for international students who come to Japan on the Monbu-kagaku-sho scholarship. The program is designed to help students develop their base knowledge and advance their skills in the Japanese language required to meet the academic standards of their hosting institutions. The certificate issued to the students upon successful completion of this program is a prerequisite for admission to their future universities in Japan.

The Japanese Studies Program is intended for undergraduate-level Monbu-kagaku-sho scholars specializing in Japanese studies. They are expected not only to improve their skills and proficiency in Japanese, but also to develop the knowledge required for their research in various fields of Japanese studies. This will provide them with an extensive knowledge of Japanese language and culture that will be useful before and after leaving Osaka University. The program also offers various extracurricular activities that help students deepen their understanding of Japanese language, culture and society.

The Maple Program is a one-year program for short-term exchange students at Osaka University designed especially to help students improve their language skills, enhance their knowledge of Japanese culture and society, and to advance them forwards on their respective academic goals. Moreover, the program aims to develop individuals with an in-depth and proficient understanding of Japan from various perspectives, thereby encouraging them to compare and contrast Japanese language and culture with their home countries.

### Center for Environmental Innovation Design for Sustainability

[www.ceids.osaka-u.ac.jp/english](http://www.ceids.osaka-u.ac.jp/english)

Center for Environmental Innovation Design for Sustainability (CEIDS), launched in October 2010 as an institution-wide Osaka University organization, succeeded Sustainability Design Center to further promote sustainability science education and research in the field of environmental innovation. By collaborating with multiple graduate programs and departments, the center provides graduate students from all parts of Osaka University with the interdisciplinary, cross-university Sustainability Science Education Program, which aims to train people in the core knowledge and practical skills of sustainability science as well as the communication and design skills needed to develop a sustainable society. Through its educational programs, the CEIDS functions as a platform for sharing knowledge within the university and supports and promotes research that encourages taking action toward environmental innovation for sustainability. CEIDS also conducts interdisciplinary research with the objective of building a sustainable society. Taking an interdisciplinary approach, the center uses domestic and international networks to conduct research and

education on such topics as the model design of sustainable societies (including low-carbon societies and recycling-oriented societies), management and system design for transitioning to low-carbon societies, and creating pluralistic valuation methods for sustainability and the establishment of environmentally sustainable energy systems. In addition to the above, the center conducts research that brings together basic technologies to build sustainable societies with expanded, global social views and to encourage technological and social innovation.

### Institute for NanoScience Design

[www.insd.osaka-u.ac.jp/index\\_e.html](http://www.insd.osaka-u.ac.jp/index_e.html)

The Institute for NanoScience Design (INSD) prepares various kinds of education and training programs aimed at passing on the accumulated knowledge of nano-science and nano-engineering to graduate school students and younger scientists who are expected to design and develop new fields for the future of science and technology. Among these programs are the trans-disciplinary graduate-school minor course program, the evening refresher course program, the short-term international research-training program, and others. They offer a series of lectures including public engagement and technology design, some of them in the form of distance education broadcasted live via internet to satellite classrooms located all over Japan, and even overseas in English. In addition to the lecture courses, the students can join in intensive hands-on training programs using modern facilities, allowing them to design, fabricate, measure, and characterize nano-materials and nano-devices. Project-aimed learning and training programs are also offered in collaboration with the Academia-Industry Liaison Consortium. These programs are conducted by joint groups of lecturers and researchers belonging to six graduate schools and five research institutions and centers related to nano-science and nano-engineering in Osaka University.

### Intellectual Property Center (IPrism)

[www.iprism.osaka-u.ac.jp](http://www.iprism.osaka-u.ac.jp)

The Intellectual Property Center (IPrism) was established on April 1, 2010 as a center for promoting comprehensive intellectual property education and research. Our center is composed of center members and researchers from university and IP practitioners with hands-on experience. IPrism aims to educate a new generation of specialists equipped with a broad intellectual property vision. In addition, members also aim to make social contributions in the intellectual property field. IPrism offers various educational opportunities for students such as a general education in Intellectual property for the undergraduate student. There is also an Intellectual property law program for graduate students. In particular, the Intellectual property law program will help develop leaders in practice or top specialists in intellectual property law. In addition to the lecture, students join an e-learning system using the internet. The learning and practical training provided will improve the student's intellectual property skills.

# National Joint-Use Facilities



Research Center for Nuclear Physics



Ultra-High-Speed Supercomputers (Cybermedia Center)



Institute of Laser Engineering

## Research Center for Nuclear Physics

[www.rcnp.osaka-u.ac.jp](http://www.rcnp.osaka-u.ac.jp)

The Research Center for Nuclear Physics (RCNP) was founded in 1971 as a national research center for nuclear physics. Its aim is to promote and perform world-level research in nuclear and particle physics using advanced accelerators and related facilities in order to answer basic questions such as "How are quarks confined in a nucleon?", "How are various nuclei formed in the universe" and "Why do the matter dominate over the anti-matter?" RCNP operates the Ring Cyclotron in Suita campus, the Laser-Electron facility at SPring-8, underground facilities at Kamioka, and a super-computer for international collaborative researches. Current major activities are: (1) Studies of the properties of nuclear forces and mesons in nuclei by using a high resolution proton beam and heavy ion beam from the Ring-Cyclotron, (2) Studies of the quark and gluon properties in hadrons by using a high-energy polarized photon beam at SPring-8, and (3) Studies of the properties of elementary particles to understand how our universe was created.

## Cybermedia Center

[www.cmc.osaka-u.ac.jp/?lang=en](http://www.cmc.osaka-u.ac.jp/?lang=en)

The Cybermedia Center (CMC) was founded in 2000 as Osaka University sought to reorganize and expand its Computation Center to form a branch of the Information Infrastructure Center.

In the expansion, the Education Center for Information Processing and part of the university library were merged into the CMC. CMC consists of eight research divisions: Informedia Education, Multimedia Language Education, Large-Scale Computational Science, Computer-Assisted Science, Cyber Community, Advanced Network Environment, Applied Information Systems and University-wide information and Communications Infrastructure Services Promotion. We continue to provide computers for advanced scientific techniques and media services and to promote education in information processing and the university library by providing digital contents.

We have ultra-high-speed supercomputers and computing servers, and provide a powerful high performance computing environment for university researchers across Japan. It plays the role of the nation's hub in teaching and diffusing advanced information technology. In addition, we assume the responsibility of facilitating the campus infrastructure and promoting its effective use. We also provide facilities for advanced education to our

students.

It operates an Information Education system and Computer Assisted Language Learning system with approximately 1,180 computers connected by the Osaka Daigaku Information Network System. We offer a consistent information education curriculum, covering basic use of e-mail communication and the Internet to advanced computing technology.

## Institute of Laser Engineering

[www.ile.osaka-u.ac.jp](http://www.ile.osaka-u.ac.jp)

The Institute of Laser Engineering (ILE) was founded in 1972 and unified with the Research Center for Superconductor Photonics in 2004. The objective of the Institute is to develop high energy and high power lasers and to open a new scientific field related to the extremely high energy density state created by the high power lasers.

ILE consists of five research divisions, Power Photonics, Laser Fusion, High Energy-Density Science, Laser Terahertz, and Radiation and Particle Physics. In the Power Photonics Division, new laser materials with high endurance and advanced technologies to control the laser are studied to construct extremely high power and high intensity lasers. The Laser Fusion Division explores feasibility of fast ignition scheme using an ultra-short, intense laser pulse, which is an innovative approach toward high gain laser fusion. The High Energy-Density Science Division covers laboratory astrophysics, planet physics, particle acceleration, and laser nuclear physics that can be realized with the ultra-high intensity laser. The Laser Terahertz Division explores science, technology and application of terahertz electromagnetic wave radiation generated with laser irradiation. The Radiation and Particle Physics Division deals with physics and applications of radiations from laser-produced plasma including energetic particles, X-rays and EUV for lithography.

These researches are based upon varieties of lasers which are the GEKKO XII high power laser (10 kJ in 1 ns), the ultra-high intensity LFEX laser (10 kJ in 10 ps) and the high repetition rate YAG laser (5 kW > 10 kHz). These laser facilities are open not only for domestic users, but also for international users.

# Osaka University Hospital

[www.hosp.med.osaka-u.ac.jp/english/](http://www.hosp.med.osaka-u.ac.jp/english/)



Surgical Assistant Robot "Da Vinci"



Osaka University Hospital started in 1869 at Daifuku-ji Temple as a provisional hospital. Since then, the hospital has continued to grow with several reorganizations along the way. The hospital is now one of the leading medical institutions in Japan, contributing to a wide range of fields in

clinical medicine. It is renowned for the recent pioneering role in advanced emergency medicine, medical quality management and innovative medical translational research in cancer immunotherapy, gene therapy, tissue engineering and transplantation, as well as healthcare robotics.

# Osaka University Dental Hospital

[hospital.dent.osaka-u.ac.jp/index-e.html](http://hospital.dent.osaka-u.ac.jp/index-e.html)



Cell Processing Center (CPC)

Over 60 years since the establishment in 1953, Osaka University Dental Hospital has been expanding and enriching itself to respond to the needs of society with its basic philosophy "To promote education and research in oral medicine through dental practice, and devote to development of oral health care for regional and global society."

Osaka University Dental Hospital consists of the three main clinical divisions; Tooth and Supporting Tissues Diseases, Prosthodontics and Orthodontics and Oral and

Maxillofacial Diseases, associated with the central clinical facilities.

Center for Translational Dental Research exclusively focuses highly advanced dental treatments at Implant unit also conducts preclinical research for dental tissue engineering at CPC, Cell Processing Center unit. Currently we are planning to establish "Center for Cleft Lip and Palate Treatments" and "Center for Global Oral Health" for further commitments for regional as well as global society.

# Kaitokudo for the 21<sup>st</sup> Century

[21c-kaitokudo.osaka-u.ac.jp](http://21c-kaitokudo.osaka-u.ac.jp)



In 1724, a gakumonsho [a place for study] called Kaitokudo was established in the city of Osaka. In those days such gakumonsho were, in general, founded by influential samurai or fiefdoms for the purpose of educating samurai. Kaitokudo, however, was founded and financed by five powerful merchants for the benefit of members of the merchant class. Moreover, Kaitokudo was not merely a place for educating merchants; it boasted the highest caliber research achievements of that age. Present-day Osaka University traces its spiritual origins back to Kaitokudo and to Tekijuku, a gakumonsho founded by Ogata Koan in 1838.



To realize in our time the ideals that Kaitokudo aspired to, Osaka University launched Kaitokudo for the 21st Century in April 2008. Kaitokudo for the 21st Century not only informs Osaka people as to the contributions Osaka University is making to society, but also offers cultural programs to the local community. It also plays the role of coordinator, listening to the local community's opinions and requests and reflecting them in the university's activities.

Its main office is in the Osaka University Hall on Toyonaka Campus. The building contains a communication gallery displaying Osaka University's intellectual activities as well as a multi-purpose studio for holding various events.

# Osaka University Nakanoshima Center

[www.onc.osaka-u.ac.jp](http://www.onc.osaka-u.ac.jp)



Osaka University was originally founded in Nakanoshima thanks to the enthusiasm of the Osaka inhabitants and continued efforts of the local people. At present, various urban regeneration projects are being developed there, and in April 2004, in a way that inherits this unique history, the 'Osaka University Nakanoshima Center' (ONC) was founded.

Within the center itself, halls, lecture theaters, seminar and conference rooms are open to university faculty as well as the general public. For example, lectures are sometimes given by faculty at the University and 'Osaka University Open Lecture' was the first course of its kind aimed at the general public.

The University not only hosts cultural and academic lectures but also acts as a lecture venue for the general public and co-hosts various events with the private cultural center. ONC has become an academic, cultural and educational 'space' for learning and exchange.



In addition, a number of universities have established satellite campuses within the center giving expert lectures to citizens to help shape and improve their careers. Located in the center of the city, ONC is the fourth campus easily accessible to a wide variety of people and is used as a base to contribute to the community and society as a whole.

# Osaka University Tokyo Office

[www.osaka-u.ac.jp/en/academics/facilities/tokyo/office](http://www.osaka-u.ac.jp/en/academics/facilities/tokyo/office)



The Osaka University Tokyo Office was established in 2014 as a base for Osaka University in and around Tokyo, the nation's capital. The Office has three main purposes: to promote education and research, to provide a place to meet and interact with alumni, and to advance industry-university collaboration.

The Office is located in Kasumigaseki, a central area in Tokyo where government ministries and major companies have their headquarters. It consists of two multipurpose rooms, suitable for meetings, seminars and lectures, as well as a common space for meetings and office work. The Office is actively used by Osaka University faculty members, staff members, students, and alumni.



# Teaching and Learning Support Center (TLSC)

[www.tlsc.osaka-u.ac.jp/](http://www.tlsc.osaka-u.ac.jp/)



Teaching and Learning Support Center (TLSC) is a campus organization that was established in June, 2013. The mission of TLSC is to promote and support the development and enhancement of teaching and learning at Osaka University. In 2014, the center hosted more than 60 FD seminar and workshop programs. The center also focuses on the development of an active learning environment on campus. In 2014, the center has four active learning class rooms and runs automated lecture capture system in 17 class rooms in the CELAS lecture buildings. Active learning facilitates spontaneous learning by students who actively find or define problems in specific fields and challenge to solve them. From a university-wide standpoint, the center is also in charge of planning, development and implementation of teaching and learning support programs.

# Support Center for Campus Life

[www.osaka-u.ac.jp/en/guide/student/support\\_st](http://www.osaka-u.ac.jp/en/guide/student/support_st)



This center, previously known as the Student Support Station but renamed as the "Support Center for Campus Life" on June 1, 2013, provides counseling services to help students solve their personal problems and also provides support for their extra-curricular social activities. This center consists of three units: **Student Disability Services, Student Counseling and Consultation Services, and Career Development Services.** These units also work in coordination with the counseling rooms at each school and the student counseling room at the Health Care Center.

In addition to providing high-quality student support, the Support Center for Campus Life issues newsletters and hold Station Cafés regularly in order to provide opportunities for students to get together. As social activity support, this center holds sign language classes, report and opinion exchange sessions for volunteer activities in various issues. As career support, this center provides information, advice and guidance on career development so that students can make and realize successful career decisions.

# University of California/University of California Education Abroad Program Osaka Office



The UCEAP (University of California Education Abroad Program) established its Osaka Office in December 2014, at the Interdisciplinary Research Building on Osaka University's Toyonaka Campus. The University of California had concluded an Inter-University Academic Exchange Agreement with Osaka University in 2002.

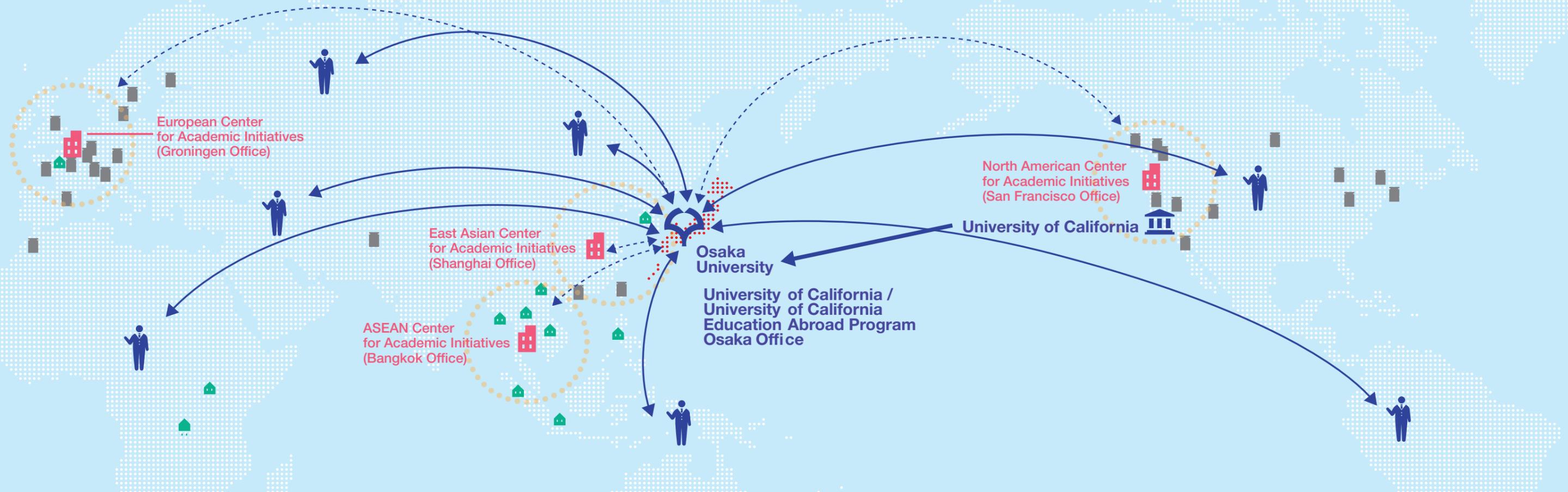
This Office is aimed at enhancing student exchange between the University of California and its partner universities in western Japan, including Osaka University. It also acts as a center of support for University of California faculty members conducting lectures at Osaka University.

Osaka University continues to expand its exchange with the University of California by holding international symposiums, workshops and summer schools.

# Education and Research at Osaka University: Expanding Worldwide Developments

Osaka University is actively enhancing its worldwide network of educational and research institutions to strengthen its international presence and research capacity. International Joint Labs and the expansion of offices facilitating collaboration with institutions overseas are expanding the reach and impact of Osaka University outside of Japan.

-  Centers for Academic Initiatives established by Osaka University
-  Centers established by departments and institutions
-  Research Universities and Institutions Associated with International Joint Labs



### International Joint Labs

International Joint Labs bring researchers from overseas to a center for collaborative research at Osaka University, with a total of 22 labs successfully formed the first year of the system from 2013 to 2014 in cooperation with 28 research institutions around the world. The goal of increasing the number of these collaborative labs to 100 by 2023, a decade after its inception, is meant to further enhance the quality of research at Osaka University.

### A Network of International Centers

Osaka University's four Overseas Centers have been repositioned to facilitate exchange in their entire region, including but not exclusive to the city in which they are based. This extension of their reach from a single locale to an entire region, coupled with the 11 independently established departmental and institutional centers across the globe, aim to solidify and expand the reach and contribution of Osaka University in and to the world.

### Research Universities and Institutions Associated with International Joint Labs (at Osaka University)

#### Europe

- Academy of Sciences of the Czech Republic
- École Centrale de Nantes
- École Polytechnique
- Eidgenössische Technische Hochschule Zürich
- Ersta Sköndal University College
- European Institute of Japanese Studies
- Friedrich Miescher Institute for Biomedical Research
- Ruhr University Bochum
- RWTH Aachen University
- The Finnish Institute of International Affairs
- Université Paris Ouest Nanterre La Défense
- University of Copenhagen
- University of Helsinki
- University of Oxford

#### Africa

- Moroccan Foundation for Advanced Science, Innovation and Research

#### Asia

- Indian Statistical Institute
- The University of Hong Kong

#### North America

- Baylor College of Medicine
- California Institute of Technology
- California State University
- Canada's National Laboratory for Particle and Nuclear Physics (TRIUMF)
- Fordham University
- George Mason University
- Northwestern University
- University of Kentucky
- University of Michigan
- University of Victoria
- University of Washington

# Overseas Centers

- North American Center for Academic Initiatives
- European Center for Academic Initiatives
- ASEAN Center for Academic Initiatives
- East Asian Center for Academic Initiatives



Osaka University aspires to become one of the world's most advanced universities and based on exchange agreements with distinguished academic institutions, we intend to further strengthen student exchange activities through international student inbound activities and the active promotion of overseas study for Japanese students. In particular, Osaka University places great importance on nurturing global human resources with excellent communication skills who can demonstrate leadership skills in the international society. To this end, we have established four overseas centers to support the exchange of students. Furthermore, we support alumni activities in several regions and strive to expand the networks in the local areas.



## North American Center for Academic Initiatives (San Francisco Office)

[www.osaka-u-sf.org/en](http://www.osaka-u-sf.org/en)

The North American Center for Academic Initiatives has opened an office in San Francisco to facilitate the university's activities in North America. The North American center supports overseas research, international symposiums/seminars collaborating with Osaka University's departments, exchange and short-term summer programs. It offers information about international programs and provides support to Japanese and international students with regard to program matching activities. To stimulate students/faculties motivation to study / research abroad, live lectures are broadcast from San Francisco and through such distance learning activities we actively promote the deployment of students overseas. The North American Center fosters alumni activities and strives to expand its international network with the cooperation of alumni members in North America.



## European Center for Academic Initiatives (Groningen Office)

[www.osaka-u-groningen.org/en](http://www.osaka-u-groningen.org/en)

The European Center for Academic Initiatives has established an office in Groningen, the Netherlands, to support the university's activities in Europe. The European center supports overseas research, student and staff mobility and short-term summer programs. In particular, the European Center offers collaborative language programs within Europe as a first step *appetizer* program to encourage long-term overseas study. The European Center supports overseas alumni activities and aims to expand its international network with the cooperation of the alumni members in Europe. Through the recruitment of outstanding international students at European study fairs, we aim to enhance the overall presence of Osaka University in the region.



## ASEAN Center for Academic Initiatives (Bangkok Office)

[www.osaka-u-bangkok.org/Eng](http://www.osaka-u-bangkok.org/Eng)

The ASEAN Center for Academic Initiatives has established an office in Bangkok, Thailand, to support the university's activities in Southeast Asia. The center aims to recruit outstanding students to Osaka University from Thailand and ASEAN countries through active promotional activities making use of the local network. Through the recruitment of outstanding international students at Study-in-Japan Fairs and other international education fairs, we aim to enhance the overall presence of Osaka University in the region. The ASEAN Center also supports alumni's activities in Thailand and ASEAN countries, aiming at expanding its international reach with the cooperation of the alumni members in Southeast Asia.



## East Asian Center for Academic Initiatives (Shanghai Office)

[www.shanghai-center.osaka-u.ac.jp](http://www.shanghai-center.osaka-u.ac.jp)

The East Asian Center for Academic Initiatives has established an office in Shanghai, China to support the university's activities in East Asia. The center aims to recruit outstanding students to Osaka University from China and neighboring countries and regions through the active promotion of public relations activities making use of the network in the local area. We aim to enhance the overall presence of Osaka University through the recruitment of outstanding international students at Study-in-Japan Fairs. The East Asian Center also supports alumni activities and we strive to expand the international network with the cooperation of the alumni members in East Asia.



## University of California/ UCEAP Osaka Office opened!

The Osaka University Toyonaka campus welcomed the opening of the University of California's second office in Japan, the University of California/University of California Education Abroad Program Osaka Office in November of 2014. It is a newly-created platform to further enhance exchange between the campuses in the University of California system and Osaka University, and will facilitate the growing institutional cooperation between California and Osaka in education and research.



# Academic Programs and Admission

## Degree Programs

### Undergraduate Program (Bachelor's Degree Program)

Each of the eleven Schools offers an undergraduate program.

Students enrolled in one of these programs study for a period of four years. Students enrolled in the Faculty of Medicine's Medical School, the School of Pharmaceutical Sciences' Department of Pharmacy, and the School of Dentistry study for a period of six years. All undergraduate students are required to undergo the General Education Program (a program that covers a wide range of specialty and liberal arts courses) for their first three semesters (one and a half years) after entering the university. The General Education Program is offered at the Toyonaka Campus.

#### Application Conditions for Un-sponsored International Students (except for degree programs in English):

International applicants (students from outside of Japan) must meet one of the following criteria by March 31<sup>st</sup> of their year of enrollment.

For example,

- Those who have completed a standard 12-year school education curriculum of a country other than Japan.

- Those who are at least 18 years of age and who have passed an examination in a country other than Japan which certifies that they have scholastic ability equivalent to a person who has completed a standard 12-year school education curriculum in the said country.

\*In principle, international applicants required to take the TOEFL and the "Examination for Japanese University Admission for International Students" (EJU) conducted by the Japan Student Services Organization (JASSO), having taken the designated subjects in the determined period of time, and having scored at least the minimum amount of points determined by the faculty or school one is applying to. The Faculty of Medicine's School of Allied Health Sciences, the School of Dentistry, and some majors in the School of Foreign Studies do not require the TOEFL.

\*The most current details regarding application requirements and entrance methods can be confirmed at Osaka University's website. It is recommended that one contact the Admission Division before applying if one has further questions.

([www.osaka-u.ac.jp/en/admissions](http://www.osaka-u.ac.jp/en/admissions))

([www.osaka-u.ac.jp/en/admissions/faculty/expense](http://www.osaka-u.ac.jp/en/admissions/faculty/expense))

### FOUR TYPES of INTERNATIONAL STUDENTS

#### Japanese Government Scholarship Students (Monbukagakusho Scholarship)

Japanese Government Scholarship Students are able to enter Japanese universities with an exemption of the entrance examination fee, enrollment fee and tuition fees. Furthermore, they are granted a scholarship stipend every month. Japanese Government Scholarship Students are able to enroll in Osaka University as "Undergraduate Students," "Research Students (graduate students)," "Japanese Studies Students" or "Teacher-Training Students."

Before coming to Japan, there are two ways of applying to this program: "Embassy Recommendation" and "University Recommendation." For further detailed information including application conditions and procedures, please contact the Japanese Embassy located in your home country for "Embassy Recommendation," or the relevant office of the specific school/graduate school, or the faculty member you would like to have as an academic supervisor for "University Recommendation."

#### Foreign Government Sponsored Students

The Japanese Government is currently accepting students who are sponsored by their home countries of Malaysia, Thailand, Singapore, the United Arab Emirates, Saudi Arabia, Brazil. For further detailed information including application conditions and procedures, please contact the appropriate government agency of these countries.

#### Un-sponsored International Students (Privately Financed International Students)

International students not receiving a scholarship from the Japanese Government or from the government of their own countries are categorized as "Un-sponsored International Students."

#### Short-Term Exchange Students (from partner universities<sup>1</sup>)

Osaka University has formed student exchange agreements with universities abroad, accepting non-degree exchange students from these universities for one year or less, granting entrance examination fees, enrollment fees and tuition fee waivers. During the exchange period, short-term exchange students will continue their enrollment at their home university. Depending upon their home university, credits earned at Osaka University can be counted as required credits for graduation. For further detailed information including application conditions and procedures, please contact the office in charge of international student exchange at the university you are currently enrolled at.

<sup>1</sup>The universities marked with a "\*" among those listed on p.114-115 fit the universities described here.

### Graduate Program (Master's Degree and Doctor's Degree Programs)

Each of the sixteen graduate schools at Osaka University implements graduate programs. These graduate programs are generally composed of two courses: the Master Course (first two years) and the Doctor Course (a continuation for those who have completed the Master Course). Students who have completed the Master Course are granted a master's degree; students who have completed the Doctor Course receive a doctor's degree.

The Doctor Course generally takes place after the Master Course and has a duration of three years. The Doctor Course for the Graduate School of Medicine (major in Medicine), the Graduate School of Dentistry, and the Graduate School of Pharmaceutical Sciences (major in Medical Pharmacy) have a duration of four years. The Graduate School of Frontier Biosciences has a 5-year intensive doctor course. The Law School program has a duration of three years, and upon completion students are granted a Juris Doctor's Degree.

#### Main Application Conditions for Un-sponsored International Students:

For information regarding admissions to the Graduate Programs, please visit our graduate school websites.

#### Main Application Conditions for Master Courses, the Doctor Course of the Graduate School of Frontier Biosciences and the Law School:

One of the following conditions must be fulfilled.

- Completed 16 years of schooling in a country other than Japan

- Graduated from a Japanese university
- Recognized and approved as having academic ability equivalent to the above by the Ministry of Education, Culture, Sports, Science and Technology or the graduate school concerned

#### Main Application Conditions for Doctor Courses:

Either of the following conditions must be fulfilled.

- Obtained a master's degree or professional degree
- Recognized and approved as having academic ability equivalent to the above by the Ministry of Education, Culture, Sports, Science and Technology or the graduate school concerned

#### Main Application Conditions for Doctor Courses (major in Medicine the Graduate School of Medicine, the Graduate School of Dentistry, major in Medical Pharmacy of the Graduate School of Pharmaceutical Sciences):

One of the following conditions must be fulfilled.

- Completed 18 years of schooling in a country other than Japan. However, to enter the Doctor Course in Medicine and Dentistry students must have graduated from a university School of Medicine, School of Dentistry, School of Pharmacy, or School of Veterinary Medicine (course requiring six years of study for graduation)
- Graduated from a Japanese university School of Medicine, School of Dentistry, School of Pharmacy, or School of Veterinary Medicine (course requiring six years of study for graduation)
- Recognized and approved as having academic ability equivalent to the above by the Ministry of Education, Culture, Sports, Science and Technology or by the graduate school concerned



#### NECESSARY LANGUAGE ABILITY

Degree courses are regularly held in Japanese. International students must have acquired the appropriate required level of Japanese ability in order to keep up with their classes by the time of enrollment.

Some of our undergraduate programs, graduate programs, short-term exchange programs are in English. (See p. 106-107)

For those who just wish to conduct specific research activities, there are many fields (especially in the field of science) where research is conducted in English and English speaking researchers are accepted as visiting scholars or graduate school students. For further information, please confirm with the faculty member of Osaka University you would like to have as a co-researcher or as an academic supervisor.

Supplementary Japanese courses are offered for international students and visiting scholars at Osaka University, but there are no Japanese pre-training courses for un-sponsored international students.

For information on local Japanese language schools, please contact the Japanese Embassy in your home country.

## Degree Programs in English

**Human Sciences International Undergraduate Degree Program (BSc)** offers students an interdisciplinary program in English with two integrated majors: Global Citizenship and Contemporary Japan. In the first three semesters students complete foundation courses that equip them with a range of transferable skills, including data processing, research methodology and critical thinking. At the same time, we introduce students to a number of disciplinary approaches to studying global citizenship and contemporary Japan. Students will also study the Japanese language and can register for some regular Human Science Courses if their proficiency level is sufficient. From the fourth semester students will take advanced courses as they build specialized knowledge in their chosen major. For more details see <http://g30.hus.osaka-u.ac.jp/>.

**The Chemistry-Biology Combined Major Program (BS/BE)** will offer students a new opportunity to learn two fundamental and interacting fields and prepare them for the challenges of rapidly advancing scientific frontiers (Admission in October). ([www.cbcmp.jp/](http://www.cbcmp.jp/))

**The Special Integrated Science Course (MS/Ph.D.)** is a graduate program for students in biology, chemistry, and macromolecular science. The program is designed to train the next generation of cutting-edge scientists (Admissions in October and April). ([www.bio.sci.osaka-u.ac.jp/global30/SISC](http://www.bio.sci.osaka-u.ac.jp/global30/SISC))

**The International Physics Course (MS/Ph.D.)** is a graduate course for students who have completed an undergraduate major in physics or the equivalent. The course is designed so that students can work as active members in international collaborations, whether in theory or experiments, for example with large-scale facilities (For admissions, please refer to the website below.). ([www.rcnp.osaka-u.ac.jp/~IPC](http://www.rcnp.osaka-u.ac.jp/~IPC))

**Biotechnology Global Human Resource Development Program** is a five-year program for master's and doctor's degrees which aims to expose young scientists to state-of-the-art research and in-depth knowledge of advanced biology, chemistry and physics to harness the potential of biotechnology. Students having completed the Chemistry-Biology Combined Major Program can take this program.

**"Engineering Science 21st Century" Program (MS/Ph.D.)** promotes trans- and multi-disciplinary topmost research and education as the "Engineering Science 21st Century" Program among emerging specialized areas of science and technology such as materials science, chemical engineering, chemistry, materials physics and nanotechnology; mechanical science/engineering, nonlinear mechanics, mechatronics, bio-mechanics/physics and biomedical engineering; and system innovation including opto-electronics, systems science and applied information, robotics, and mathematical science. ([www.es.osaka-u.ac.jp/en/programs/admissions.html](http://www.es.osaka-u.ac.jp/en/programs/admissions.html))

**International Program of Maritime and Urban Engineering** in the Graduate School of Engineering, Osaka University, offers an international course using English as the language of instruction toward advanced degrees in Maritime and Urban Engineering. The aim of this course is to educate a new generation of young scientists with fundamental knowledge and state-of-the-art research skills in this area to realize safer and more efficient construction, infrastructure and transport systems with a cleaner environment. ([maritime-urban.naoe.eng.osaka-u.ac.jp/](http://maritime-urban.naoe.eng.osaka-u.ac.jp/))

**The Quantum Engineering Design Course** provides students with up-to-date and world-class research techniques to advance Quantum Engineering Design in response to global, technological and environmental challenges. The core divisions are "frontier mathematical methods," "elucidation of emergent material function" and "realization of new generation functional materials." ([www.dyn.ap.eng.osaka-u.ac.jp/QEDC/index.html](http://www.dyn.ap.eng.osaka-u.ac.jp/QEDC/index.html))

**Information Technology Special Course in English** covers the wide range of information science and related fields such as a hardware, software and "human-ware" for information and network technologies. This program is a cross-departmental 5-year Doctor Course program, which is promoted by the whole graduate school. We welcome the students with a particular interest in information science and technology wishing to make contributions to the advanced information society of the 21st century. ([www.ist.osaka-u.ac.jp/english/](http://www.ist.osaka-u.ac.jp/english/))

**The Chemical Science Program** at Osaka University offers postgraduate students both the Masters and Ph. D. degrees and covers all aspects of "Chemistry", the center of science. "Chemistry" provides a broad and comprehensive program that serves as the basis of societal needs with respect to chemistry and provides keys for the future. The Chemical Science Program is designed to provide a seamless postgraduate program that integrates both the Masters and Ph.D. degrees. In the initial years, you will acquire and establish a fundamental basis for applied chemistry in the fields of Physical Chemistry, Synthetic Chemistry, and Biological Chemistry. In the second year, the program is geared towards developing within each student the ability to perform creative scientific research and to think creatively. Thereafter, students will become involved in library research related to their projects and will prepare to begin actual experimental or theoretical studies. ([www.chem.eng.osaka-u.ac.jp/appl/eng/index\\_e.html](http://www.chem.eng.osaka-u.ac.jp/appl/eng/index_e.html))



## Non-Degree Programs

### Programs for Short-Term Exchange Students

There is a wide variety of one-year (or less) short-term programs prepared for international students from the universities abroad that have student exchange agreements with Osaka University (so called as "short-term exchange students").

Within these programs, there are a number of classes that Japanese students may also participate in. Through these classes, close inter exchange with Japanese students can be acquired.

For applications and inquiries on these programs, please contact the appropriate office in charge of international student exchange at the university you are currently enrolled in.

#### OUSSEP

(Osaka University Short-term Student Exchange Program)

OUSSEP has been designed to give students from overseas universities who have not studied Japanese an opportunity to earn transferable credits at Osaka University under the close coordination of the Center for International Education and Exchange. 3rd and 4th year undergraduate students of their home university can study a variety of subjects in fields such as the medical sciences, natural sciences, social sciences, arts and foreign studies in English for 1 year (2 semesters) (Full-year OUSSEP) or half a year (1 semester) (Half-year OUSSEP), from April or late September. In addition to this, independent research may also be conducted. Every year, applications must be submitted to Osaka University through the applicant's home university by the beginning of November (for those starting in April) or by late March (for those starting in late September). ([ex.isc.osaka-u.ac.jp/oussep](http://ex.isc.osaka-u.ac.jp/oussep))

#### Maple

Maple is a special Japanese Culture-Language program designed to raise talented people capable of understanding Japan in a diverse way from a comparative and contrastive viewpoint. Participating students will be able to select Japanese courses from elementary-intermediate to advanced levels based on their Japanese proficiency. Students will also take comparative research classes conducted in English, comparing and contrasting the language and cultural differences between their home country and Japan, as well as take specialized Japanese culture and language seminars focused on understanding intercultural differences with Japanese students. In addition to this, independent research may also be conducted. The program is held from late September to August of the following year (2 semesters), and mainly accepts 3rd and 4th year undergraduate students from their currently enrolled university. ([www.cjlc.osaka-u.ac.jp/program/m](http://www.cjlc.osaka-u.ac.jp/program/m))

#### FrontierLab@OsakaU

The FrontierLab@OsakaU program is designed to nurture originality in students by offering potential research directions in a wide range of fields and emphasizing hands-on laboratory experience. Each participant will be assigned to a particular research group in one of Osaka University's internationally renowned science and technology fields. Thematic studies will be conducted through experiments, peer consulting, group work and interactive discussions under the close supervision of the faculty. The program will be conducted in English or Japanese.

The program focuses on foreign undergraduate students who have completed their 1st and 2nd year of study at their enrolled university and graduate students.

The following two types are offered:  
Credited Research

- i. Applicable for both undergraduate and graduate students
- ii. Fixed period: 1 semester (15 weeks) or 2 semesters
- iii. Participants will conduct credited research supervised by faculty members, and have the option to take other credited courses (including Japanese language subjects)

Non-credited Research

- i. Applicable for graduate students only
- ii. Flexible period (3 to 12 months)
- iii. Participants will conduct research supervised by faculty members, but are unable to participate in coursework that will grant credits
- iv. Research work will be evaluated by an academic supervisor and reported to the participant's home university

Students from universities abroad that do not have student exchange agreements with Osaka University are also eligible to participate in the program if the tuition fee to Osaka University is paid.

([www.osaka-u.ac.jp/en/international/inbound/exchange\\_program/frontierlab](http://www.osaka-u.ac.jp/en/international/inbound/exchange_program/frontierlab))

#### iExPO (immersion Exchange Program Osaka)

This program is intended for undergraduate/graduate international students to study for less than one year, selecting and attending classes that are originally intended for Japanese students. Graduate students may also focus on research under the guidance of a faculty member for less than one year. Classes eligible for attending are determined by each school/graduate school.

## Research Students

The research student system enables students to enter schools or graduate schools to research a specific subject/field as "research students," with the permission of the schools or graduate schools concerned. However, students enrolled are unable to receive a degree or credits. In addition to schools and graduate schools, research institutes, joint-use facilities, and national joint-use facilities also accept research students.

For further information, please contact the relevant school/facility.

# Campus Life



## The Best Facilities for the Best Students

Osaka University's three campuses, Suita, Toyonaka, and Minoh, are connected by monorail and a free shuttle bus service. Each campus has facilities that are needed in daily life such as cafeterias, food stores, bookstores, stationary stores, a housing support corner, travel centers, and ATMs. And Suita and Toyonaka campuses have post offices and barbershops.

As a result, students can enjoy a convenient campus life while undertaking in their studies.

Each campus has a health care center where consultation services on health and medical care (internal medicine) is offered. Every year, regular medical checkups for students and medical consultations are given at the center.



# Club Activities



## Enrich your School Life with Sports, Clubs, and Cultural Activities

Osaka University offers a vast array of sports facilities such as athletics grounds, gymnasiums, swimming pools and more. Of the athletics fields on Osaka University's three campuses, the field on Suita campus was recently resurfaced making it the University's first all-weather area with artificial turf.

Osaka University has 59 sports groups, which range from traditional martial arts to modern outdoor sports. There are also 69 extracurricular cultural groups at the University.

Students are able to travel beyond their fields of research and deepen their friendships through these activities.

Osaka University emphasizes activities that nurture human relationships through several competitions, and supports students through the maintenance of equipment and facilities.



# Support and Other Information

## Fees and Financial Support

Tuition Fees\*

Category	Entrance Examination Fee	Enrollment Fee	Tuition Fee
Undergraduate Student	17,000 yen	282,000 yen	535,800 yen/year
Graduate Student	30,000 yen	282,000 yen	535,800 yen/year
Law School Student	30,000 yen	282,000 yen	804,000 yen/year
Research Student	9,800 yen	84,600 yen	28,900 yen/month
Auditor / Credited Auditor	9,800 yen	28,200 yen	14,400 yen/credit

\*These fees may be subject to change.

## Enrollment fee and Tuition Fee Exemption / Reduction

Un-sponsored international students (full-time private students in the undergraduate/graduate courses) who have difficulty in paying the enrollment fee and tuition fee and have an outstanding academic record may apply for enrollment fee and tuition fee exemption.

The ratio of enrollment and tuition deduction is either full reduction or half reduction.

Enrollment and tuition fees can be exempted within the limit of our budget.

## Scholarships

Offered by the Japan Student Services Organization (JASSO) and private scholarship organizations, there are scholarships provided to un-sponsored international students with outstanding academic records who have financial difficulty. The amount of most scholarships varies from 30,000 to 200,000 yen per month, but most of them are from 50,000 to 100,000 yen per month.

Currently, about 40% of the un-sponsored international students at Osaka University are receiving some form of financial aid. The applications for many scholarships are processed through the administrative office at the school/graduate school where students are enrolled.

Information on scholarships is also available through JASSO ([www.jasso.go.jp/study\\_j/scholarships\\_e.html](http://www.jasso.go.jp/study_j/scholarships_e.html)).

Most of these programs may be applied for after entering the university.

Please note that the scholarships listed below for short-term exchange students require applicants to apply through their currently enrolled university that have student exchange agreements with Osaka University before coming to Japan.

- Osaka University Scholarship for Exchange Study
- JASSO Scholarship for Short-term Study in Japan

## Cost of Living

Cost of Food	30,000 yen—40,000 yen
Living Cost, Utilities, Travel Expenses	50,000 yen—60,000 yen
Study Expenses	6,000 yen—12,000 yen
Entertainment, Clothes	21,000 yen—22,000 yen
Other Miscellaneous Expenses	14,000 yen—23,000 yen
<b>Total (Per Month)</b>	<b>121,000 yen—157,000 yen</b>

## Health Insurance

International students who reside legally in Japan longer than three months are required to join the insurance program called Kokumin Kenko Hoken (National Health Insurance). They can enroll in the program at the City Office where their address is registered. By paying the premiums and presenting the certificate, the insurance covers about 70% of the expenses for most of medical care and hospitalization.

## Accommodation

### Dormitory for International Students (Osaka University Dormitory, Public Dormitory)

The number of residences being managed by Osaka University and public organizations is limited. The rent for these facilities is comparatively cheaper than private housing.

([www.osaka-u.ac.jp/en/guide/international/residence.html](http://www.osaka-u.ac.jp/en/guide/international/residence.html))

Osaka University Residence Halls

Residence	Suita International Student Dormitory		Tsukumo-dai International Student Dormitory		Toyonaka Campus International House	
	Single	Couple	Family	Couple	Single	Single
Room Type	Single	Single	Family	Couple	Single	Single
No. of units	76	119	13	17	70	
Monthly Rent	15,000 yen	21,000 yen	16,000 yen	14,000 yen	10,000 yen	

Residence	Niina International Student Dormitory		Minoh International Student Dormitory		Minoh International Student House	
	Single	Couple	Single	Single	Single	Single
Room Type	Single	Couple	Single	Single	Single	Single
No. of units	12	6	117	40		
Monthly Rent	10,000 yen	13,000 yen	9,000 yen	9,000 yen		

Residence	Seimei Student Dormitory		Momiji Student Dormitory		Toneyama Student Dormitory	
	Single	Single	Single	Single	Single	Single
Room Type	Single	Single	Single	Single	Single	Single
No. of units	75	48	49			
Monthly Rent	5,900 yen	5,900 yen	5,900 yen			

※As of April 1st, 2015  
These fees may be subject to change.



### Other Alternatives

Due to the limited capacity at University dormitories, most of the international students need to find their housing outside of the campus. Since there are special Japanese customs in this process, it may be difficult to understand when trying to find a place for the first time.

Dormitories operated by international students support organizations: there are some dormitory-type facilities which are usually applied through each administrative office at Schools / Graduate Schools upon an official announcement made by International Student Affairs Division when there are some openings.

Private Housing: Rooms are usually unfurnished. Rents vary according to the location, the size of the apartment, its age, the degree of furnishing, and whether or not there is a view. Looking on the internet or in rental-housing magazines in advance should provide general information about options in the local area. Generally, a six to seven month's rent will be expected as a total initial cost, such as a rental deposit, security deposit, key money, broker's commission and other fees.

The Support Office for International Students and Scholars at the Center for International Education and Exchange (see p. 110: <https://iss-intl.osaka-u.ac.jp/supportoffice>) and the advising room for international students at each School/Graduate School offer housing assistance.

Also, the Osaka University CO-OP welcomes international students to give them a real estate service with a variety of property information around the campus.

### Apartments

Type	Deposit	Rent Per Month (Excluding Utilities)
Studio (One Room)	100,000yen – 450,000yen	30,000yen – 70,000yen
Apartment (Two Rooms)	150,000yen – 500,000yen	50,000yen – 120,000yen

## Support and Exchange Activities

At Osaka University, we are endeavoring to equip and sustain systems designed to help the study and research of international students and visiting scholars progress smoothly.

### Counseling, Advice

With the cooperation of counselors and special academic advisors, the Center for International Education and Exchange provides international students with various types of advisory services related to living in Japan and studying at Osaka University.

Students may also use advising rooms for international students that are provided independently by some of the schools/graduate schools (separate from the service above).

### Japanese Language and Culture Programs

The following programs are offered:

- Japanese language courses for international students (Provided by the Center for International Education and Exchange)

- Japanese programs for specialized fields, implemented by some of the scientific and engineering schools/graduate schools
- High-level Japanese learning programs designed for undergraduate Japanese Government Scholarship Students, specializing in Japanese studies (provided by the Center for Japanese Language and Culture)
- Japanese Culture-Language programs for short-term exchange students (Maple Program) (Provided by the Center for Japanese Language and Culture)
- Japanese preliminary language programs for Japanese Government Scholarship Students and KOSMOS (Korean Students of Science Major at Osaka University with Special Scholarship) students (Provided by the Center for International Education and Exchange the Center for Japanese Language and Culture)

### Exchange Activities

International students can broaden friendship and communication with both international and Japanese students, as well as the faculty, staff and local residents by actively participating in a variety of the following support and exchange programs, mainly organized by the Center for International Education and Exchange.

- Cultural exchange events for international students and local residents
- Home visits (a chance to participate in Japanese daily life)
- International understanding programs with local schools
- Inter-exchanges between international students and Japanese students (parties, campus tours, help with the Japanese language, and school and local events and festivals), provided by the international students association and student volunteer groups

### Tutor Program

The One-on-one peer tutor program provided by Center for Education in Liberal Arts and Sciences is available to undergraduate students for their first one and half years at Osaka University.

The tutors are mainly senior students, majoring in courses relating to the major of the respective international student. They help the international students improve their Japanese skills and provide learning support and guidance for matters in daily life.

### OUISA (Osaka University International Student Association) & International Student Associations at Osaka University

OUISA supports the lives of international students with their needs in mind. OUISA works closely with IRIS (Information Room for International Students) in organizing various kinds of events and activities for international students and for international activities. Every year OUISA selects the committee members in managing and running OUISA for that year. By joining OUISA activities, which are often in close cooperation with B.S.P (Brothers and Sisters Program), students get to meet and make friends from around the world. Having a network of good friends and community will help them in their student life at Osaka.

In addition to OUISA, there are many international

student associations at Osaka University. Students can keep contact with those friends who share the same backgrounds while they study at Osaka. It must be added that IRIS works closely with these student associations. IRIS, OUISA, and these student

associations, in cooperation with other concerned people, all work in support of international students at Osaka University.



### Useful Links

Osaka University	<a href="http://www.osaka-u.ac.jp/en">www.osaka-u.ac.jp/en</a>
Graduate & Undergraduate Schools & Facilities	<a href="http://www.osaka-u.ac.jp/en/academics">www.osaka-u.ac.jp/en/academics</a>
Admissions	<a href="http://www.osaka-u.ac.jp/en/admissions">www.osaka-u.ac.jp/en/admissions</a>
Prospective Students	<a href="http://www.osaka-u.ac.jp/en/for-examinee">www.osaka-u.ac.jp/en/for-examinee</a>
General Information of Financial Aid	<a href="http://www.osaka-u.ac.jp/en/guide/student/tuition">www.osaka-u.ac.jp/en/guide/student/tuition</a>
Overseas Centers (San Francisco, Groningen, Bangkok and Shanghai)	<a href="http://www.osaka-u.ac.jp/en/international/action/branch.html">www.osaka-u.ac.jp/en/international/action/branch.html</a>
Partner Universities	<a href="http://www.osaka-u.ac.jp/en/international/action/exchange/index.html">www.osaka-u.ac.jp/en/international/action/exchange/index.html</a>

### Other Useful Links

JASSO (Japan Student Services Organization) Information on Study in Japan, Japan Education Fair, etc.	<a href="http://www.jasso.go.jp/index_e.html">www.jasso.go.jp/index_e.html</a>
STUDY IN JAPAN Comprehensive guide for prospective students, for foreign students in Japan, for former foreign students	<a href="http://www.studyjapan.go.jp/en/index.html">www.studyjapan.go.jp/en/index.html</a>
Japanese Embassies (If you want to obtain the information on Japan pre-arrival scholarships offered by the Japanese Government, please refer to the Japanese Embassy in your country.)	<a href="http://www.mofa.go.jp/about/emb_cons/mofaserv.html">www.mofa.go.jp/about/emb_cons/mofaserv.html</a>

**IRIS (Information Room for International Students)**

IRIS is where international students can visit anytime when they have questions or problems. As one international student said, "It's my home in Japan," IRIS always listens and helps students in solving problems. IRIS is also where international students can spend their free time, such as eating lunch and/or chatting with other international and local students, over a cup of coffee or tea.

What is more, IRIS supports various kinds of student activities on international exchanges such as by OUISA (Osaka University International Student Association) and B.S.P. (Brothers and Sisters Program). Furthermore, IRIS works in close cooperation with local communities and schools, such as in organizing home-visit type host family programs and school visit programs.



**Support Office for International Students and Scholars**

The Support Office offers various types of assistance for international students, scholars and their families, such as assistance with the procedures for their CESR (Certificate of Eligibility for Status of Residence), the search for accommodations, and the additional procedures before and after their arrival in Japan. The Support Office also provides information through monthly orientations for newcomers, handbooks/guidebooks, and a website.

The primary goal of the Support Office is to help make the life of our international students and scholars easier and more comfortable, so that they can fully concentrate on their academic activities throughout the duration of their stay in Japan.

For more information, please view the following websites.

Support Office: <https://iss-intl.osaka-u.ac.jp/supportoffice>



**Overseas Alumni**

To date, degrees have been awarded to approximately 221,000 students at Osaka University and many are working extensively in various fields throughout the world.

The University has established overseas centers in four locations: North America (San Francisco), Europe (Groningen), ASEAN (Bangkok) and East Asia (Shanghai) as bases for international exchange activities overseas to support local alumni association efforts and to work closely with the alumni themselves.

As a forum of exchange for overseas alumni, the University boasts the Osaka University North American Alumni Association (OU-NAAA), the Osaka University Alumni Association of Europe (OUAAE), the Thai Osaka University Alumni Club (TOUAC) and the Osaka University Shanghai Alumni Association. Furthermore, there are also department, division and school reunions at overseas branches where alumni deepen friendships and further enhance collaboration and cooperation.

Other reunions are also held in various places and graduates are actively warming old friendships in many parts of the world.



Alumni Association Name	Overseas Center
Osaka University North American Alumni Association (OUNAAA)	North American Center for Academic Initiatives (San Francisco office)
Osaka University Alumni Association of Europe (OUAAE)	European Center for Academic Initiatives (Groningen office)
Thai Osaka University Alumni Club (TOUAC)	ASEAN Center for Academic Initiatives (Bangkok office)
Osaka University Shanghai Alumni Association (OUSAA)	East Asian Center for Academic Initiatives (Shanghai office)

Department Name	Branch Name	Country	City	URL
School of Letters Graduate School of Letters (Alumni Association of the School of Letters and Graduate School of Letters)	Korean Branch	Korea	Seoul	http://sakuyakai.net/
	Hong Kong Branch	China	Hong Kong	
	Beijing Branch	China	Beijing	
	Dalian Branch	China	Dalian	
	Shanghai Branch	China	Shanghai	
	Manila Branch	Philippines	Manila	
	Jakarta Branch	Indonesia	Jakarta	
	Bangkok Branch	Thailand	Bangkok	
	Milan Branch	Italy	Milan	
	London Branch	U.K.	London	
	Düsseldorf Branch	Germany	Düsseldorf	
	Paris Branch	France	Paris	
	New York Branch	U.S.A.	New York	
	Los Angeles Branch	U.S.A.	Los Angeles	
Saõ Paulo Branch	Brazil	Saõ Paulo		
School of Foreign Studies (Sakuyakai)	Moscow Branch	Russia	Moscow	
	Sydney Gaigo* Association	Australia	Sydney	
	Yangon Gaigo* Association	Myanmar	Yangon	

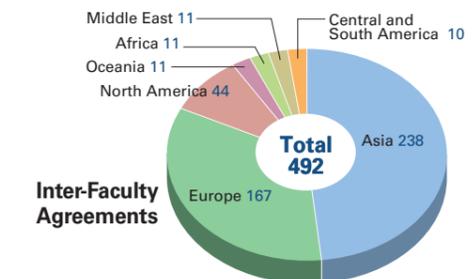
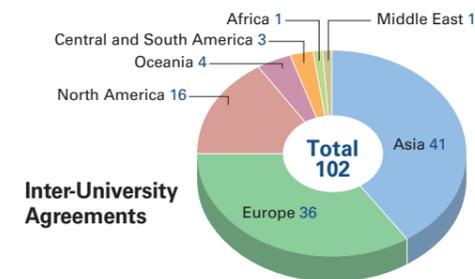
\* School of Foreign Studies

# Academic Exchange Agreements with Universities Abroad

## 102 Inter-University and 492 Inter-Faculty Exchange Agreements

Osaka University has concluded academic exchange agreements with universities and institutions throughout the world for both inter-university and inter-faculty exchanges. Extensive exchanges of students, researchers and joint research projects are being conducted with these partner institutions.

Mutual tuition waivers may be implemented for students who participate in exchange programs with the universities marked with a “\*” in the following list :

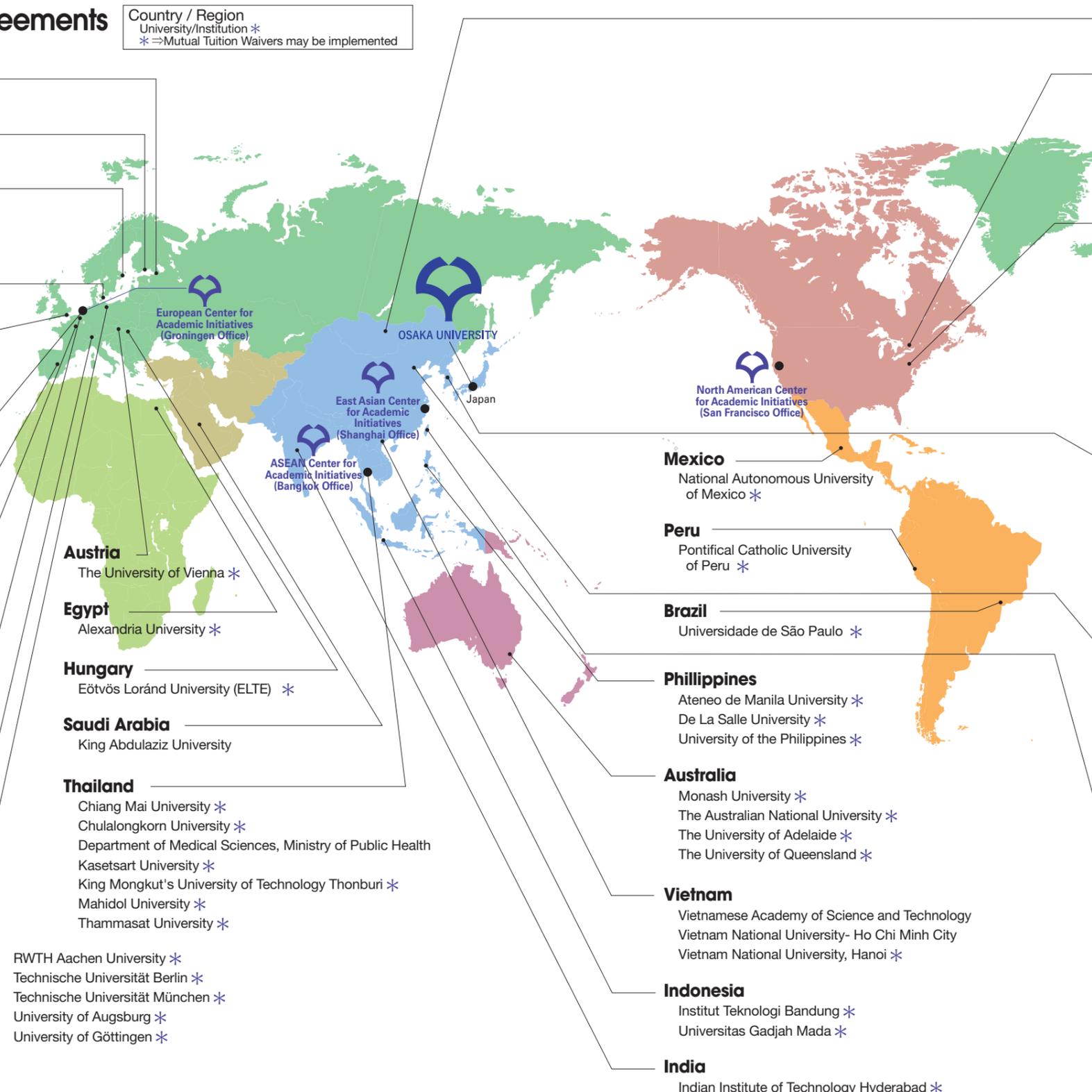


### Inter-University Exchange Agreements

(as of February 1, 2015)

Country / Region  
University/Institution \*  
\* => Mutual Tuition Waivers may be implemented

- Russia**  
Saint Petersburg State University \*
- Finland**  
Åbo Akademi University \*
- Sweden**  
Karolinska Institutet  
Royal Institute of Technology (KTH) \*  
University of Gothenburg \*
- Denmark**  
The University of Copenhagen \*
- UK**  
The University of Nottingham \*  
The University of Sheffield \*  
University of Leeds \*  
University College London
- Netherlands**  
Delft University of Technology \*  
University of Groningen \*
- Spain**  
Universidad Autónoma de Madrid \*  
University of Valladolid \*
- France**  
Centre National de la Recherche Scientifique  
École Nationale Supérieure de Chimie de Paris \*  
Grenoble Universités (Consortium of Universities in Grenoble) \*  
Pierre & Marie Curie University \*  
University of Bordeaux \*  
University of Strasbourg \*
- Belgium**  
Interuniversitair Micro-Electronica Centrum vzw (IMEC)  
Université catholique de Louvain (UCL) \*
- Switzerland**  
École Polytechnique Fédérale de Lausanne (EPFL) \*
- Germany**  
Bielefeld University \*  
Friedrich-Alexander Universität Erlangen-Nürnberg \*  
Heidelberg University \*  
Johann Wolfgang Goethe-Universität Frankfurt am Main \*  
Ludwig-Maximilians- University of Munich \*  
Ruhr -University Bochum \*



- Austria**  
The University of Vienna \*
- Egypt**  
Alexandria University \*
- Hungary**  
Eötvös Loránd University (ELTE) \*
- Saudi Arabia**  
King Abdulaziz University
- Thailand**  
Chiang Mai University \*  
Chulalongkorn University \*  
Department of Medical Sciences, Ministry of Public Health  
Kasetsart University \*  
King Mongkut's University of Technology Thonburi \*  
Mahidol University \*  
Thammasat University \*
- Central and South America**  
RWTH Aachen University \*  
Technische Universität Berlin \*  
Technische Universität München \*  
University of Augsburg \*  
University of Göttingen \*

- Mongolia**  
National University of Mongolia \*
- Canada**  
McGill University \*  
McMaster University \*  
The Conference of Rectors and Principals of Quebec Universities  
University of British Columbia \*  
University of Toronto \*
- USA**  
Cornell University  
Indiana University  
Nazareth College of Rochester \*  
Purdue University \*  
Rice University \*  
Texas A&M University \*  
The University of Georgia \*  
University of California \*  
University of California, Berkeley  
University of Washington \*  
Wesleyan College \*
- Mexico**  
National Autonomous University of Mexico \*
- Peru**  
Pontifical Catholic University of Peru \*
- Brazil**  
Universidade de São Paulo \*
- Philippines**  
Ateneo de Manila University \*  
De La Salle University \*  
University of the Philippines \*
- Australia**  
Monash University \*  
The Australian National University \*  
The University of Adelaide \*  
The University of Queensland \*
- Vietnam**  
Vietnamese Academy of Science and Technology  
Vietnam National University- Ho Chi Minh City  
Vietnam National University, Hanoi \*
- Indonesia**  
Institut Teknologi Bandung \*  
Universitas Gadjah Mada \*
- India**  
Indian Institute of Technology Hyderabad \*
- Korea**  
Changwon National University \*  
Chonnam National University \*  
Chung-Ang University \*  
Chungnam National University \*  
Gyeongsang National University \*  
Hanyang University \*  
Pusan National University \*  
Seoul National University \*  
Yonsei University \*
- China**  
Beijing Normal University \*  
Fudan University \*  
Nanjing University \*  
Peking University \*  
Shanghai Jiao Tong University \*  
The Chinese University of Hong Kong \*  
Tongji University \*  
Tsinghua University \*  
Wuhan University \*  
Xi'an Jiaotong University \*  
Zhejiang University \*
- Taiwan**  
National Cheng Kung University \*  
National Chiao Tung University \*  
National Taiwan University \*  
National Tsing Hua University \*

# Financial Figures

## Budget (FY 2014, in millions of Yen)

Revenue		
Management Expenses Grants		48,509
Facility Maintenance Grants		12,464
Revenue from Government Grants and Other Funding		14,027
National University Financial and Administrative Center Facility Funds		148
Independent Revenue	Tuition/Enrollment/Application Fees Revenue	13,010
	Osaka University Hospital Revenue	35,977
	Miscellaneous	4,983
University-Industry Cooperative Research Revenue		20,375
Long-Term Loan Revenue		1,953
Investments by Government		380
<b>Total</b>		<b>151,826</b>

## Grants-in-Aid for Scientific Research (KAKENHI) (FY 2013, in millions of Yen)

Categories	Number of Cases	Amount
Specially Promoted Research	5	703
Scientific Research on Priority Areas	1	3
Scientific Research on Innovative Areas	Research in a proposed research area	209
	(S)	36
Fundamental Research	(A)	141
	(B)	387
	(C)	701
Exploratory Research	459	743
Young Scientist	(S)	3
	(A)	97
Research Activity Start-up	(B)	549
	(S)	3
JSPS Fellows	71	101
	435	396
<b>Total</b>	<b>3,094</b>	<b>12,437</b>

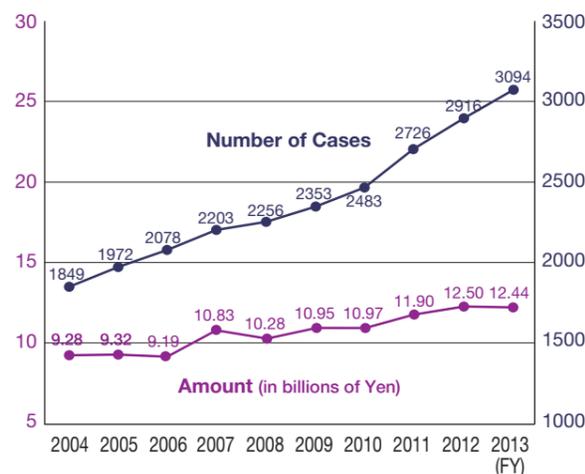
## Third-Party Funding (FY 2013, in millions of Yen)

Categories	Number of Cases	Amount
Joint Research	961	3,224
Commissioned Research	1,258	10,970
Donations for Research	25,091	5,438
<b>Total</b>	<b>27,310</b>	<b>19,632</b>

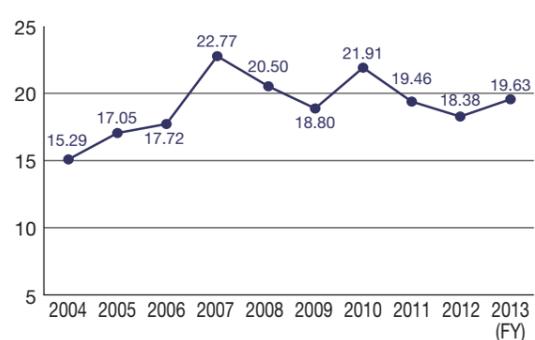
## Expenditure

Administrative Affairs Expenses	Education and Research Expenses	65,093	98,171
	Hospital Examination Expenses	33,078	
Facility Maintenance Expenses		14,565	
Subsidy Expenditure		14,027	
University-Industry Cooperative Research Expenses and Endowment Project Expenses		20,375	
Long-Term Loan Redemption Expenses		4,688	
<b>Total</b>		<b>151,826</b>	

## Transition of Grants-in-Aid for Scientific Research (KAKENHI) (Past 10 years)



## Transition of Third-Party Funding (Past 10 years, in billions of Yen)



# Number of Students, Staff and Researchers

## Number of Students (as of May 1, 2014) ( ) International Students

<b>Regular Students Total</b>	<b>23,470</b>	<b>(1,463)</b>
<b>Non-Regular Students Total</b>	<b>1,070</b>	<b>( 549)</b>
<b>Students Grand Total</b>	<b>24,540</b>	<b>(2,012)</b>

### Regular Students

#### Undergraduate Schools

Letters	756	( 15)
Human Sciences	631	( 22)
Foreign Studies	2,969	( 50)
Law	1,119	( 21)
Economics	1,038	( 57)
Science	1,198	( 37)
Medicine	1,365	( 12)
Dentistry	362	( 1)
Pharmaceutical Sciences	406	( 5)
Engineering	3,724	( 86)
Engineering Science	1,956	( 30)
<b>Undergraduate Students Total</b>	<b>15,524</b>	<b>(336)</b>

#### Graduate Schools

	Master Course	Doctor Course (5 years)
Letters	164 ( 26)	202 ( 26)
Human Sciences	208 ( 41)	191 ( 34)
Law and Politics	92 ( 31)	47 ( 12)
Economics	173 ( 94)	104 ( 17)
Science	532 ( 23)	281 ( 65)
Medicine (Health Sciences)	160 ( 3)	88 ( 1)
Pharmaceutical Sciences	143 ( 4)	66 ( 7)
Engineering	1,696 (137)	523 (182)
Engineering Science	573 ( 24)	146 ( 57)
Language and Culture	185 ( 65)	142 ( 56)
International Public Policy	95 ( 39)	72 ( 20)
Information Science and Technology	283 ( 20)	124 ( 22)
Integrated Studies in Language and Society	—	2 ( 0)
United Graduate School of Child Development	—	53 ( 2)
<b>Total</b>	<b>4,304 (507)</b>	<b>2,041 (501)</b>

#### Master Course (2 years)

Letters (Cultural Dynamics)	42 (5)
<b>Total</b>	<b>42 (5)</b>

#### Master Course (2 years) | Doctor Course (4 years)

Medicine	53 ( 8)	778 (62)
Dentistry	—	173 ( 9)
Pharmaceutical	1 ( 0)	13 ( 0)
<b>Total</b>	<b>54 ( 8)</b>	<b>964 (71)</b>

#### Doctor Course (5 years)

Frontier Biosciences	268 (35)
<b>Total</b>	<b>268 (35)</b>

#### Law School (3 years)

Law School	232 (0)
<b>Total</b>	<b>232 (0)</b>

	Master Course	Doctor Course	Law School
<b>Graduate Students Total</b>	<b>4,400 (520)</b>	<b>3,273 (607)</b>	<b>232 (0)</b>

#### Specialized Training Colleges

Dental Technology Institute	41 (0)
<b>Total</b>	<b>41 (0)</b>

## Number of Staff (as of May 1, 2014)

### Full-Time Staff (total 6,282)

Professor	922
Associate Professor	854
Associate Professor (Lecturer)	236
Assistant Professor	1,143
Assistant and Others	16
Specially Appointed Researcher	289
<b>Academic Staff</b>	<b>3,460</b>

Administrative Staff	1,196
Technical Staff	307
Medical Staff	1,319
<b>Non-Academic Staff</b>	<b>2,822</b>

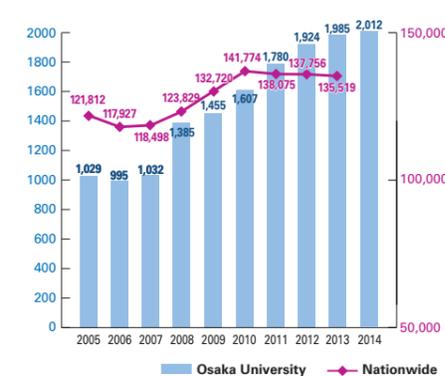
### Part-Time Staff and Others (total 3,653)

Academic Staff	752
Administrative Staff	1,427
Technical Staff	419
Medical Staff	1,003
Others	52

## Number of International Students (as of May 1, 2014)

Asia	1,618
Europe	207
Central and South America	59
North America	43
Middle East	43
Africa	32
Oceania	10
<b>Total</b>	<b>2,012</b>

## Transition of Number of International Students (as of May 1, 2014 Past 10 Years)



## Number of Visiting International Researchers (FY2013)

Asia	475
Europe	244
North America	59
Africa	29
Middle East	23
Oceania	18
Central and South America	12
<b>Total</b>	<b>860</b>

# Addresses

• **International Student Affairs Division**  
Tel: +81-6-6879-7103 Fax: +81-6-6879-8964  
E-mail: kenkyou-r@ml.office.osaka-u.ac.jp

## Suita Campus

Tel: +81-6-6877-5111 (Central)  
Tel: +81-6-6879-5111 (Central for Faculty of Medicine/Osaka University Hospital/School of Dentistry/Osaka University Dental Hospital/United Graduate School of Child Development)

### ◎ Schools and Graduate Schools

**Human Sciences**  
1-2 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-8010  
E-mail: oie@hus.osaka-u.ac.jp

### Medicine

2-2 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-3347  
E-mail: i-soumu-syomu@office.osaka-u.ac.jp

### Division of Health Sciences

1-7 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-2629  
E-mail: kouhou@sahs.med.osaka-u.ac.jp

### Osaka University Hospital

2-15 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-5019

### Dentistry

1-8 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-2832  
E-mail: si-soumu-kyomu@office.osaka-u.ac.jp

### Osaka University Dental Hospital

1-8 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-2861

### Pharmaceutical Sciences

1-6 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-8154  
E-mail: yakugaku-kyomu@office.osaka-u.ac.jp

### Engineering

2-1 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-7229  
E-mail: iso-staff@eng.osaka-u.ac.jp

### Information Science and Technology

1-5 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-4570  
E-mail: office@ist.osaka-u.ac.jp

### Frontier Biosciences

1-3 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-4420  
E-mail: seimei-daigakuin@office.osaka-u.ac.jp

### United Graduate School of Child Development, Osaka University, Kanazawa University, Hamamatsu University School of Medicine, Chiba University and University of Fukui

2-2 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-3347  
E-mail: office@ugscd.osaka-u.ac.jp

### ◎ Research Institutes

#### Research Institute for Microbial Diseases

3-1 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-8266  
E-mail: biken-kenkyo@office.osaka-u.ac.jp

#### The Institute of Scientific and Industrial Research

8-1 Mihogaoka, Ibaraki, Osaka 567-0047  
Fax: +81-6-6879-8509  
E-mail: kouhou@sanken.osaka-u.ac.jp

#### Institute for Protein Research

3-2 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-8590  
E-mail: tanpakuken-kyoudo@office.osaka-u.ac.jp

#### Institute of Social and Economic Research

6-1 Mihogaoka, Ibaraki, Osaka 567-0047  
Fax: +81-6-6879-8583  
E-mail: syaken-syomu@office.osaka-u.ac.jp

#### Joining and Welding Research Institute

11-1 Mihogaoka, Ibaraki, Osaka 567-0047  
Fax: +81-6-6879-8689  
E-mail: setugouken-syomu@office.osaka-u.ac.jp

### ◎ Life Sciences Library

2-3 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-2428  
E-mail: ls-desk@library.osaka-u.ac.jp

### ◎ Science and Engineering Library

2-1 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-7190  
E-mail: sl-desk@library.osaka-u.ac.jp

### • International Affairs Division

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E-mail: kokusai-ina@ml.office.osaka-u.ac.jp

### ◎ Joint-Use Facilities & National Joint-Use Facilities

#### Research Center for Nuclear Physics

10-1 Mihogaoka, Ibaraki, Osaka 567-0047  
Fax: +81-6-6879-8899  
E-mail: director@rcnp.osaka-u.ac.jp

#### Cybermedia Center

5-1 Mihogaoka, Ibaraki, Osaka 567-0047  
Fax: +81-6-6879-8814  
E-mail: zysui-kikaku-soumu@office.osaka-u.ac.jp

#### Institute of Laser Engineering

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E-mail: rezaken-syomu@office.osaka-u.ac.jp

#### Low Temperature Center

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Fax: +81-6-6879-7986

#### Research Center for Ultra-High Voltage Electron Microscopy

7-1 Mihogaoka, Ibaraki, Osaka 567-0047  
Fax: +81-6-6879-7942

#### Radioisotope Research Center

2-4 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-8825

#### Research Center for Environmental Preservation

2-4 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-8978  
E-mail: hozen@epc.osaka-u.ac.jp

#### Center for International Education and Exchange

1-1 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-8964  
E-mail: kokusai-gakusei-ryugakusei@office.osaka-u.ac.jp

#### International Center for Biotechnology

2-1 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-7454  
E-mail: info@icb.osaka-u.ac.jp

#### Health Care Center

2-1 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-4088

#### Global Center for Medical Engineering and Informatics

2-2 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-3378  
E-mail: mei-sec@mei.osaka-u.ac.jp

#### Global Collaboration Center

2-7 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-4444  
E-mail: jim@glocol.osaka-u.ac.jp

#### Center for Environmental Innovation Design for Sustainability

2-1 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6875-6271  
E-mail: ceids-jim@ceids.osakau.ac.jp

### ◎ World Premier International Research Center

#### Immunology Frontier Research Center

3-1 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-4272  
E-mail: ifrec-office@ifrec.osaka-u.ac.jp

### ◎ Institute for Advanced Interdisciplinary Research

#### Center for Information and Neural Networks

1-4 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-4308  
E-mail: info@cinet.jp

### ◎ Education & Research Support Organizations

#### Institute for Academic Initiatives (IAI)

2-2 Yamadaoka, Suita, Osaka 565-0871  
E-mail: mirai-soumu@office.osaka-u.ac.jp

#### Office for University-Industry Collaboration

2-8 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-4208  
E-mail: contact@uic.osaka-u.ac.jp

#### Department of Safety and Hygiene

1-1 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-4024  
E-mail: contact-dash@ml.office.osaka-u.ac.jp

#### Department of Environment and Energy Management

1-1 Yamadaoka, Suita, Osaka 565-0871  
Fax: +81-6-6879-7138  
E-mail: kankyou-kikaku@office.osaka-u.ac.jp

#### Support Center for Campus Life

1-1 Yamadaoka, Suita, Osaka 565-0871  
FAX: +81-6-6879-7167

## Toyonaka Campus Tel: +81-6-6850-6111 (Central)

### ◎ Main Library

1-4 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
Fax: +81-6-6850-5052  
E-mail: honkan@library.osaka-u.ac.jp

### ◎ Schools and Graduate Schools

#### Letters

1-5 Machikaneyama-cho, Toyonaka, Osaka 560-8532  
Fax: +81-6-6850-5087  
E-mail: bunsouhaku-kyoumu@office.osaka-u.ac.jp

#### Law / Law and Politics

1-6 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
Fax: +81-6-6850-5089  
E-mail: houkyoumu@law.osaka-u.ac.jp

#### Economics

1-7 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
Fax: +81-6-6850-5212  
E-mail: kyoumu@econ.osaka-u.ac.jp  
E-mail: keikoku-keizaikyomu@office.osaka-u.ac.jp

#### Science

1-1 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
Fax: +81-6-6850-6777  
E-mail: ri-gakuseikokusai@office.osaka-u.ac.jp

#### Engineering Science

1-3 Machikaneyama-cho, Toyonaka, Osaka 560-8531  
Fax: +81-6-6850-6145  
E-mail: ki-kyomu@office.osaka-u.ac.jp  
E-mail: ki-daigakuin@office.osaka-u.ac.jp

#### Language and Culture

1-8 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
Fax: +81-6-6850-5865  
E-mail: genbun-daigakuin@office.osaka-u.ac.jp

#### International Public Policy

1-31 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
Fax: +81-6-6850-5600  
E-mail: kyomu@osipp.osaka-u.ac.jp

#### Law School

1-6 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
Fax: +81-6-6850-6947  
E-mail: kousikyomu@lawschool.osaka-u.ac.jp

### ◎ Joint-Use Facilities

#### Low Temperature Center

1-1 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
Fax: +81-6-6850-6090

#### Radioisotope Research Center (Toyonaka Branch)

1-1 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
Fax: +81-6-6850-6104

#### Research Center for Solar Energy Chemistry

1-3 Machikaneyama-cho, Toyonaka, Osaka 560-8531  
Fax: +81-6-6850-6699

#### The Museum of Osaka University

1-20 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
Fax: +81-6-6850-6049

#### Health Care Center

1-17 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
Fax: +81-6-6850-6040

#### Center for the Study of Finance and Insurance

1-3 Machikaneyama-cho, Toyonaka, Osaka 560-8531  
Fax: +81-6-6850-6092  
E-mail: csfi-jim@sigmath.es.osaka-u.ac.jp

#### Center for Scientific Instrument Renovation and Manufacturing Support

1-2 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
Fax: +81-6-6850-6052

#### Center for the Study of Communication-Design

1-16 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
Fax: +81-6-4865-0121  
E-mail: zenkyo-insoumu@office.osaka-u.ac.jp

#### Institute for NanoScience Design

1-3 Machikaneyama-cho, Toyonaka, Osaka 560-8531  
Fax: +81-6-6850-6398

#### Intellectual Property Center (IPrism)

1-6 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
Fax: +81-6-6850-6593  
E-mail: ipjim@iprism.osaka-u.ac.jp

### ◎ Education & Research Support Organizations

#### Center for Education in Liberal Arts and Sciences

1-16 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
Fax: +81-6-6850-5613  
E-mail: zenkyo-soumu@office.osaka-u.ac.jp

#### Teaching and Learning Support Center

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E-mail: zenkyo-tlsc@office.osaka-u.ac.jp

#### Kaitokudo for the 21st Century

1-13 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
Fax: +81-6-6850-6449  
E-mail: info@21c-kaitokudo.osaka-u.ac.jp

### Tekijuku Commemoration Center

1-13 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
Fax: +81-6-6850-5015  
E-mail: kinenkai@tekijuku.osaka-u.ac.jp

### Support Center for Campus Life

1-10 Machikaneyama-cho, Toyonaka, Osaka 560-0043  
FAX: +81-6-6879-7167

## Minoh Campus Tel: +81-72-730-5111 (Central)

### ◎ Schools and Graduate Schools

#### Foreign Studies

8-1-1 Aomatani-higashi, Minoh, Osaka 562-8558  
Fax: +81-72-730-5057  
E-mail: genbun-minoh-kyomu@office.osaka-u.ac.jp

#### Language and Culture (Language and Society / Japanese Language and Culture)

8-1-1 Aomatani-higashi, Minoh, Osaka 562-8558  
Fax: +81-72-730-5057  
E-mail: genbun-minoh-kyomu@office.osaka-u.ac.jp

### ◎ Joint-Use Facilities

#### Health Care Center

8-1-1 Aomatani-higashi, Minoh, Osaka 562-8558  
Fax: +81-72-730-5153

#### Center for Japanese Language and Culture

8-1-1 Aomatani-higashi, Minoh, Osaka 562-8558  
Fax: +81-72-730-5074  
E-mail: kouryu@cjlc.osaka-u.ac.jp

### ◎ International Studies Library

8-1-1 Aomatani-higashi, Minoh, Osaka 562-8558  
Fax: +81-72-730-5127  
E-mail: ml-cir@library.osaka-u.ac.jp

### ◎ Education & Research Support Organizations

#### Support Center for Campus Life

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FAX: +81-6-6879-7167

## Osaka University Overseas Centers

### ■ North American Center for Academic Initiatives (San Francisco Office)

44 Montgomery St., Suite 3580, San Francisco, CA 94104, USA  
Tel: +1-415-296-8561 Fax: +1-415-296-8676  
E-mail: info@osaka-u-sf.org

### ■ European Center for Academic Initiatives (Groningen Office)

Oude Kijk in 't Jatstraat 26, 9712 EK Groningen, The Netherlands  
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E-mail: info@osaka-u-groningen.org

### ■ ASEAN Center for Academic Initiatives (Bangkok Office)

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Tel: +66-2-661-7584 Fax: +66-2-661-7585  
E-mail: info@osaka-u-bangkok.org

### ■ East Asian Center for Academic Initiatives (Shanghai Office)

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Tel: +86-21-6598-5665 Fax: +86-21-6598-5535  
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## Nakanoshima Area

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Tel: +81-6-6444-2100 Fax: +81-6-6444-2338  
E-mail: office@onc.osaka-u.ac.jp  
URL: www.onc.osaka-u.ac.jp

## Tokyo Area

### ■ Osaka University Tokyo Office

10th Floor, Nittochi Bldg., 1-4-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-0013  
Tel: +81-3-6205-7741 Fax: +81-3-6205-7743  
E-mail: ou-tokyo-office@ml.office.osaka-u.ac.jp  
URL: www.osaka-u.ac.jp/en/academics/facilities/tokyo/office

# Introduction of Osaka

Osaka, surrounded by Kyoto, Nara and Kobe, is located in the centre of Japan.

Here, in this modernised, friendly and charming city with more than 1,800 years of history, old and new come together.

In terms of transportation, Osaka is very conveniently positioned and, thanks to Kansai International and Itami airports, it can be easily accessed from both inside and outside of Japan. From Kyushu in the south to Tokyo in the north, the bullet train (Shinkansen) runs the length of Japan, stopping at Shin-Osaka Station. All other train and subway lines also run through Osaka Station.

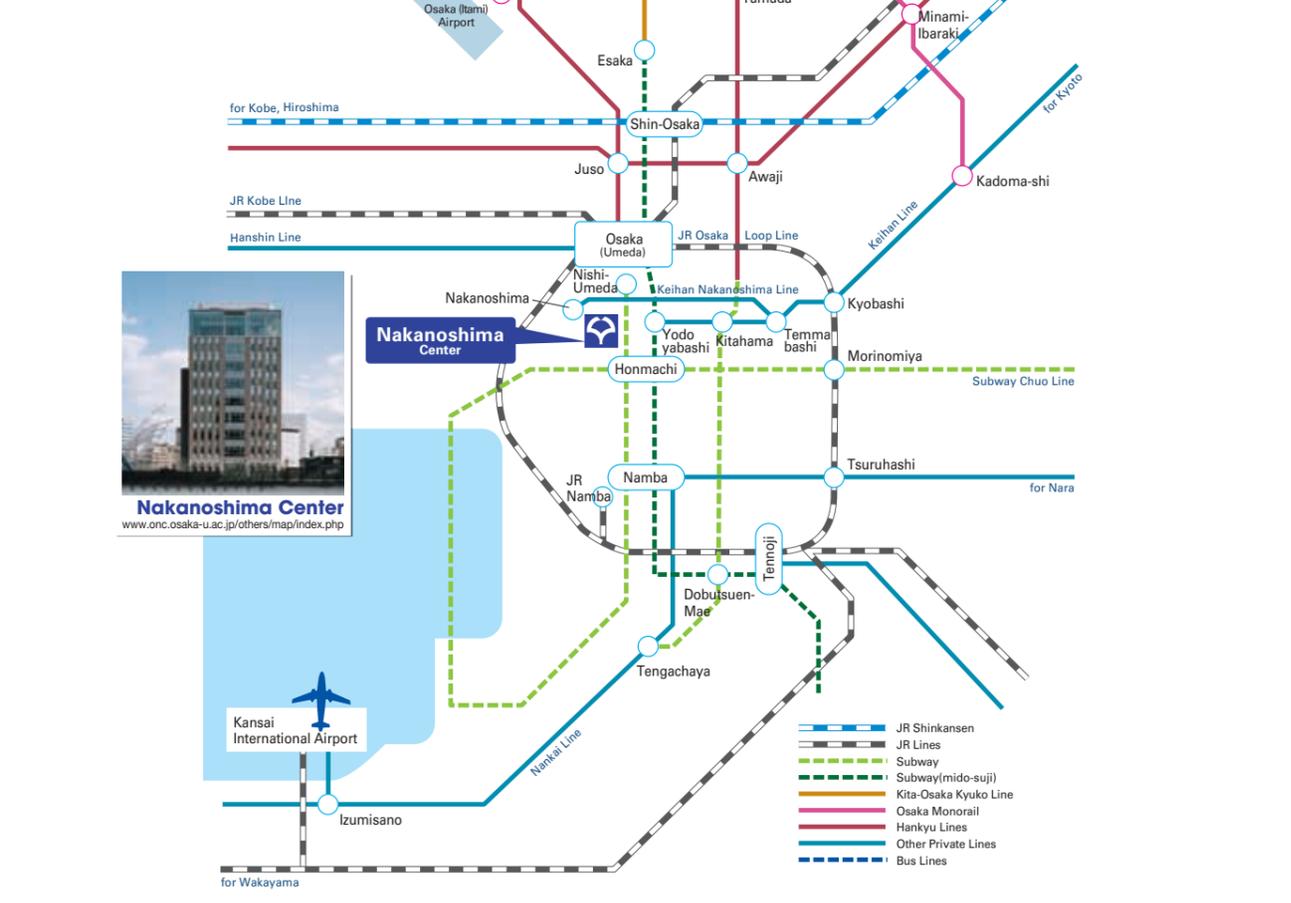
We are looking forward to seeing you in Osaka!



1. Osaka Castle
2. Osaka City Central Public Hall
3. Dotombori
4. Sumiyoshi-Taisha Grand Shrine
5. Abeno Harukas
6. Shin-Sekai (New World)
7. Shitennoji Temple
8. Nintoku-ryo Tumulus
9. Osaka Aqua-bus "AQUA-LINER"
10. Umeda Sky Building

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# Campus Locations and Transportation



Published by: Osaka University  
 Edited by: International Affairs Division, Department of General Affairs and Planning  
 Editorial Cooperation and Printing: Yoshida Printing Inc.  
 Distributed by: International Affairs Division, Department of General Affairs and Planning  
 Administration Bureau, Osaka University  
 1-1 Yamadaoka, Suita, Osaka 565-0871, JAPAN

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