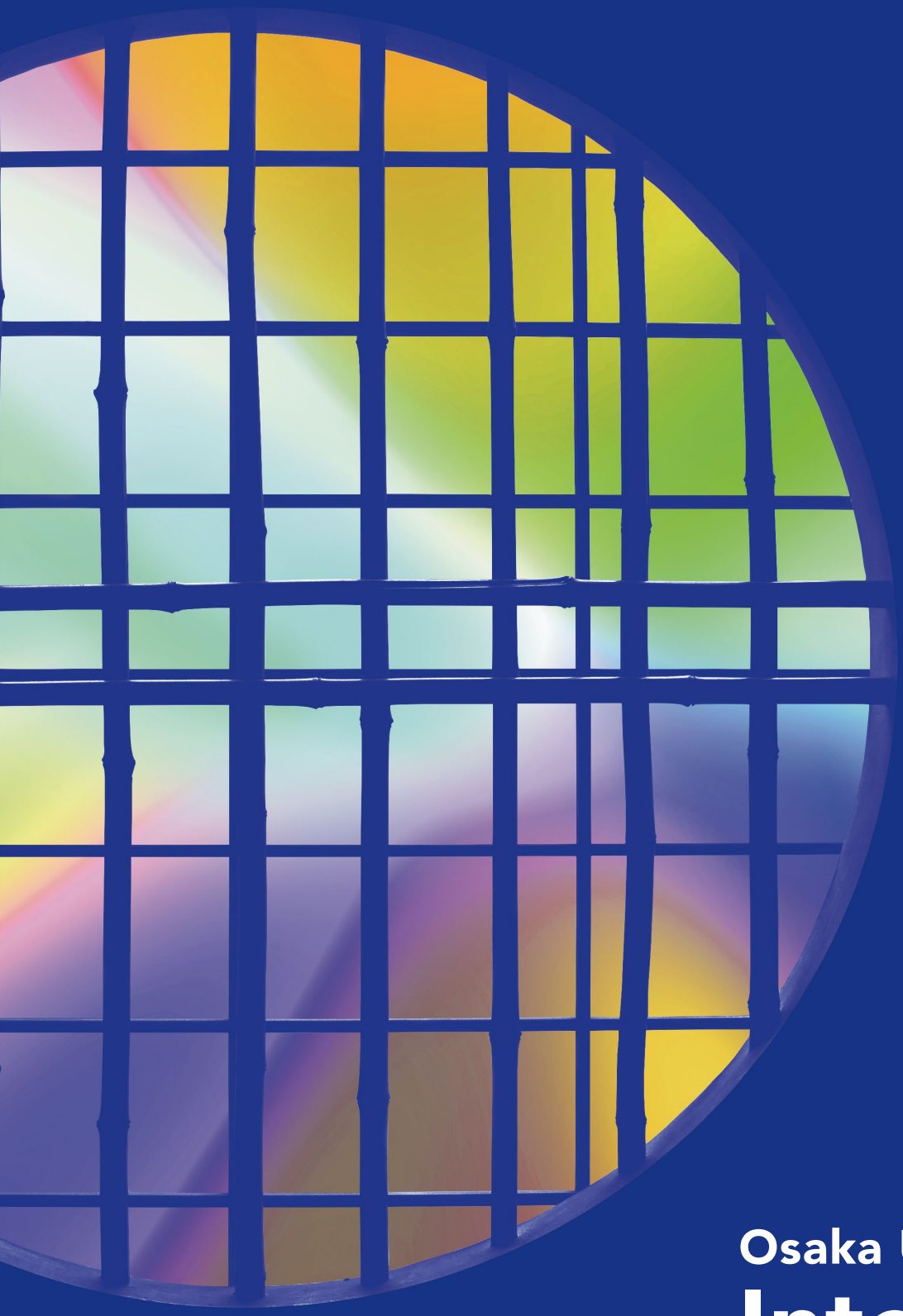


Osaka University

Integrated Report 2023

Editorial Policy

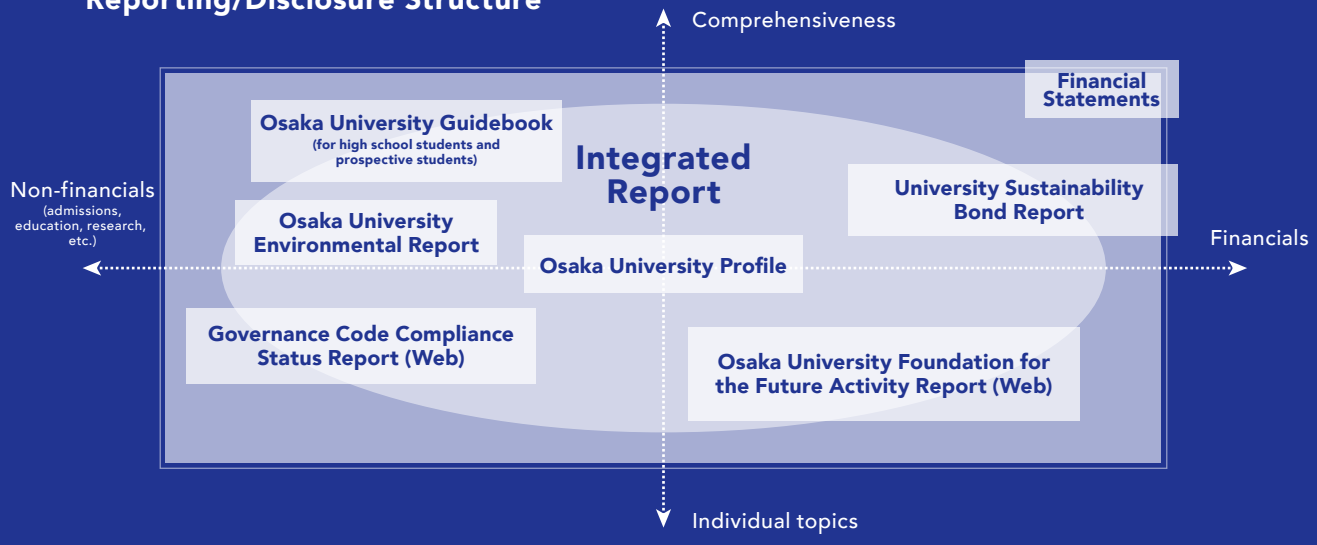
We are pleased to publish the Osaka University Integrated Report 2023. The report was put together to present our achievements and financial information to stakeholders, particularly in education and research, and to communicate our stance and strategies for bringing about social transformation, which focus on creating new value and producing exceptional talent.
This integrated report introduces our initiatives based on the OU Master Plan, which outlines our medium-to long-term vision, hoping to stimulate a dialogue that leads to further co-creative endeavors with stakeholders to fulfill our aspiration as a university, "to create a society where each member feels worth living."
For more information on each initiative, please refer to the Osaka University website.

Scope of report: Osaka University, National University Corporation
Reporting period: April 1, 2022 – March 31, 2023
Note: The report includes some content more recent than April 2023
Reference guidelines: International Integrated Reporting Framework, part of the International Integrated Reporting Council (IIRC)

Osaka University Integrated Report 2023
Published: November 2023
Produced by: Osaka University Integrated Report 2023 Editorial Team
1-1 Yamadaoka, Suita, Osaka 565-0871 Japan
Email: ou-tougou-houkoku@ml.office.osaka-u.ac.jp

Please take our survey (in Japanese only)
We are conducting a Web-based survey to improve the Integrated Report going forward. This is a short survey, so please share your impressions with us.

Reporting/Disclosure Structure



Cover Concept

Osaka University's predecessor, Tekijuku, a contributor to the formation of modern Japan that sent many talented individuals into society in such fields as medicine, politics, and education, is the source and spiritual origin of our aspiration "to create a society where each member feels worth living." For the cover of this report, we chose as a motif the round window of the study used by OGATA Koan, the founder and headmaster of Tekijuku.
As the link between indoors and outdoors, the window represents the connection between the university as an organization and the society in which it operates. It symbolizes how Koan took in students, nurtured them, and sent them out into the world throughout his life. The light from the window expresses the myriad colors of the future that awaits Osaka University.

Introduction

In addition to this Integrated Report, detailed information is provided to stakeholders on the official website of Osaka University and the websites of each school or faculty, as well as on social media, in other booklets, etc.

Integrated Report 2023

Other Information

Osaka University Official Website
https://www.osaka-u.ac.jp/en

About OU

Outline / Organization / Philosophy / Policies / University Strategy / Facts & Figures, etc.
https://www.osaka-u.ac.jp/en/guide

Osaka University Profile
PROSPECTUS

Education and Research

About Education
Educational System / Educational Reform, etc.
https://www.osaka-u.ac.jp/en/education
Handai Education Review
https://chega.osaka-u.ac.jp/em/category/en/

About Research
Research Support System / Research information portal "ResOU," which provides information on current research, etc.
https://www.osaka-u.ac.jp/en/research
OU RESEARCH GAZETTE
https://www.osaka-u.ac.jp/en/guide/Public-Relations-activities

Co-Creation

About industry-academia co-creation and donations
Collaboration options at a glance
https://www.ccb.osaka-u.ac.jp/en/service/hitome/
R&D Seeds
https://www.ccb.osaka-u.ac.jp/en/seeds/

Financial Information

Financial Information
https://www.osaka-u.ac.jp/en/guide/publications/zaimu
Osaka University Bond for Creating a Society Where Each Member Feels Worth Living
https://www.osaka-u.ac.jp/en/guide/publications/bond

Information by audience

For prospective students‥ **OMOROI HANDAI**
For alumni‥‥‥‥‥‥‥‥ **OU Style**
For the general public‥‥‥ **Osaka University NewsLetter**
MyHandai app
Dialogue

Other

SDGs Initiatives
Status of Compliance with the National University Governance Code
Promotion of Compliance
Center for Diversity & Inclusion
Osaka University Environmental Report

Information is also available on the website of each school or faculty.
https://www.osaka-u.ac.jp/en/schools

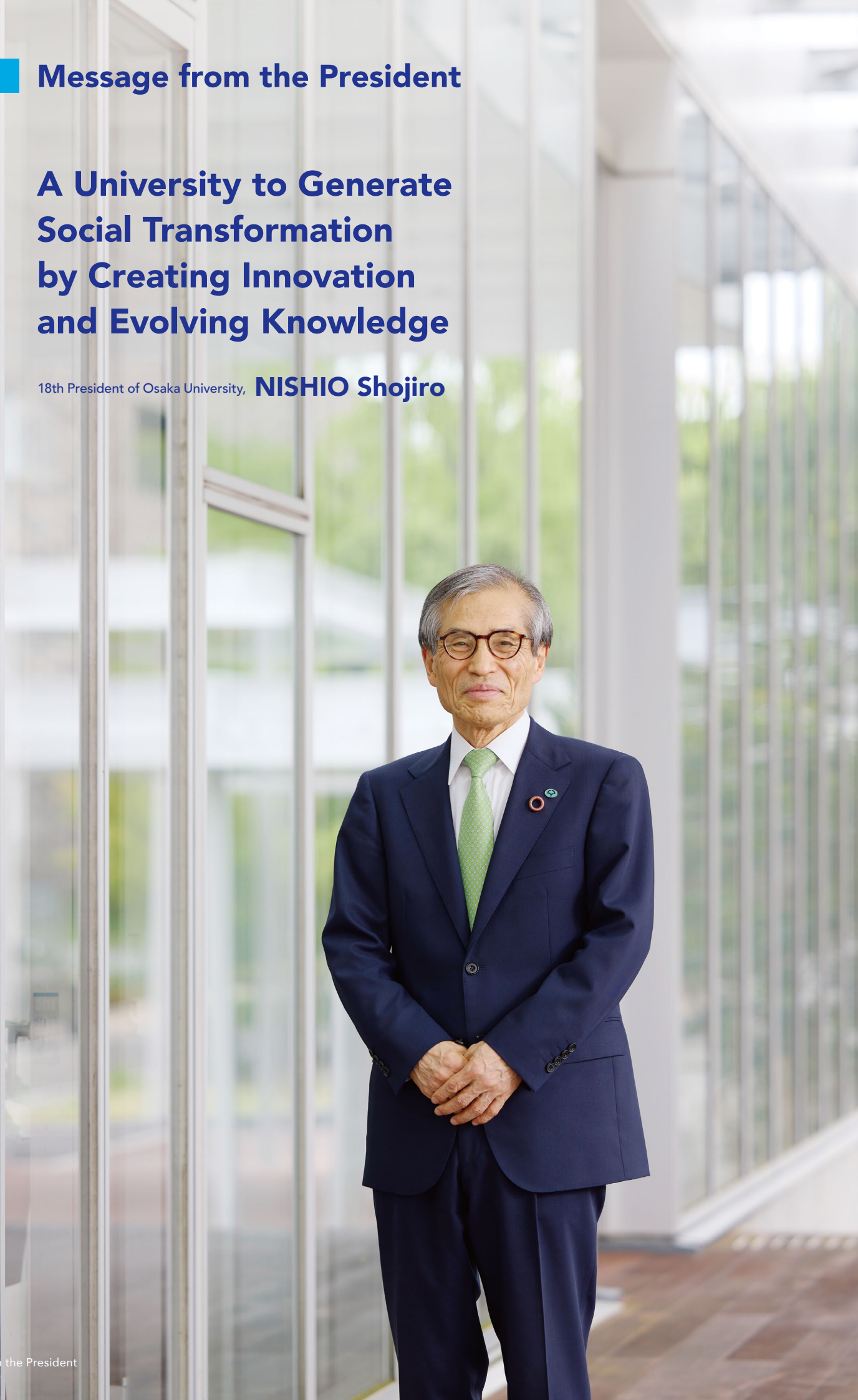
We're also on social media!

Search using "Osaka University ____" or scan the QR code on the left and select a category.

Message from the President

A University to Generate Social Transformation by Creating Innovation and Evolving Knowledge

18th President of Osaka University, **NISHIO Shojiro**



Osaka University's Resolve

As laid out in the OU Master Plan, the university's medium-term vision is to create a society where each member feels worth living. To achieve this goal, Osaka University is pursuing a new image of a university to lead social transformation from Asia.

We have been engaging with diverse stakeholders to discuss what our vision for future society should be and to clarify the mission of universities. The world is facing unprecedented challenges, including global warming, pandemics, hunger, depletion of resources, disasters, and population aging. This process has generated a shared understanding that the time to act is now and that we must boldly address serious global issues, harness new knowledge, human resources, and the latest technology to overcome this sense of stagnation and, through a variety of reforms of social systems, build a resilient and sustainable future society to empower Life and Living.

In the society we envision, every individual will enjoy the highest possible state of physical and mental well-being as well as extend their social longevity through meaningful involvement in society to enhance their living. Since the university has an important role to play as a leader in assuring this future, our resolve is renewed to pursue a more proactive strategy to generate social transformation by creating innovation and evolving knowledge as well as nurturing outstanding talent.

Creating the Future Together with Society

Osaka University was founded in 1931 as an imperial university, with passionate support from the local government, the Kansai business community, and the citizens of Osaka. It also inherits the spirit of two private academies, Kaitokudo and Tekijuku, deeply rooted in the Osaka region, that delivered front-line scholarship during the Edo period (1603-1867). This founding history has led us to a tradition of partnership with society. Our mission is to contribute to society through education and research as a university in society, for society under the motto of Live Locally, Grow Globally.

As the university is founded on community spirit, it is first and foremost aware of the need for the university to develop along with society and the importance of addressing issues. It is our belief that our mission is to create the future through co-creation with society, not as an isolated activity, but by generating sustainable social transformation to meet society's needs.

A University to Lead Social Transformation

It is essential to attract outstanding researchers from around the world and bring together the knowledge, talent, and technology necessary to achieve social transformation to address societal issues. As a comprehensive university, Osaka University is committed to finding practical solutions to societal issues by combining its diverse fields of expertise. Thus, innovative outcomes that impact society, such as the creation of new industries, are produced by promoting the social implementation of research outcomes through co-creation with society.

The university will also strengthen cooperative relationships with the Kansai region and contribute to the development of local communities. At the same time, addressing global issues such as overcoming infectious diseases and building sustainable societies from a global perspective will be another focus. Furthermore, we will nurture talent able to lead social transformation while involving various communities. This will be accomplished by providing students with opportunities to understand diverse cultures and backgrounds, and by attracting outstanding international students from around the world to study and interact in a global environment.

Working Together

Our vision is to build a resilient and sustainable future society to empower life and living. For that purpose, it is our commitment to pursue self-innovation and continue to evolve. As a new model of a university, Osaka University will demonstrate leadership in a changing society, and together with our stakeholders, we will create an ideal society through innovation and evolving knowledge for social transformation. We will work together with our partners to achieve our vision. Thank you for your continued support.

Aiming to Foster Talent Capable of Leading the Creation of New Value through Co-Creation Based on Diversity

TANAKA Toshihiro Senior Executive Vice President of Education and Research, and Internal Control
(Executive Vice President in charge of Education, Entrance Examinations, and Student Support)

Rooted in the community since its founding, Osaka University has been known for its openness to the community and has continued co-creation with diverse stakeholders. As the world changes rapidly and becomes more complex, our future is increasingly uncertain. Universities must engage in new co-creation with stakeholders to cultivate talented individuals who can live a 100-year life and design a future society. New value emerges when every identity is respected, core strengths are celebrated, and diverse ideas are exchanged. This requires the cultivation of individuals in an environment full of diversity. Not only in disciplines but also in generations are essential. Universities in Japan have a much more limited age range in matriculation than overseas universities, with the vast majority of students being in their 20s. We aim to be a university that provides new opportunities for learning to individuals who have gained a wide range of experience after graduation and create an environment with age diversity in the 100-year lifespan era. To encourage age diversity, the pre-university age group should also be included. Therefore, it is necessary to address the current entrance examination system to attract outstanding talent. Our undergraduate education employs departmental units such as schools and departments as well as discipline classifications such as sciences or humanities. However, we are faced with complex issues that cannot be addressed by disciplines classified as “science” or “humanities.” Also important for the university is international exchange, and various measures have been implemented. Particularly vital among these is that the young students, faculty, and staff are provided with opportunities to gain experience overseas as well as new perspectives on Japan. Simultaneously, it is essential to create a campus environment that encourages international students to study in Japan and serve as a bridge between Japan and their home countries.

Osaka University emphasizes an educational system, including graduate students as they advance their studies, that focuses on deepening expertise and integrating it with interdisciplinary fusion and societal issues. In addition, we are building a Student Life-Cycle Support system that supports learning in the 100-year lifespan era by using students’ educational data showing their academic progress to provide personalized guidance. The system also allows graduates to maintain ties to the university to continue receiving learning support. Furthermore, we are creating an environment where individuals who will connect on- and off-campus initiatives, including efforts overseas, are fostered over a long-term period under our OFF/ON Campus concept.

Osaka University is now challenged to promote the creation of new value through co-creation with stakeholders through various forms of diversity. In any case, all such activity will revolve around people. The university is committed to reforms that will improve our ability to nurture a pioneering talent to bring about social transformation.

In August 2017, Osaka University appointed two Senior Executive Vice President (Osaka University Provost) positions to build a system for swift management—one in charge of university management and the other in charge of education and research.

Creating New Value and Fostering Social Intelligence

KANEDA Yasufumi

Senior Executive Vice President of University Management and Planning of OU Vision (Executive Vice President in charge of Co-Creation, International Affairs (Co-Creation), and Hospital Management)

Issues that we face as humankind, such as global warming, resource scarcity, severe natural disasters, and pandemics seem more likely than ever to create a crisis situation in the future. Meanwhile, Israeli historian Dr. Yuval Noah Harari predicts that human-centered society, which has prevailed since the Industrial Revolution, will give way rapidly to a world based on data-centered one. Of concern is that the unstoppable advancement of AI, as we are seeing with generative AI, will be a double-edged sword. Over-dependence on AI may lead to not only the disappearance of traditional professions but a decline in human cognitive abilities, and perhaps even the erosion of brain functions. But if used appropriately, AI has the potential to greatly assist in solving the biggest challenges humanity faces on this planet. The key question is how to co-exist with AI. Two areas in which AI is lacking, as pointed out by Dr. Michael A. Osborne of Oxford University, are creativity and social intelligence. Enhancement of these qualities in humans—the ability to create new value from novel ideas unconstrained by existing information that is also based on a profound understanding of human nature in a broadly inclusive society—will lead to the evolution of humankind.

The modern university is the highest seat of learning in academia, born to foster intellectual innovation. It is the only institution that allows new social value to be created through unfettered research on any topic. However, if we remain confined to research within academia, we will become complacent, resulting in the "Galapagos syndrome" without any development of research itself. Inventions and discoveries originating at universities that have transformed society are not hard to find in human history. They have led to great progress in society, which in turn has raised the level of research. Many universities recognize the importance of implementing the findings of university research in society, and Osaka University has been promoting this practice actively. More importantly, it is necessary to analyze the issues that arise through such implementations and circulate the insights back into research to deepen understanding so that new areas of research may emerge that lead to innovative value creation. We have introduced the concept of "R&D Ecosystem" throughout the University and are promoting activities to create a virtuous cycle of knowledge, talent, and funds. An important part of this effort is to promote collaborative activities with various stakeholders in society. Through such co-creation activities, we need to consider the future of society and future social issues from a long-term, global perspective, explore the essential issues that need to be resolved from multiple perspectives, and work to solve them across organizations and sectors. In the process of working with stakeholders across society, the most important aspect is an attitude of respect toward others and the desire to deeply understand them. Without this, it is impossible to have serious, honest conversations and build cooperative relationships. This is social intelligence, a human strength that AI cannot match.

As a Senior Executive Vice President, I wish to build a university that fosters social intelligence to support co-creation and the generation of new value based on intellectual activities.

Governance Structure

Through a combination of Osaka University's unique system of two Senior Executive Vice Presidents and three Strategic Meetings, we have created a governance structure that facilitates rapid, optimal decision-making with an emphasis on communication between the central administration and the frontlines of teaching and research.

In accordance with the National University Corporation Act, Osaka University has established a Board of Directors, Administrative Council, and Education and Research Council as the bodies that deliberate on important matters, plus a Council of Deans and Directors, following internal university regulations. Additionally, since 2017 we have had in place two Senior Executive Vice Presidents and three strategic committees under the leadership of the President to ensure prompt decision-making and optimized university management—a system that is unique to Osaka University.

As stipulated by the National University Corporation Act, the President is appointed by the Minister of Education, Culture, Sports, Science and Technology upon the request of the university after being vetted by the Presidential Selection and Scrutiny Committee.

Executive Vice Presidents and Executive Directors, including those who are not trustees or employees of the university, are selected and appointed by the President under certain conditions. The President appoints the Senior Executive Vice Presidents who oversee matters that require university-wide coordination from among the Executive Vice Presidents.

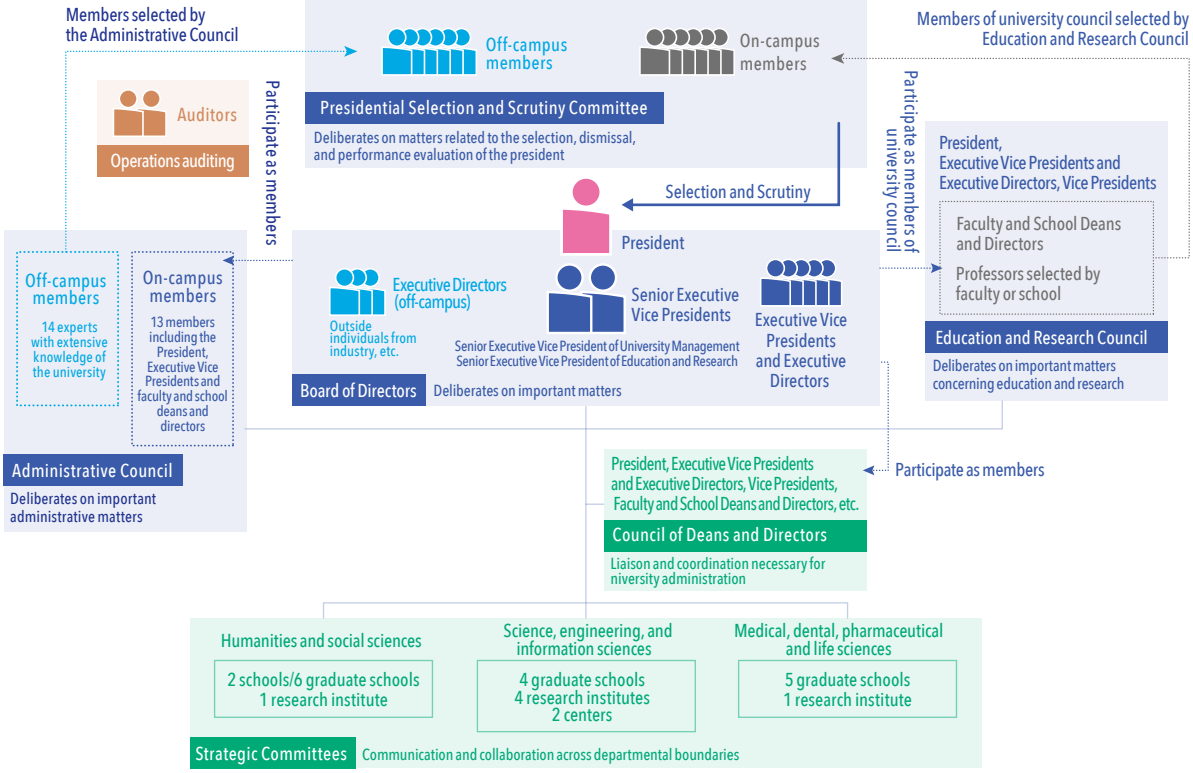
The Board of Directors, consisting of the President and 10 Executive Vice Presidents and Executive Directors, deliberates on important matters such as views to be presented to the Minister of Education, Culture, Sports, Science and Technology on medium-term goals and the preparation of budgets.

The Administrative Council is the body that deliberates on important matters related to university management. It consists of the President, Executive Vice Presidents appointed by the President, faculty and school deans and directors, and off-campus members appointed by the President as experts with extensive knowledge of the university.

The Education and Research Council consists of the President, Executive Vice Presidents and Executive Directors, Vice Presidents, faculty and school deans and directors, etc., as well as professors selected by their faculty or school, and it deliberates on important matters related to education and research.

The Council of Deans and Directors consists of the President, Executive Vice Presidents and Executive Directors, Vice Presidents, and faculty and school deans and directors, etc., and it provides liaison and coordination functions necessary for the smooth operation of the university.

Administrative Structure



A System Unique to Osaka University

Senior Executive Vice President

This position is equivalent to that of provost at Osaka University. The university has two—the Senior Executive Vice President of University Management, who implements strategic resource allocation and assessment based on medium- to long-term management strategies, and the Senior Executive Vice President of Education and Research, who plans and manages education, research, and international strategies for the entire university. The two formulate specific strategies and policies following the President's fundamental vision while fostering the lateral cooperation of the Executive Vice Presidents and Executive Directors to enable swift decision-making.

Strategic Committees

Three committees that organize the university's faculties and schools into three groups—humanities and social sciences; science, engineering, and information sciences; and medical, dental, pharmaceutical and life sciences—based on commonalities in educational and research fields. As new forums for communication and collaboration that transcend existing academic divisions, the committees formulate strategies and action plans to optimize overall management (including personnel, education, research, etc.).

List of Trustees

As of September 1, 2023

NISHIO Shojiro, President

KANEDA Yasufumi, Executive Vice President

Senior Executive Vice President of University Management and Planning of OU Vision (Executive Vice President in charge of Co-Creation, International Affairs (Co-Creation), and Hospital Management)

TANAKA Toshihiro, Executive Vice President

Senior Executive Vice President of Education and Research and Internal Control (Executive Vice President in charge of Education, Entrance Examinations, and Student Support)

ONOYE Takao,

Executive Vice President

Research, International Affairs (Research), Information Promotion, and Libraries

FUKUTA Yuichi,

Executive Vice President

Finance and Quality Assurance Promotion

TANAKA Manabu,

Executive Vice President

Global Engagement, Facilities, and Expo 2025

MIZUSHIMA Ikuko,

Executive Vice President

Personnel and Labor and Harassment Prevention

YAMAMOTO Beverley Anne,

Executive Vice President

International Affairs (Education)

INOUE Keiji,

Executive Vice President

Diversity and Inclusion, Public Relations, SDGs, Risk Management, and Office Administration

TAKEUCHI Noriko,

Executive Director (Part-time)

Managerial Reform

IZUTANI Yachiyo,

Executive Director (Part-time)

Academic Community Outreach and University Branding

KINOSHITA Takehisa,

Auditor

SAKURAI Miyuki,

Auditor (Part-time)

Osaka university List of Trustees

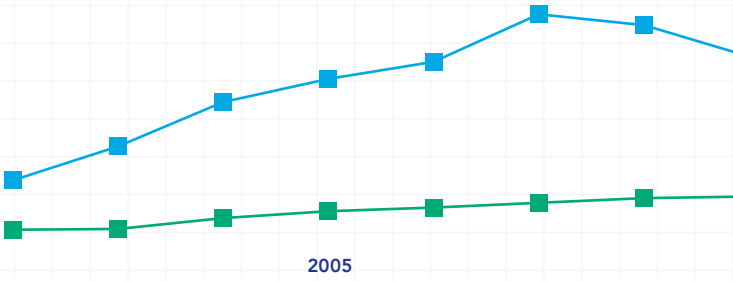
https://www.osaka-u.ac.jp/en/guide/president/trustees.html

Osaka University's History of Co-Creation

Inheriting the civic spirit of its predecessors, Kaitokudo and Tekijuku, deeply rooted in Osaka, Osaka University was established in 1931 with strong support from political and business circles and the public. Based on this founding history, the university has kept its doors open to society following the motto, "Live locally, grow globally," continuing to return to society the outcomes of its world-leading academic research.

Amount of funding for commissioned research and joint research over time

Note: Funding for commissioned research excludes clinical research on pharmaceuticals, etc.



Steps to Co-Creation

World's first automatic ticket gate introduced at Hankyu Kita-senri Station (1967)

The first automatic ticket gates installed at Hankyu Kita-senri Station read commuter passes with holes punched in them like punch cards and regular train tickets with a magnetic (bar code) system. This world-first railroad ticketing examining system was recognized by the Institute of Electrical and Electronics Engineers (IEEE) as an historical achievement, a Milestone, along with the Tokaido Shinkansen (bullet train) and other technological feats.

Steps to Co-Creation

Development of Tocilizumab, the first antibody drug produced in Japan (2005)

Interleukin-6

Rheumatoid arthritis drug (blockbuster)

Note: Estimated rheumatoid arthritis patients worldwide: 18 million

Tocilizumab, the first antibody drug produced in Japan and co-developed with Chugai Pharmaceutical, was approved for the treatment of Castleman's disease in Japan. The drug's indications were expanded as a treatment for rheumatoid arthritis, and in 2013 it became a blockbuster drug with global sales of more than 1 billion Swiss francs.

1724 Kaitokudo

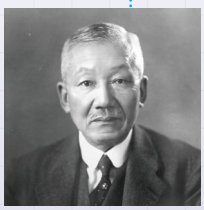
Monument at original site of Kaitokudo

1838 Tekijuku

Exterior view of Tekijuku

1931 Osaka Imperial University

1949 Osaka University (new system)



NAGAOKA Hantaro, first president of Osaka Imperial University

2004 Osaka University, National University Corporation

2005

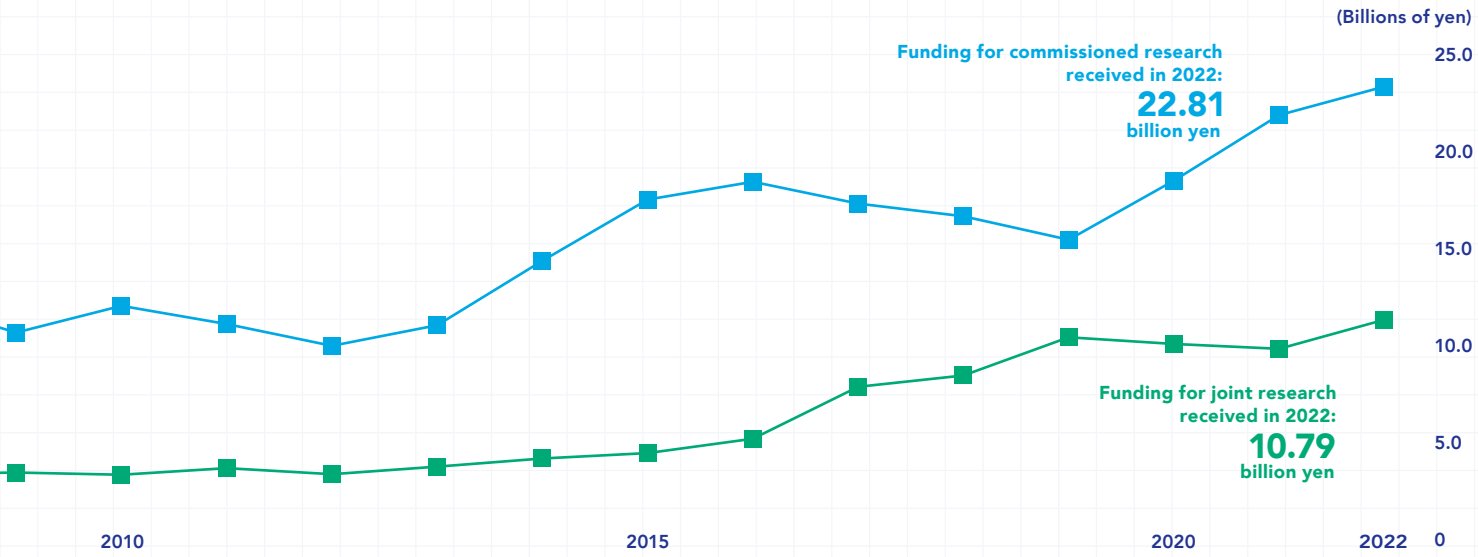
1921 Osaka School of Foreign Languages

Sign for Osaka School of Foreign Languages on the gate of the Uehachi schoolhouse

1944 Osaka College of Foreign Affairs

1949 National University Corporation Osaka University of Foreign Studies

2004 Osaka University of Foreign Studies, National University Corporation

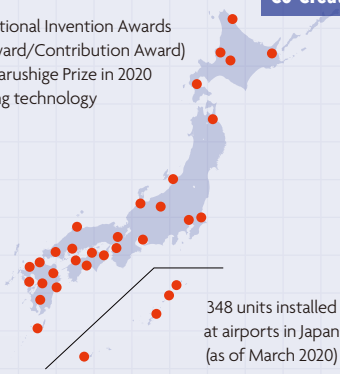


Steps to Co-Creation

Liquid Explosive Scanning (2018)

Research and development work was conducted at Osaka University on liquid explosive scanning technology using near-infrared light to detect from the outside the presence of liquid explosives in drink containers that passengers bring onto an airplane. Japanese company Kumahira Co., Ltd. has commercialized liquid explosive scanning systems that are now in use at airports around Japan and at some airports outside of Japan, contributing significantly to the deterrence of terrorism and global safety and security.

Recipient of the 2019 National Invention Awards (21st Century Invention Award/Contribution Award) Awarded the Inoue Harushige Prize in 2020 for outstanding technology



348 units installed at airports in Japan (as of March 2020)

Integration of Osaka University and Osaka University of Foreign Studies

President Nishio receiving the designation certificate

Named as a Designated National University Corporation

Steps to Co-Creation

(2019~2023)

For five consecutive years since 2019, the university has won awards for its research achievements, including winning the National Invention Awards.
Note: See p. 45 for details of the National Invention Awards.

2007 — 2018 — 2019 — 2020 — 2021 — 2022 — 2023

Steps to Co-Creation

Co-Creation Bureau established (2018)

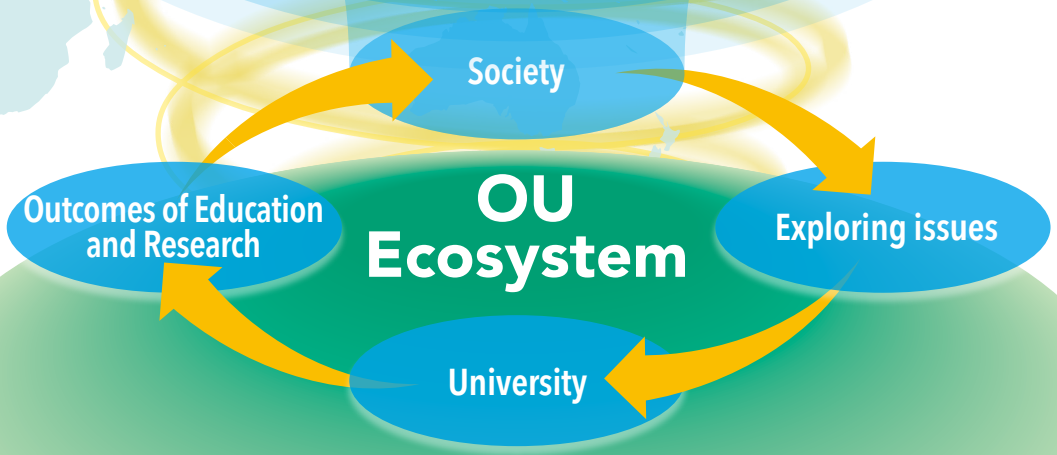
The Co-Creation Bureau, established in January 2018, focuses on collaborative activities between industry and academia (intellectual property and venture incubation), while also working to strengthen community partnerships and its fundraising capabilities. The Bureau is engaged in activities to "co-create" new value by combining the knowledge and proficiencies of society and the university.
For details, please refer to p. 44–49.

Scan to see major awards and commendations.
https://www.ccb.osaka-u.ac.jp/achievements/jyushou/
(in Japanese only)

Scan for more information on the history of Osaka University.
https://www.osaka-u.ac.jp/en/guide/history.html

Creating a Society Where Each Member Feels Worth Living

Become an opinion leader that can create a society where the active lifespan of individuals (social activity) is extended, people of all ages apply their diversity in support of society, and every person enjoys a happy and fulfilling life.



Cultivating intellectual curiosity and deep knowledge by respecting diversity and providing fulfillment

Educational Strategies

Environments to Foster Knowledgeable Individuals Capable of Social Change

Cultivating individuals who can envision a future society and lead social transformation

Research Strategies

Environments to Cultivate Intellectual Curiosity

Promoting fundamental research that contributes to the creation of a new society and guiding it toward implementation to create new value

Management Strategies

Co-Creation as a Source

Enhancing management strategies through co-creation improvement and education, research, and administrative reforms

- Information Infrastructure for the New Era of COVID-19
- Global Strategy and Advancement of Diversity and Inclusion to Welcome Diverse Talent
- Providing Fulfillment to Pursue Intellectual Curiosity
- Branding Initiatives to Foster and Encourage Co-Creation with Society

OU Master Plan

The OU Master Plan is designed to serve as a medium- to long-term management vision to connect all activities of the university—focusing on education, research, and management—through dialogues with stakeholders both at the university and outside to create a society where each member feels worth living.

The OU Master Plan is a comprehensive and flexible medium- to long-term plan that interweaves various strategies to guide all activities.

Specifically, it weaves strategies in education, research, and management, together with approaches to support these three domains, such as information infrastructure development, global strategy, diversity and inclusion, providing fulfillment, and branding.

With the OU Master Plan serving as a guide, we will develop the strengths needed to transform society by drawing together all of the university's knowledge and wisdom. To create a society where each member feels worth living, Osaka University must boldly seek solutions to a variety of challenges from the local to global levels through co-creation with diverse stakeholders. This includes not only industry partners but also citizens, local governments, and international organizations.

OU Ecosystem

This is our strategic framework for implementing the OU Master Plan. Osaka University has established a strong foundation of research based on intellectual curiosity and cultivating a large number of talented individuals, and we are applying the outcomes of this outstanding education and research to society. Any challenges identified in the process are fed back into the university's education and research system, creating a virtuous cycle of knowledge, talent, and funds.

Under the OU Ecosystem, the identified issues are analyzed, but rather than merely making adjustments to techniques, the issues are fed back into the university's education and research for further development and expansion of new research fields.

Osaka University will continue working with diverse stakeholders to address the social issues and challenges identified through co-creative activities and to generate new knowledge and talent.

Value Creation Model

Osaka University will create value for society in different forms by collaborating with stakeholders based on our high-value educational and research activities. We aim to build a society where each member feels worth living by applying such newly created value to resolving the major challenges faced by humankind.

INPUTS

Human Capital

Fostering Diverse Talent and Career Formation

- Support System for Maintaining One's Career P29
- Creating an Environment that Fosters Knowledgeable Individuals Capable of Social Change P32
- Innovators' Club P48

Intellectual Capital

Framework for Producing New Knowledge

- Creating Environments to Cultivate Intellectual Curiosity P38
- Co-Creation Bureau's Activities Bringing Together Governments, Industry, and Academia to Co-Create P44

Social and Relational Capital

Networks that Face Social Issues

- Support for Venture Creation P46
- Overseas Centers, Osaka University ASEAN Campuses, & Global Knowledge Partners P58

Financial Capital

Financial Foundation for Implementing Strategies

- University Bond P52
- External Funding Record P55
- Osaka University Foundation for the Future P60

Manufacturing Capital

Proactive Investment in Education and Research Environment

- Student Life-Cycle Support (SLiCS) System P36
- Formation of eResearch Environment P43

Natural Capital

Energy-Saving and Initiatives to Achieve Carbon Neutrality

- Carbon Neutral & Sustainable Campus Initiatives P50
- Material Balance, Energy Usage P59

OU Master Plan Strategies

Educational Strategies

Environments to Foster Knowledgeable Individuals Capable of Social Change

Cultivating the people to envision a society of the future and lead the way to social transformation

P32

Research Strategies

Environments to Cultivate Intellectual Curiosity

Promoting basic research that contributes to the creation of a new society and guiding it toward implementation to create new value

P38

Management Strategies

Co-Creation as a Source

Raising the level of co-creation activities and improvement of management strategies through reforms to education, research and management systems

P44

OUTCOMES

Rich intellect and spirit

Technological innovations

Lifelong learning

Mental and physical well-being

Sustainable society

Diversity and harmonious coexistence

Co-Creation with Society

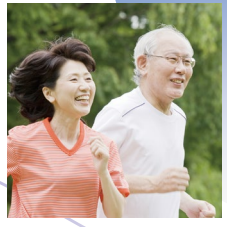
Solving the major challenges facing humanity

- Achieving a resilient society that can overcome threats to humanity
- Improving people's adaptability to a drastically changing world
- Diverse people getting involved in society through new industries

Well-being

- People's connections with society
- Extending the lifespan of social activity

Creating a society where each member feels worth living



Roundtable Discussion: An Ideal Future through Co-Creation—A Self-Actualizing Society Supported by Empathy and Respect

YAMAMOTO Yasunori

President and CEO, Shimadzu Corporation

Mr. Yamamoto received a Master's degree in Engineering from Osaka University in 1983 and joined Shimadzu Corporation in the same year. He became president in April 2022.

TANAKA Manabu (Facilitator)

Executive Vice President, Osaka University

Completed a Master's degree in Engineering at Osaka University in 1992 and has been a professor since 2008. He has been in his current position since April 2023 and holds a doctorate in engineering.

MARUYAMA Mihoko

Professor, Graduate School of Engineering, Osaka University

Completed a doctorate in the Department of Earth Science at Tohoku University in 2009. Has been in her current position since October 2022. Research interests: medical-engineering collaborative research on biomaterials (bones, urinary tract stones, etc.)

YAMASHITA Takuro

Professor, Osaka School of International Public Policy, Osaka University

B.A. in Economics, Hitotsubashi University (2003), Ph.D. in Economics, Stanford University (2011), U.S. Has been in his current position since October 2022. Research interests: mechanism design theory

MITARAI Kosuke

Associate Professor, Graduate School of Engineering Science, Osaka University

Completed his Ph.D. in Engineering Science at Osaka University in 2020, co-founded QunaSys Inc. while still a student in 2018, and has been in his current position since September 2023. Research interests: quantum software/algorithms

Osaka University is committed to resolving serious social issues as an academic institution that is leading social transformation. We consider it our mission to create a resilient and sustainable future society that empowers life and living. Yet we must make further progress in co-creation with stakeholders to fulfill this mission. Against this backdrop, we invited a guest with extensive experience in co-creation activities with the university—Mr. YAMAMOTO Yasunori, President and CEO of Shimadzu Corporation—to join three up-and-coming researchers from the university in a discussion on what is an ideal society and what kinds of talent will be needed in the future. May this record of the discussion help to deepen our understanding of how to design the future of society.

What is an "ideal" society?

Tanaka: Today, we have with us three up-and-coming young researchers at Osaka University and Mr. YAMAMOTO Yasunori, the president of Shimadzu Corporation, who supports our university through the Research Alliance Laboratory and the REACH project. We are here to discuss what an ideal society would look like and the kind of people that will be needed to build it. Let's start with our researchers. What do you envision as an ideal society?

Maruyama: A trendy term in Japan that points to an ideal society is pinpin korori (PPK), which means staying healthy until old age, then dying quickly and painlessly. What makes me happy is doing research and I want to continue doing research even when I'm old and gray. I imagine myself looking through a microscope right before my death and exclaiming, "That's it!" And when my colleagues look over to see what the commotion is, they find me keeled over dead with a smile on my face. My ideal is a seamless society in which all kinds of people are free to interact as they wish, and there is a medical system that allows people to meet their final days feeling fulfilled.

I'd like shared affinities for people's dreams to emerge everywhere

Pres. Yamamoto: That would certainly be ideal. In Japan, it's said there is a gap of more than 10 years between actual lifespans and healthy lifespans, so we definitely need to do something to improve that.

Mitarai: I think maybe a society with universal "Basic Income" is the ideal, where people are free to pursue what they love and enjoy their lives. With the advance of AI technologies, we may reach a point where people don't have to work anymore if they don't want to. If we are to reap such returns down the road, though, society as a whole needs to continue investing in science and technology. And even if people don't need to work, I'm sure there will be people who want to work, me being one—to continue doing my research.

Pres. Yamamoto: It's wonderful to have time to do what you love, even if it's just a little bit each day. However, in Japan, with our rapidly declining population, life might be difficult in the future without the help of robots.

Yamashita: Since my field of research is economics, I would frame an ideal society as one in which goods are distributed optimally. That is because a fundamental principle of economics is to properly match the producer and production of goods with their consumption, using just the right technologies and means of distribution. For example, if producers do not know what consumers want, or if consumers do not know what to buy, optimal distribution will not take place. From this perspective, the proper communication of information becomes critical as a means to achieve the optimal distribution of goods.

Pres. Yamamoto: Certainly, the proper communication of information is important. In our case, getting feedback and requests from customers in Japan is easy, but overseas, that becomes difficult. When you have such information asymmetry, how well a company can obtain important information is a direct reflection of its strengths and weaknesses, but that is the society we live in today.

Yamashita: Since information will inevitably be unevenly distributed, to overcome that you need to create appropriate incentives to get people to disclose information.

Maruyama: Information asymmetry can also cause fear. In fact, when I was pregnant and going through a difficult period, all I got was scary information, which made me even more depressed, when all I really wanted was to hear, "Everything will be all right." That is what I mean by information asymmetry. In a society where people are happy for others' happiness, lots of positive information gets disseminated, so I think the mindset of people is one key factor that affects the spread of information.

Pres. Yamamoto: That is the problem of insufficiently distributing beneficial information while bad information spreads easily. Perhaps there should be some way of sorting good information from bad information.

Mitarai: Currently, in the field of quantum computer research there is an open mood of information sharing where people feel like, "Let's get along with each other and develop this thing together!" But when companies get involved, I'm sure that more information will start to become closed off, and I don't know if I could stand that (laughs). Is there some way to stop that from happening from an economic standpoint?

Yamashita: Well, I suppose it is necessary to sequester information to some degree as a way of protecting the legitimate interests of those who make the discoveries.

Mitarai: As a developer myself, I think it would be better to make all the information open and then each party does whatever they can, equipped with all of the necessary information.

Tanaka: We have just had a lot of discussion about information, so now I'd like to return to the question of what an ideal society is to you. President Yamamoto?

Pres. Yamamoto: The ideal society is one where people can live life to the fullest with a sense of vitality. As Dr. Mitarai said, it is important to have the time to do what you love, even if it's just an hour or two a day. When every person has something they love to do, a dream that they share with others, a network of shared empathies is created. Such a society is ideal, and two important things needed to bring it about are an open mind and respect for others.

Toward a society that lets a person do research up to the end of their life

Contributing to an "ideal" society

Tanaka: Now I would like to hear about your research and how you think it might contribute to the realization of an ideal society.

Maruyama: My field is crystal growth, and I am currently pursuing cross-disciplinary research on biominerals that living organisms produce in their bodies. There is a condition called urinary tract stones in which stones form about 1 cm in size with the same composition as bone, and the surprising thing is that people who have this condition often have osteoporosis. This is due to a disturbance in the body's crystallization process, where crystals form in unwanted locations instead of where they are needed. Learning this, I decided to begin doing research to try to

understand crystal growth in the human body as a whole. But since my field of research had previously been meteorites, to get into crystal research I need to collaborate with researchers and engineers outside of my field of expertise. So, the first several months involved sharing my enthusiastic ideas with lots of people and running around trying to put a team together. In the end, we were able to launch the METEOR Project*1, a collaboration involving crystal engineering, medicine, and earth science. We have various experts at the table, including one famous individual from a large organization and a female engineer who runs a small factory in Higashiosaka as a famous manufacturing area in Osaka. This kind of teamwork among colleagues from different fields and positions is only possible because we all have a sense of shared mutual respect. I hope that as this project progresses, it will not only yield research results but also contribute to the realization of an ideal society by showing the process of how people from different fields can join hands to work together.

Going forward, I want to join with others working in medicine, crystal engineering, and imaging to launch research in a novel academic field of "medical crystallization" aimed at helping to maintain the health of the elderly, but one major obstacle we face right now is obtaining data from patients' medical records.

Pres. Yamamoto: Medical record information belongs to each patient, so if you can get permission directly from the patients themselves, you might be able to gather that information and use it for your research. Osteoporosis is likely to become an even more serious concern in the future, so I wish Dr. Maruyama the very best in her quest to reach her "active to the end" ideal.

Maruyama: I see. We will need the cooperation with empathy of the patients themselves. I will lay the groundwork, then, starting with whatever is possible right now.

Tanaka: The naming of the METEOR Project is nice, it's catchy.

Yamashita: My research is in the field of microeconomic theory. We represent people's behavioral patterns using mathematical modeling, and try to predict the consequences (changes) on people's behavior by adjusting the rules, in the process of searching for desirable rules. For example, we are analyzing how the outcome of an election depends on how much information about candidates is made public, and what kind of information should be circulated. What we have found in performing the research is how difficult it is to handle information. At first glance, one might think that the election outcome would be better off if all candidates' policy positions were accurately communicated to the public, but that was not always the case. Since many voters prioritize issues that affect them in the short term, over long-term social perspectives, it is sometimes better to keep some information secret if it will lead to short-term effects. To be honest, I don't know how this kind of research can contribute to an ideal society. We take a long-term perspective in pursuing this kind of research, so I feel there is no choice but to take it one step at a time.

People who can accurately interpret information will be needed

Pres. Yamamoto: If you make progress with the research, will it lead to being able to sway people's opinions?

Yamashita: I think economic researchers have a desire to find ways to sway people's opinions, but the problem lies in the morality of those who want to do the persuading. And even if you try to persuade people, as with medical record information, if there is an asymmetry of information, to be able to acquire that information you must provide incentives that get people to give out their information. At any rate, I feel it will be difficult to elicit the information that leads to imemdaite returns. Ultimately, there are aspects that you just can't control.

Pres. Yamamoto: Shimadzu also struggles with the content and methods, etc., when providing information.

Mitarai: My research involves developing software and algorithms that will lead to practical applications for quantum computers. Quantum computers are often spoken of as supercomputers that can solve any problem, but in fact, they can only solve certain kinds of problems and they still have a long way to go. For example, a quantum computer is not fast at doing ordinary calculations, such as addition and multiplication. What it does excel at are quantum chemical calculations*2 needed for material design, and there is much hope for the early application of quantum computers in this area. These calculations will elucidate why and through what mechanisms the crystallization of bone components in the body takes place. I believe that if we can develop an extremely fast, large-scale quantum computer, we will eventually be able to perform such calculations. My goal for the future is to use this revolutionary, new calculating machine that is the quantum computer to do calculations that are useful for society, but I am not sure yet if my research will contribute to an ideal society (laughs).

Pres. Yamamoto: Are there any examples of quantum computers being used in society today?

Mitarai: Unfortunately, no. So, if you hear of a quantum computer venture that is saying they have one now capable of being used for drug discovery or for solving optimization problems very quickly, those are current impossibilities, so don't even give them the time of day (smiles). Related to material design, I would guesstimate that within 10 years we will have developed a quantum computer that is capable of calculating a physical model, though maybe not one that is necessarily practical. But I can't even imagine their application at the drug discovery level, as the barriers are too high. Honestly speaking, I'm at the stage in my research where I can only encourage people to get going and help us build one of these things!

Yamashita: Do you think that quantum computers will be mass-produced in the future and that people will be able to use them like we use PCs and mobile devices today?

Mitarai: I would be thrilled to have a quantum computer on a tablet device, but the way things are going that is unlikely. If we can develop a highly integrated optical quantum computer that runs at room temperature, then maybe in the distant future it might be possible.

It would be great if people are free to pursue what they love

The People to Pioneer Tomorrow's Society

Tanaka: We have heard everyone's idea of an ideal society and what you are possibly doing to help in its realization. Now I want to ask what kind of people you think we will need to pioneer that society of tomorrow.

Mitarai: It will be vital to have people who are always curious and eager to learn new things. We won't make any progress without people who are willing to give new things a try, like with the release of ChatGPT. You'd be surprised how many students have never used ChatGPT, and that has to make you wonder. Unless you are willing to try using some new technology you won't be able to learn it, and such people may be the type that continues to do things very inefficiently.

Yamashita: The ability to accurately interpret information will be essential. When a company launches a new product or service, it must accurately convey information about who should use it and when and how to use it, both to retailers and consumers. That means translating information and presenting it in a way that can be understood by others. Such facilitators will be necessary. I say this because I know how important the role of a coordinator is on a cross-disciplinary research project—the person who holds together the experts from different fields of research.

Maruyama: Looking ahead, the ability to connect with people will become more important, so we need people who are not burdened by either needless pride or paralyzing trauma. The key will be to limit people's exposure to traumatic events, as trauma can interfere with building relationships. Say you ask someone a basic question and they come back with, "How can you even ask that? Look it up and then come back!" It is hard to make a connection with such a person. I personally want to maintain a frame of mind free from trauma.

Pres. Yamamoto: It is important to have dreams and to feel empathy and respect toward others. In addition to figuring out what you want to do and who you are, having an open mind in your approach to others will be the most important ability required of those who will pioneer the future of society.

Tanaka: I see. Dreams, empathy, and respect.
Finally, President Yamamoto, please give us your reaction to today's discussion and tell us your expectations for Osaka University in the future.

Pres. Yamamoto: I've really learned a lot from this very interesting discussion with these rising and talented researchers. Thank you very much. I expect that you will encounter many kind of difficulties in pursuing your original research, but I hope that you will all keep forging ahead!
Osaka University has been active in pursuing tie-ups with industry in many areas to improve society. I believe that this direction is the best one a university could take. The pursuit of scholarship alone will do little to improve society. It is vital to get research results out and find ways to implement them in society to achieve real-world results. I hope Osaka University and its researchers will continue to pursue research that is useful to society at an accelerated pace in the same way they have in the past. My company and I will continue to support you as much as possible.

Tanaka: Thank you very much. We will continue to promote industry-academia co-creation at Osaka University and apply the results of the original research conducted by our young professors into society. We look forward to your continued support in our efforts to make society a better place.

*1: METEOR stands for "Medical and Engineering Tactics for Elimination of Rocks."
This project is a medical and engineering collaborative strategy to eliminate urinary tract stones.
*2 Quantum chemical calculations: a simulation technique for predicting the structure of molecules

Special Feature: Live Locally, Grow Globally

This section introduces Osaka University's international strategy, cutting-edge research that is helping to solve global social issues, and initiatives for diversity and inclusion.

Making Osaka an International Academic City of the Future based on the Science Hills Plan New Co-Creation with Society through Osaka University's Seamless International Strategy

KANEDA Yasufumi

Senior Executive Vice President, International Affairs (Co-Creation)

Born in Nara Prefecture in 1954, Professor KANEDA Yasufumi graduated from Osaka University Faculty of Medicine in 1980 and completed his doctorate in internal medicine at Osaka University Graduate School of Medicine in 1984, earning a Ph.D. in Medicine at Osaka University. After working at the Institute for Molecular and Cellular Biology, Osaka University, and the University of California, San Francisco, he became a professor in the Department of Gene Therapy Science in 1998. Following on from this, Kaneda served as Chairman of the Board of Directors of the Japanese Society of Gene and Cell Therapy, Dean of the Faculty/Graduate School of Medicine, Osaka University, and vice president of Osaka University before assuming his current position in August 2019. His areas of expertise include oncology and the development of gene delivery technologies.

ONOYE Takao

Executive Vice President, International Affairs (Research)

Born in Hyogo Prefecture in 1968, Professor ONOYE Takao received his M.S. in Electronic Engineering from the Graduate School of Engineering, Osaka University, in 1993 and later a Ph.D. in Engineering from Osaka University. After working as an assistant and lecturer at Osaka University, a researcher at the University of California, Irvine, associate professor at Kyoto University, and professor at Osaka University, he was appointed Dean of the Graduate School of Information Science and Technology, Osaka University, in 2015. He has been in his current position since August 2019. His areas of expertise are applied integrated systems and spatial acoustic processing.

TANAKA Manabu

Executive Vice President, Global Engagement

Born in Wakayama Prefecture in 1967, Professor TANAKA Manabu received his M.S. in Welding Engineering from the Graduate School of Engineering, Osaka University, in 1992 and later a Ph.D. in Engineering from Osaka University. After serving as an assistant professor, associate professor, and professor at Osaka University, in 2015 he became Director of the Joining and Welding Research Institute, Osaka University, and served as an Associate Executive Director of Osaka University in 2017 and chairman of The Council of Joint Usage/Research Centers in National Universities in 2019, assuming his current position in April 2023. His areas of expertise include welding and joining process studies, thermal plasma engineering, and plasma material science.

TANAKA Toshihiro

Senior Executive Vice President, Education

Born in Hyogo Prefecture in 1957, Professor TANAKA Toshihiro completed his doctorate in Metallurgical Engineering from the Graduate School of Engineering, Osaka University, in 1985, subsequently earning a Ph.D. in Engineering at Osaka University. After working as a researcher at the Institute of Theoretical Metallurgy, RWTH Aachen University, and as an assistant professor, associate professor, and professor at Osaka University, he was appointed Dean of the School/Graduate School of Engineering, Osaka University in 2015. He has served as president of The Iron and Steel Institute of Japan, and has been in his current position since August 2019. His areas of expertise are high-temperature materials chemistry and interface control engineering.

YAMAMOTO Beverley Anne

Executive Vice President, International Affairs (Education)

Born in England in 1959, Professor YAMAMOTO Beverley Anne received her Ph.D. in East Asian Studies, Division of Social Sciences, Graduate School, University of Sheffield, England, in 2000. At Osaka University she has served as a lecturer, associate professor, and professor at the Graduate School of Human Sciences, the Director of the Human Sciences International Undergraduate Program and the Deputy Director of the International College, as well as Chair holder of the UNESCO Chair on Global Health and Education at Osaka University. She has been in her current position since April 2023. Her areas of expertise include the sociology of education and health, with a particular focus on sex education, internationalization of education, health promotion, and health care and civic engagement.

Osaka University is the only national university in Japan that has five Executive Vice Presidents in charge of international affairs working on international strategic initiatives. Such initiatives include training Japanese students and international students to become professionals working around the world, building an international network that utilizes Osaka University's Overseas Centers, and promoting joint international research, international industry-university co-creation, and the social implementation of research results. We asked each Executive Vice Presidents for their thoughts on what new value creation could be expected through these strategic initiatives.

Tanaka (Manabu): A key feature of Osaka University's international strategy is that we have five Executive Vice Presidents in charge of international affairs, each of whom is actively pursuing separate initiatives while working together. We try to provide seamless support to international students before, during, and after their time at the university. In addition to human resource development, we aim to improve research capabilities and promote social co-creation through our international strategy. One organization that supports international students is the Center for Global Initiatives, which is associated with the Center for International Education and Exchange, Center for Japanese Language and Culture, International Center for Biotechnology, and International College. In the future we plan to establish a Global Admissions Office (GAO) to expand the functions of the Admissions Assistance Desk (AAD) and provide a single contact point for international students from abroad. The university has four Overseas Centers covering:*— North America, Europe, ASEAN countries and East Asia. Through collaboration with each center, the GAO will function as a "one-stop center" for carefully disseminating information tailored to the characteristics of each country or region, recruiting talented students, centralizing admissions information and offering the assistance needed to entrance examinations, and providing support for the acceptance of international students. The university also has an excellent Japanese language program for international students that allows students, prior to their enrollment, to gain a certain level of proficiency in the Japanese language. We also support continued study upon enrollment for students to reach their desired level of language skill. Providing such seamless support to international students from abroad is a particular feature of this university.

Yamamoto: The Osaka University International College offers degree programs that are taught in English or offer the first two years in English in the human sciences. Students are also offered Japanese language education. This allows

* For more details about our Overseas Centers, see p. 58.

international students and Japanese students who have received an international education to receive high-quality educational contents in English, develop their research skills, as well as take classes to acquire advanced Japanese language skills. The students in these programs are extremely talented and enter the program with native or high-level English-language skills. Many achieve a high level in Japanese with some passing the Japanese-Language Proficiency Test at the N1 level by the time they graduate. I would like to create more opportunities for interaction between our regular Japanese university students and these talented international students, which I feel would offer positive mutual stimulation and the chance for new insights to arise. I would really like to expand such opportunities beyond the current two degree programs.

Tanaka (Toshihiro): Osaka University has been offering courses taught in English since 1973 and this year marks the 50th anniversary. Few other universities in Japan have been running educational programs in English for over half-century. Moreover, this long history of promoting education for international students has resulted in many OU international alumni working in positions of responsibility in their home countries, and they are taking the lead in promoting cooperation with Osaka University. For example, in 2014, Osaka University launched its first Double Degree Program, which today extends to 50 agreements with partner universities outside of Japan. This admirable track record owes much to our 50-year history of accepting international students and a focus on human resource development. Our international alumni have played a large role in the

internationalization of the university over 10 to 20 years even after graduation. These developments show that we must approach human resource development from a long-term perspective. The important thing for international students is not simply to study at Osaka University, but to stay in touch after graduation and serve as bridges between the university and their home countries. To facilitate such endeavors, we launched the Center for Student Success Research and Practice* and are scaling up data collection and analysis related to international students.

Tanaka (Manabu): It sounds like seamless international efforts are taking place that transcend time zones and distance.

Onoye: As for seamless international efforts, our university has many world-renowned researchers, and students from all over the world have come to study under them. However, at present these arrangements are not set up as systematically as they could be. I want to establish a system to ensure that the achievements of top-notch researchers are presented in a more easy-to-understand way so that we can strategically attract talent from all over the world. For example, in terms of supporting researchers, we are strengthening the activities of international university research administrators (URAs). Since Osaka University has four Overseas Centers, we could assign a URA to each center to anchor and promote joint international research and international industry-university co-creation. It would also be effective to hire international alumni in their home countries. They have acquired advanced competency in the Japanese language and understand the Japanese mentality. Moreover, they are fluent in their country's culture and customs and could play a significant role in facilitating communications.

Tanaka (Manabu): By sharing information about our internationally active researchers, making their activities known at each of our centers, we can expand and strengthen our network, bringing together researchers, companies, and government agencies around the world.

Yamamoto: Information gathering and analysis can create that pipeline for international students and researchers that encourages internationalization, which includes research activities.

Tanaka (Manabu): Hearing this, I get the sense that progress in international industry-university co-creation can help similar activities within Japan break through to the next phase.

Kaneda: The key will be how to commercialize research results. From a corporate perspective, when a system is put in place that gives company-led projects access to whatever university resources are needed for commercialization , that will spur advances in industry-university co-creation. But to facilitate this will require affiliated companies separate from the university to work on the commercialization of research results.

Tanaka (Manabu): Promoting seamless international co-creation will also help advance industry-university co-creation at the university and open up new possibilities for value creation.

Onoye: I think this signals a major shift in the positioning of the university with respect to industry. Surely, opportunities for industry-university co-creation will expand even further by approaching companies with the notion that joint research and co-creation with Osaka University can greatly bolster corporate activities and commercialization efforts.

Kaneda: So, what we really want to do is foster more talent, develop individuals who can think in terms of new value creation, and further enhance the university's research capabilities.

Tanaka (Manabu): One initiative we are taking is to build the concrete environment, a new town around the university to which we can invite all kinds of researchers from overseas centers, together with their families. That is the Science Hills Plan we are working on. The concept also involves the Osaka/Kansai region in the development of human resources. International joint research is just one way to provide young people with challenges to eventually contribute to society by creating new value, which will also create value for the university.

* For more information about the Center for Student Success Research and Practice, see p. 36.

Kaneda: The Science Hills concept is based on the idea that we need to bring together researchers from different fields as part of an interdisciplinary research system to tackle the major social issues faced by all of humanity, which cannot be solved by researchers working separately in their own fields. By bringing together researchers from multiple fields to work on global warming, food problems, pandemics, and other big issues, and integrating their research across disciplines, new value will be generated. What is "Interdisciplinary" becomes "Transdisciplinary" and "Convergence of Knowledge" evolves into the new concept of "Convergence Knowledge." We want to build a system that enables new value to emerge. I believe that an important function of Science Hills will be to provide community-based implementation and verification for new technologies and products created in this way, as well as identification of areas for improvement and market needs.

Yamamoto: The invention of new techniques or technologies may have value to engineers, but whether they are useful in the field is not always guaranteed. In that regard, I would like to strengthen social implementation that is rooted in the social context by bringing together people in diverse positions, creating a knowledge mixture that embodies various perspectives. In terms of international collaboration, I feel that the synthesizing of international and Japanese perspectives will, more than anything, give rise to groundbreaking ideas and value.

Tanaka (Manabu): I would also like to involve students in such real-world contexts with a focus on developing human resources — people willing to work on solving the issues of the coming generation.

Tanaka (Toshihiro): Diversity is extremely important. For example, you will find that people from Japan, China, and Western Countries have different viewpoints on many matters, but you only come to realize the bias in your own views or opinions when you talk to other people. I feel it is crucial to start exposing young people to a range of views while they are still open to new idea. That is another good reason to proactively accept international students and send Japanese students abroad — to promote interactions that transcend nationality. I hope that Science Hills can be that kind of place—where people come from many other countries and regions to create a wonderful mix of human attributes.

Onoye: I think the university should focus on its ties to Asia in particular. An Eastern way of thinking makes it comparatively easy to share points of view, which then leads smoothly to value creation. I imagine the next evolution of Science Hills we can expect this creative process expanding countries in Asia.

Tanaka (Manabu): Bringing the Science Hills Plan to fruition could well transform the university from the inside out by attracting greater numbers of students who want to be more involved in social implementation or engaged globally. As our esteemed Executive Vice Presidents have been saying, the pursuit of a seamless international strategy that extends from human resource development to joint international research, industry-academia co-creation, and social implementation is part of our effort to help make the world a better place to live, and that includes making Osaka into an international academic city of the future through co-creation with society.

Supporting and Implementing Initiatives to Improve Diversity and Develop International-Minded Young People

Osaka University accepts outstanding international students and sends Japanese students to study abroad. Through such efforts, we are strengthening our diversity and building a diverse, inclusive environment that fosters talented, international-minded individuals capable of taking on the challenges being faced worldwide.

Support Office for International Students and Scholars

—Immigration and Life Support—

To give peace of mind to international students and researchers from abroad who want to focus their studies or research while living in Japan, the Support Office helps with all of the necessary paperwork and procedures, from getting a visa for Japan to helping with housing arrangements and the many processes that must be taken care of in Japan after arrival. The office also holds orientation sessions for newly arrived international students and researchers to help them adjust to life in Japan as quickly as possible.

Global Village Tsukumodai

— A diverse living space —

This is a new type of student dormitory with an international flavor where international and Japanese students live together in shared dormitory-style facilities, communicating in English on a daily basis. The dorm not only provides students with housing support but it serves as a "diverse living space," fostering an international atmosphere that encourages interaction among students from all over the world. Most of the student dormitories at Osaka University are mixed housing for both international and Japanese students.

International Exchange Subjects and Virtual Study Abroad Program

—International exchange support on campus—

Osaka University offers International Exchange Subjects in which Japanese students take classes in English together with international students. This is a great opportunity for students to learn in an international atmosphere and enjoy interacting and discussing topics in English. Virtual Study Abroad Program allows students to attend lectures online that are being given at partner universities overseas. Attending such lectures with overseas students online provides a virtual study abroad experience that can prepare a student to study abroad or stimulate their desire to do so.

Virtual Study Abroad flyer

Osaka University Foundation for the Future

—Economic support unique to the university—

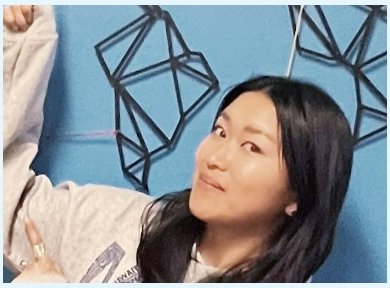
This foundation is unique to Osaka University. It provides economic support to both international students studying in Japan and students from the university studying abroad. The Osaka University Foundation for the Future* is a source of revenue that supports not only the activities of exchange students but also a wide range of other activities—short-term study abroad not covered by private scholarships, language training, and study abroad for graduate students to do research and fieldwork—thereby offering many opportunities for students to study abroad.

* For more information on the Osaka University Foundation for the Future, see p. 60

Voices of Individuals Who Have Trained Abroad

WAKABAYASHI Saki

Administrative Staff
International Student Affairs Division
Department of International Affairs
Studied in the U.S. from June 2022 to March 2023 as a trainee for international affairs under the Ministry of Education, Culture, Sports, Science and Technology



"Diversity is a fact, inclusion is an act." I came across this quote during my diversity training as a LEAP trainee at Northern Arizona University. In the United States, which is sometimes called a "Salad Bowl," I had many conversations about this topic with folks who had lots of international experience, as well as with Japanese people living in the U.S. I spent a lot of time wondering, if inclusion is an act, what actions are needed in a society with a broad diversity of people? It was time well spent, rethinking my own values and life choices, and what it means to have an international perspective when communicating with people. Training abroad also made me keenly aware of the importance of having people from other countries who understand Japan and Japanese culture, and not a small number of such people have been exchange students in Japan, so I find it very meaningful to be a part of the international student support program at Osaka University. With the perspective I have gained through this training program, I want to be a key facilitator of cooperation between international students and faculty members and contribute to the international diversity of education and research at the university.

Voices from Former Students with Experience Studying Abroad

NAKATSUJI Ryotaro

4th-Year Student
Manufacturing Science Course
Materials and Manufacturing Science
Division of Applied Science
School of Engineering
Studied abroad at the University of Toronto, Canada, from September 2022 to April 2023

I've always wanted to live in a different world and be exposed to a different culture, and being an exchange student was my dream. So I was excited to go to the University of Toronto in Canada in September 2022 to take classes and do research. My biggest takeaway was how different Japan was from this foreign country, but at the same time how little was actually different. People talking straight, junk food smothered in sauce, lots of seasonal events... I was surrounded by new stimuli every day and the experience was exactly what I was looking for.

So, while I had imagined that the world outside of Japan was a completely different world, I found that the differences were not really that substantial. Initially, I thought that accepting those differences was the meaning of diversity, but then I realized that true diversity is to see the world as one seamless space. There are gradations to everything, and it is all connected. When that realization hit me, I felt the world to be really small, and I felt the distance close between me and other people, no matter their race or nationality. By feeling this sense of harmony, I think it is possible to get along with anyone, anywhere and create a welcoming world that we can all live in together. That was the discovery I made which I will base my life around going forward.

Voices of International Students

Das Kamalini

3rd-Year Student
Human Sciences International Undergraduate Degree Program (Undergraduate English Course)
Department of Human Sciences
School of Human Sciences

The reason I wanted to go to Osaka University was to study the social sciences, plus I was impressed by the mock lectures I attended at the open campus and I thought that studying society and human nature at the university would be a satisfying path.

The university offers many interesting courses. I found them to be very stimulating and full of insight. I've also been able to meet wonderful teachers and friends who have shared their values with me, and I've learned the importance of thinking for oneself and working hard.

Besides studies, the university offers many club activities to enjoy a full and active student life. Through such extracurricular activities you can learn fortitude and discipline, and make lifelong friends. I belong to the swim team and was proud to represent Osaka University at the national tournament, and I had a great time competing.

I am interested in many kinds of social phenomena, and I am interested in utilizing what I have learned through lectures and my own research at the university about investigating how social systems can give rise to social ills. Only by getting to the root of the problem, I believe, can we hope to begin mitigating those social ills.

Taking on an unending Challenge "Conquering All Diseases" Premium Research Institute for Human Metaverse Medicine (WPI-PRIMe*)

* WPI: World Premier International Research Center Initiative
PRIMe: Premium Research Institute for Human Metaverse Medicine

Osaka University's Premium Research Institute for Human Metaverse Medicine (PRIMe) was selected for the World Premier International Research Center Initiative (WPI) program in FY2022. The center integrates two scientific fields for the first time in the world—human organoid-based biomedical science and information and mathematical sciences—and creates the new scientific field "human metaverse medicine," aiming to comprehensively understand the processes of disease progression in the human body as it develops in an unbroken series of steps.

PRIMe WPI Osaka University

Research Goals

Creation of the new scientific field "human metaverse medicine"

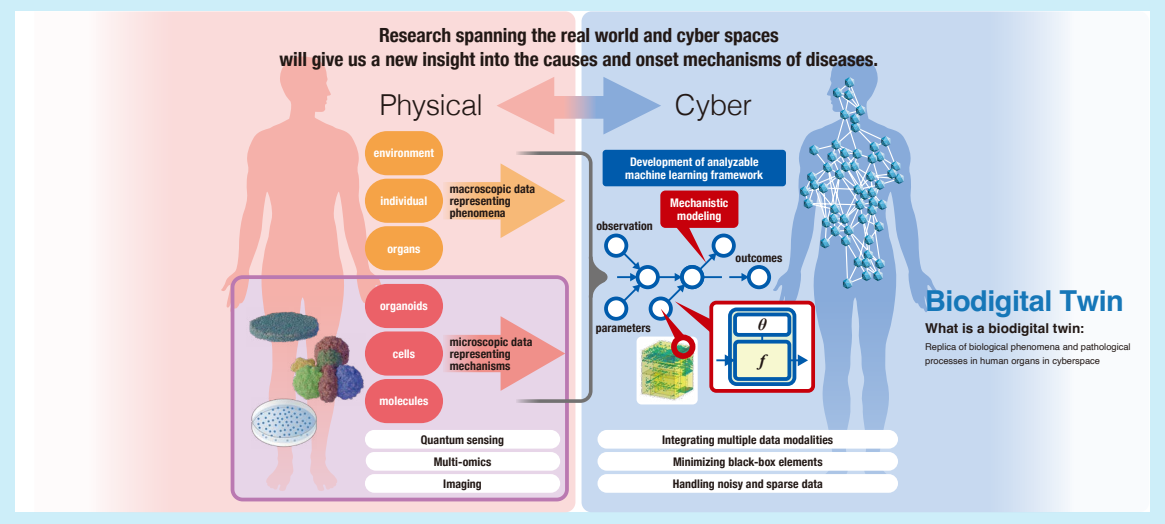
WPI-PRIMe will construct human body digital twins (referred as "biodigital twins") that are capable of precisely replicating biological phenomena and pathological processes occuring in human organs in a virtual space. This virtual platform pioneers a novel scientific field—human metaverse medicine—uncovering the mechanisms behind human diseases and predicting disease onset, progression, and response to treatments. Its ultimate goal is to develop personalized prevention and treatment modalities.
We aim to promote the human metaverse as a leading information space platform for sharing and utilizing biodigital twins globally among researchers and medical professionals. Another goal is to foster a research environment in which researchers from diverse backgrounds converge, fostering interdisciplinary and integrative research "under one roof" framework. Our environment and approach will also serve as training ground for nurturing the next generation of leaders in the field of human metaverse medicine.

As WPI

Cutting-edge, international scale research using biodigital twins

WPI-PRIMe brings together world-class researchers from two advanced fields: human organoid-based biomedical science and information/mathematical sciences. It marks the world's first comprehensive integration of these two disciplines. The primary focus of WPI-PRIMe lies in the creation of a biodigital twin and the exploration of diseases affecting vital organs such as the eyes, liver, brain, heart, reproductive organs, and bones. These diseases are prevalent among aging populations. Furthermore, we are actively addressing the ethical, legal, and social issues (ELSI) associated with this research. We have established satellites in Canada, Mexico, and two locations in Japan. Additionally, we are engaged in collaborative efforts with research institutions in the United States, Ireland, and France to foster international studies in human metaverse medicine.

WPI-PRIMe Website
https://prime.osaka-u.ac.jp/



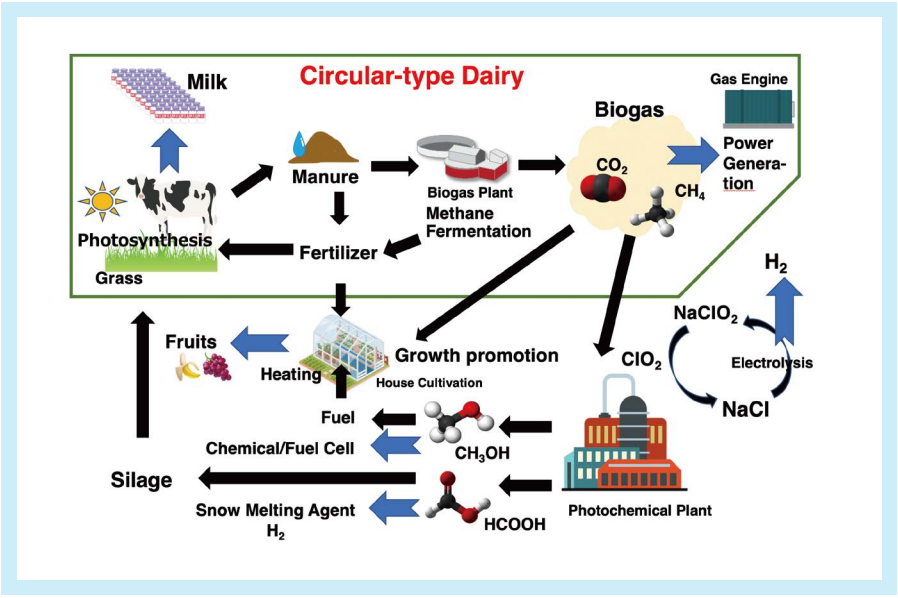
Leading-Edge Research that Contributes to Green Innovation

■ Livestock manure will save the world!?

OHKUBO Kei, Professor

Institute for Advanced Co-Creation Studies
Institute for Open and Transdisciplinary Research Initiatives
(Division of Innovative Research for Drug Development)

Professor Ohkubo's research group has signed an agreement with the town of Okoppe, Hokkaido, and succeeded for the first time in the world in producing methanol from methane gas and oxygen generated from cattle manure under ambient temperature and pressure. Normally, when methane gas reacts with oxygen, the combustion reaction takes precedence, making R&D into the production of methanol extremely difficult; it is considered "pie-in-the-sky research." However, Professor Ohkubo and his colleagues have succeeded in a near-100% conversion of methane into methanol, a type of liquid fuel, without the formation of carbon dioxide. They used chlorine dioxide (an active ingredient in disinfectants and deodorizers) as an initiator, which when activated under photoirradiation, causes methane gas dissolved in the solvent to react with oxygen, forming methanol and formic acid. The results of this research have made a significant contribution to the realization of carbon-neutral circulation-based dairy farming systems by making possible the conversion of biogas obtained from the fermentation of manure into bio-liquid fuels. The research also holds great potential to help in supplying fuel to areas with unstable electrical supply, in solving energy and environmental issues, and to help revitalize local communities.

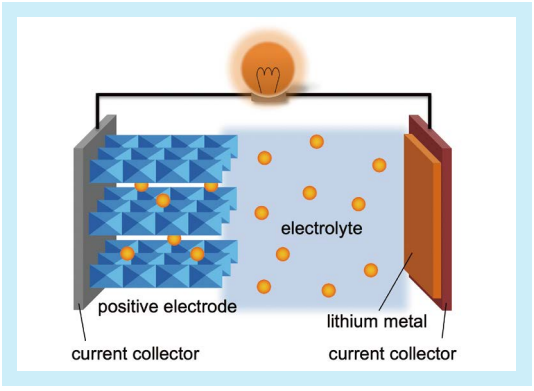


■ Next-generation rechargeable batteries to solve energy and environmental problems

YAMADA Yuki, Professor

Institute of Scientific and Industrial Research (SANKEN)

Professor Yamada's research group is developing materials for next-generation rechargeable batteries. Although lithium metal batteries that employ lithium metal negative electrodes have a much higher energy density than that of lithium-ion batteries, the high reactivity of lithium metal causes electrolyte decomposition as a side reaction, resulting in low charge-discharge efficiency. Focusing on electrolyte formulations, Professor Yamada discovered a new method to control the reactivity of lithium metal without sacrificing performance. By applying this concept, he has developed several electrolyte materials that can suppress electrolyte decomposition and achieve charge-discharge efficiencies of 99% or higher.
This finding will greatly accelerate research and development toward the practical application of lithium metal batteries, which will enable high-density energy storage, making them promising as batteries that would enable EVs to achieve a cruising range comparable to that of gasoline cars. This would result in the more widespread adoption of EVs, contributing to the realization of a low-carbon, sustainable society.

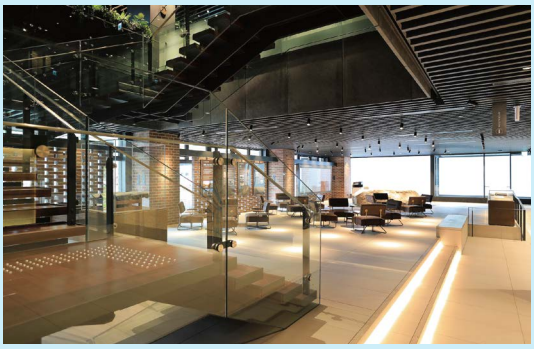


From Osaka to the World
A Hub of Co-Creation where Culture, Art, Academia, and Technology Meet
Osaka University Nakanoshima Center

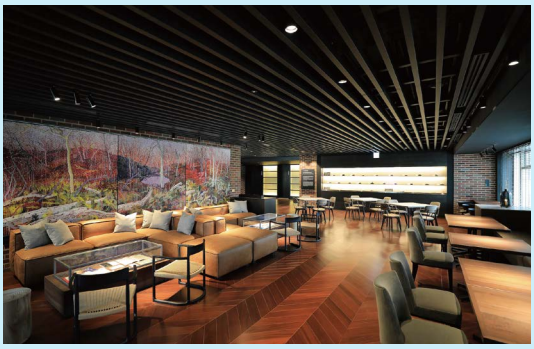
The Osaka University Nakanoshima Center was established in 2004 on the site of the former Nakanoshima Campus, the birthplace of Osaka University. The Center recently underwent renovations, reopening in April 2023, to enhance its functions as part of the commemorative projects for the 90th anniversary of Osaka University and the 100th anniversary of Osaka University of Foreign Studies. The newly renovated Nakanoshima Center will serve as a hub for four intersecting domains of knowledge—culture, art, science, and technology—and disseminate that knowledge globally through art and co-creative activities that partner the university with industry and society.

The center will build a network with various institutions and companies in the Nakanoshima area to highlight aspects of academia, culture, and art, while promoting activities that not only return knowledge from the university to society but lead to new knowledge and innovation through co-creation and collaboration between the university and society based on the theme of "kyoso (orchestration)" and "kyoso(co-creation)" of knowledge.

Osaka University Nakanoshima Center

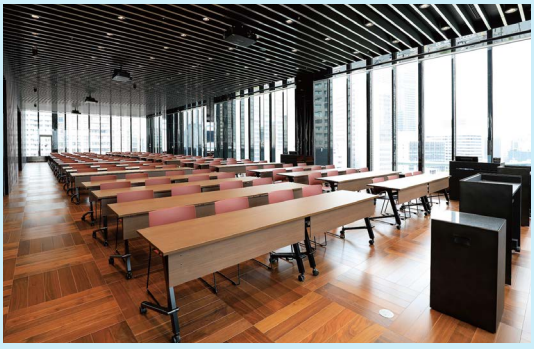


1F: Open spaces for the public to use, where visitors can view materials and objects related to Tekijuku



2F (Cafeteria Agora): A relaxing space with contemporary sculptures and paintings where visitors can enjoy a cup of coffee or a meal

9F (KISHIMOTO Tadamitsu Salon (Salon Agora)): A restaurant that can be used for lectures, dinners, standing buffet parties, and other events



10F (SAJI Keizo Memorial Hall): A hall that can be used for a wide range of events including lectures, seminars, and symposiums

Osaka University Nakanoshima Center
https://www.onc.osaka-u.ac.jp/
(in Japanese only)

Osaka University is Working to Create a DE&I Campus Center for Diversity & Inclusion

Based on the belief that diversity is the true wellspring of innovation, in 2021 Osaka University announced the "Osaka University Diversity & Inclusion (D&I) Declaration," and has been working to create an environment where diversity is fully embraced and respected. For the next phase, we are working to create a DE&I*1 Campus at which all individuals can live in high spirits and be fully who they are.

Vice President SHIMAOKA Mana
(Director of the Center for D&I) [right]
and Professor SUGITA Elli W
of the Graduate School of Human Sciences [left]

Support System to Keep Life Events from Interrupting One's Career

A Research Support Staff System supports faculty and staff in balancing work and childcare, assigning students and others as support staff to researchers who are unable to devote sufficient time to research due to life events such as childbirth, childcare, or family care. Three on-campus nursery schools have also been established to help in this effort as well as short-term childcare services and a nursery for sick and convalescent children.

Support for Female Students Advancement in Science and Engineering

An Admission Support Program awards 200,000 yen each to 50 outstanding female students who are admitted to the Faculty of Science and Engineering. Also, events for elementary, junior high, and high school students and their parents are held by "asiam," a support network for female students in the natural sciences at the university.

SOGI*2 Respect for Diversity

The center's activities have been recognized for four consecutive years with the highest rating of Gold by the PRIDE Index*3 for such things as installing all-gender toilets and distributing the SOGI Diversity Guidebook.

Achievements and Steps Ahead

Both the number of female researchers and the number of female students at Osaka University are the largest among national universities, and the ratios of female researchers and in senior positions are also steadily increasing. (For more details, see p. 57)

As part of the Initiative for the Implementation of the Diversity Research Environment (Collaboration Type)*4, the university received the highest "S" rating, and as an organizer of the All Nippon Diversity Network*5 (with 185 participating institutions), the university leads D&I efforts nationwide.

We will continue to promote various initiatives to achieve a 30% ratio of female researchers by 2031, the 100th anniversary of the university's founding.

Improving menstrual wellbeing

Designing a better future

The MeW Project*6, led by Professor SUGITA Elli W of the Graduate School of Human Sciences and her students, conducted a pilot project of developing and setting up dispensers for the free provision of menstrual products as part of research in Japan on menstrual hygiene management. The dispensers are made of corrugated cardboard. They are easy to assemble and transport, environmentally friendly, and do not require electricity to function so they may be used at evacuation centers in emergencies. They have a QR code for getting user feedback, and many positive messages have been received, such as "It really helped me in a pinch and I felt supported, as though someone understood the difficulties of having a period." Three types of menstrual pads and tampons are available, so the user can choose which suits them best.

In collaboration with the Center for D&I, approximately 200 units have been installed in restrooms on all campuses as of May 2023. Nearly 2,000 additional units have been installed at other institutions to date. In recognition of these efforts, Professor Sugita received the "Women's Challenge Award" from the Cabinet Office.

The dispenser for menstrual pads and tampons

For details on initiatives other than those listed above, please refer to the following website.
Center for Diversity & Inclusion
https://www.di.osaka-u.ac.jp/en_lp/

*1 DE&I: Diversity Equity & Inclusion
*2 SOGI: Sexual Orientation and Gender Identity
*3 PRIDE Index: An evaluation index for LGBTQ+ initiatives in the workplace created by the non-profit general incorporated association, Work With Pride
*4 Initiative for the Implementation of the Diversity Research Environment (Collaboration Type): A project subsidized by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) for human resource development in science and technology
*5 All Nippon Diversity Network: A network connecting universities and research institutions nationwide to support the activities of female researchers, organized as a project of the Initiative for the Implementation of the Diversity Research Environment (National Network Core Institute)
*6 MeW Project: Menstrual Wellbeing by/in Social Design

Strategies and Efforts for the Advancement of Education, Research, and Management

Creating an Environment that Fosters Knowledgeable Individuals Capable of Social Change

Osaka University is a preeminent educational institution. We have created an educational environment conducive to sustainably fostering highly-capable individuals in whom society places its trust. These individuals possess the skills not only to address social issues, but also strive to realize their own potential regardless of how society changes. These individuals are also able to dynamically and confidently fulfill an active role in creating a new society.
Our doctoral programs, in particular, make use of distinctive features such as Industry on Campus and our overseas campuses. We have built a support framework so that students may further advance internationally-renowned research while also being conscientiously mentored not only by academics, but also a variety of industry professionals in a richly-diverse environment. This approach produces individuals with outstanding creativity capable of mastering their specialties, the discipline to engage in a dialogue with society to contemplate the future, and the ability to conceptualize and design in a manner that even takes human sensibilities into consideration.

OU Master Plan Priority Strategy

Building an Educational Structure Anticipating Students Progressing from Undergraduate to Graduate Studies

At Osaka University, we are constantly thinking about how to better optimize our overall educational structure, which begins with a smooth transition from high school to university education, then from undergraduate to graduate, and extends to lifelong learning opportunities. As we continue to ensure the quality of our education, we have established a flexible framework that develops dynamic individuals to boldly take up the challenge to address a variety of issues in response to societal needs.
One particular initiative is Student Life-Cycle Support System (SLiCS System). The SLiCS System is building an academic and student support system based on personalized optimized data to provide continuous support for each student's life stage from pre-enrollment through post-graduation, and to promote visualization of education and learning outcomes.

Creating Environments to Cultivate Intellectual Curiosity

As a leading research institution, we aim to provide an environment that enables all member of Osaka University to apply themselves to research founded on intellectual curiosity, unfettered by short-term outcomes. We will build robust foundations for all researchers to pursue various fundamental research.
By assembling budding potential from a range of fundamental research in order to form interdisciplinary divisions and other areas, we established the Institute for Open and Transdisciplinary Research Initiatives (OTRI), an organization for creating new academic disciplines, as well as the International Advanced Research Institute, an acknowledged world-class research institution maximizing the university's strengths to reach their full potential.
In the future as well, we will augment interdisciplinary research built upon basic research and form outstanding world-class research institutions to promote research contributing to the creation of a new society and lead the implementation of new values.

OU Master Plan Priority Strategy

Putting into Practice a Variety of Basic Research Fundamental to an Academic Institution

So that all researchers may pursue basic research that accords with their intellectual curiosity and inquisitiveness, Osaka University maintains a foundation that encourages such pursuits. Personnel expenses, basic expenditures, activity locations, and other components are provided. We are also enhancing Osaka University's research capabilities through support for international activities and the development of young researchers, among other efforts.
Additionally, we are working to enhance all sorts of digital resources so that we may always offer researchers both historical and cutting-edge data. This allows us to support research activities rooted in intellectual curiosity and profound thinking.
Moreover, along with facilitating the sharing of advanced research and laboratory equipment, we have created a research environment where anyone is able to promptly utilize equipment and analytical methods necessary for facilitating their research.

Improving Management Strategies by Placing Co-Creation as a Source

Through co-creation with society, Osaka University is creating a society where each member feels worth living. We are boldly taking up the challenge to solve a range of diverse challenges from local to global issues. Underlying the foundation for these activities is the OU Ecosystem, which encourages creative thinking to accumulate research and develop human resources. At the same time, it implements or puts into practice these results. Problems revealed in that process are once again communicated back to the university to advance education and research, thereby creating a virtuous cycle of knowledge, talent, and funds. The OU Ecosystem essentially creates new knowledge and develops talent through consideration, together with society's stakeholders, of challenges, problems, and other issues in society identified as we continually co-create with society, and integrate those results back to education and research. Creation of a virtuous cycle bringing together knowledge, talent and funds provides stability for Osaka University's management base and creates a foundation for education and research, which then produces further social transformation.

OU Master Plan Priority Strategy

Promoting Co-Creation with Society to Expand the Virtuous Cycle of Knowledge, Talent, and Funds

Strengthening Functions Producing Landmark Educational and Research Results from Social Challenges

Co-Creation Bureau's Activities Bringing Together Governments, Industry, and Academia to Co-Create

In January 2018, we launched the Co-Creation Bureau. This is a core institution bringing together internal and external stakeholders to support the OU Ecosystem. The Co-Creation Bureau advances co-creation among industry, government, and academia. The Bureau focuses on collaborative activities between industry and academia (intellectual property and venture incubation), while also working to strengthen community partnerships and its fundraising capabilities. The Bureau is engaged in activities to "co-create" new value by combining the knowledge and proficiencies of society and the university.

Educational Strategies >>>P32

Developing Talented Individuals in Collaboration with Various External Stakeholders

Within the Osaka University campus, there are many Joint Research Chairs and Research Alliance Laboratories where corporate researchers and research organizations are permanently in residence. Campuswide, we will seek to promote a new talent development model through on-campus internships.
In addition, we are moving forward to construct a professional development system where corporate researchers acquire academic degrees while pursuing advanced research under the guidance of Osaka University researchers.

Support system for students at different life stages
https://slics.osaka-u.ac.jp/
(in Japanese only)

Industry-Academia Co-Creation Facilitates Recurrent Education
https://www.osaka-u.ac.jp/ja/news/storyz/storyz_education/nl86_co-creation
(in Japanese only)

Internship on Campus
http://www.mit.eng.osaka-u.ac.jp/ioc/
(in Japanese only)

Research Strategies >>>P38

Forming Outstanding World-Class Research Institutions and Pioneering New Research Fields

The Center for Quantum Information and Quantum Biology (QIQB) developed out of the Institute for Open and Transdisciplinary Research Initiatives (OTRI) into a preeminent global research institution. The center has research hubs that are part of the International Advanced Research Institute along with the Immunology Frontier Research Center (IFReC), launched as part of the World Premier International Research Center Initiative (WPI). The center has brought together renowned researchers from around the world and has produced many outstanding achievements in diverse fields of research.
In addition, at the Center for Infectious Disease Education and Research (CiDER), work is underway on an infectious disease control project, the principal pillars of which are basic research on infectious diseases and the development of individuals to carry out such work.
With the aim of establishing excellent research institutions to continue the work of these centers, Osaka University has implemented strategic policies supporting research and the pioneering of new fields for research.

More information about the Center for Quantum Information and Quantum Biology (QIQB) is available on p. 38.

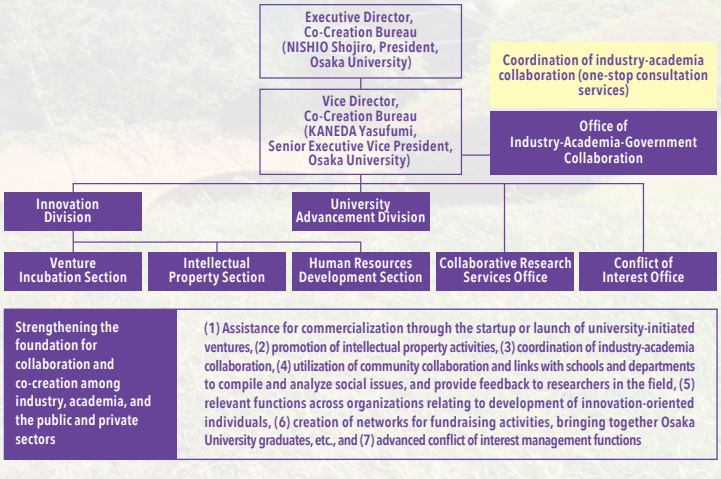
Institute for Open and Transdisciplinary Research Initiatives (OTRI)
https://otri.osaka-u.ac.jp/en/

Immunology Frontier Research Center (IFReC)
https://www.ifrec.osaka-u.ac.jp/en/

Center for Infectious Disease Education and Research (CiDER)
https://www.cider.osaka-u.ac.jp/en/

Management Strategies >>>P44

Currently, activities are administered within a framework comprising one office, two divisions, and two sections. The Office of Industry-Academia-Government Collaboration provides one-stop comprehensive consultation services for outside stakeholders. The Innovation Division is responsible for reviewing intellectual property strategy to promote technology transfer and support commercialization through the startup of university-initiated ventures. The University Advancement Division serves as the point of contact for donations, including the Osaka University Foundation for the Future. The Collaborative Research Services Office is a multi-service office handling agreements concerning joint research and other endeavors, and responsible for verifying contract procedures, conditions, terms, and other aspects so that joint research and other efforts may proceed smoothly. The Conflict of Interest Office is in charge of managing any conflicts of interests involving industry-academia collaboration and activities as well as handling consultations, education and training, and other relevant concerns. The Collaborative Research Services Office, Intellectual Property Section, and Venture Incubation Section leverage the framework for faculty collaboration to promote activities that make use of the respective and relevant background of each faculty member. The Co-Creation Bureau is at the core rallying forces throughout the university to create a virtuous cycle of knowledge, talent, and funds.



Developing Dynamic Individuals Boldly Taking up the Challenge to Solve Social Issues in the Future

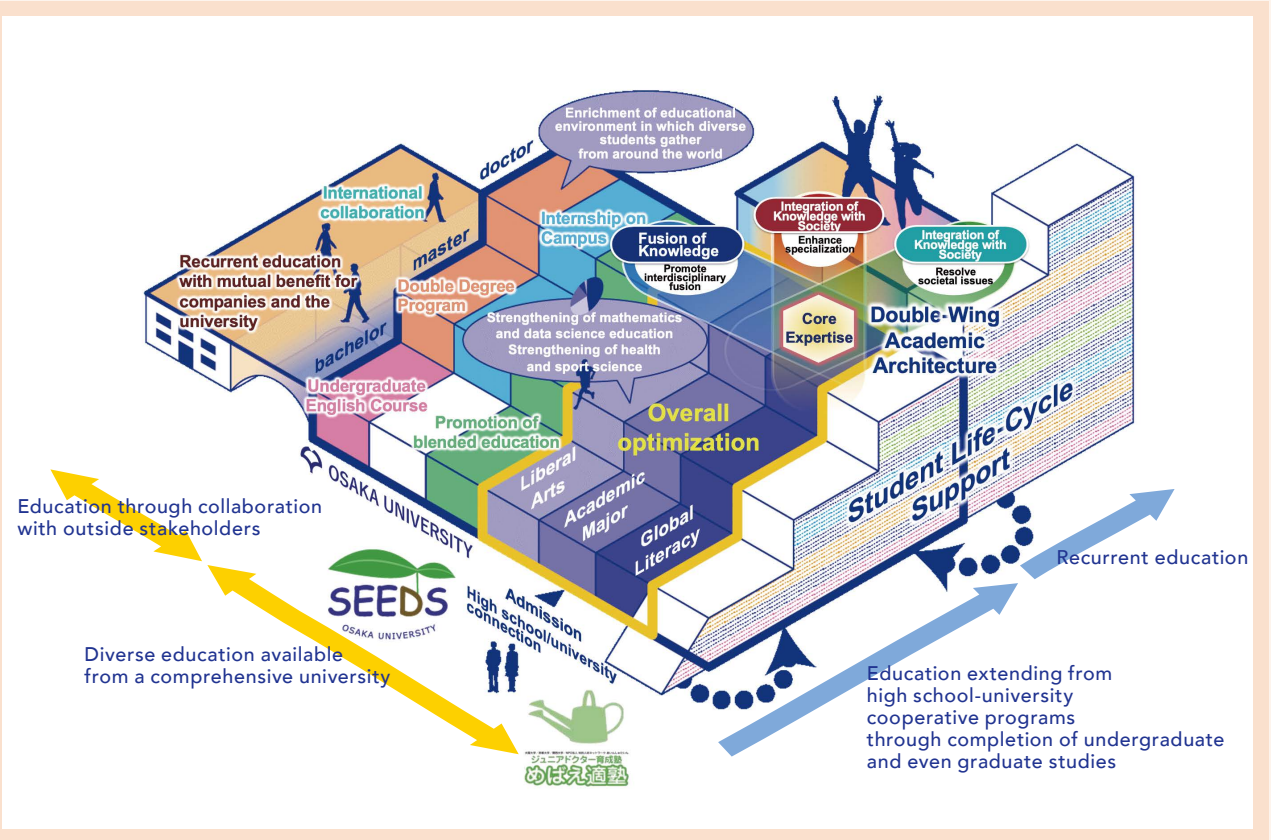
Osaka University's curriculum is comprised of three pillars: academic majors, liberal arts, and global literacy. These are integrated coherently from undergraduate to graduate studies. Our aim is to provide a platform through which students continue to study these pillars at all levels of undergraduate to graduate learning. This will help them acquire the skills to address the broad range of social issues in the future, realize their own potential regardless of the changes society undergoes, and develop into confident and dynamic individuals playing an active role in society.

We developed the Double-Wing Academic Architecture (DWAA) to promote transdisciplinary graduate education based on our three educational pillars. The DWAA maintains a core of expertise consisting of subjects focused on theory in each graduate school and specialization, while also embodying a variety of subjects corresponding to education relating to the Deepening of Knowledge for delving deeper into a specialization, the Fusion of Knowledge for contemplating fusion among academic disciplines, and the Integration of Knowledge with Society (discovering and solving problems as well as the social implementation of solutions) for leveraging specialized knowledge to solve problems through co-creation with a variety of stakeholders in society. The DWAA provides a diverse and in-depth education transcending disciplines, schools, and departments.

In addition, Osaka University also offers reskilling and recurrent education as part of the reform of our graduate education grounded in industry-academia collaboration. In collaboration with companies, we welcome researchers who have a master's degree into our doctoral programs and support them in their efforts to obtain a Ph.D. Moreover, we are also working to reform educational programs throughout the entire university to effectively promote a more diverse education. These initiatives include aiming to construct the digital data-based Student Life-Cycle Support System (SLiCS System), which provides effective educational support to our students.

Moreover, so that the development of individual talents may endure and continuously improve, we are providing STEAM education in collaboration with high schools as well as part of our undergraduate education with an emphasis on discovering problems, resolving challenges, and other aspects of inquiry-focused learning.

Overview of Osaka University's Educational Reforms



STEAM Educational Initiatives

—Embracing STEAM education taught in elementary, junior and senior high schools, Osaka University works with high schools and educates students with the aim of producing society's STEAM professionals—

Mebae Tekijuku

Mebae Tekijuku is a five-year study and research support program to train elementary and junior high school students to be "junior doctors." These young students are assigned to university research labs where they pursue independent study.

A Door to Academia ("Machikanezemi" or Machikane Seminars)

The Door to Academia is a required subject for all university first-year students that serves as a starting point for learning at Osaka University. In this seminar, students engage in a direct dialogue with faculty possessing expertise and broad insight to stimulate their awareness about university learning. The students engage in discussions with their fellow students majoring in other fields transcending schools and departments to encourage awareness about new ways of looking at the world and processes for solving problems.

The program comprises approximately 250 classes. The course "Environmental radiation in Fukushima" adopts a transdisciplinary approach, encouraging students in both the humanities and natural sciences to consider solving the social issue of reconstruction across the theme of "radiation" in Fukushima Prefecture's Iitate Village and other municipalities affected by the Great East Japan Earthquake.

"Project Hamadohri in Fukushima!" to learn and contemplate restoring and promoting Fukushima

High School-University Cooperative SEEDS Program

(Science & Engineering Enhanced Education for Distinguished Students)

The SEEDS Program is designed for highly-motivated high school students who would like to experience as soon as possible cutting-edge science and technology. The program aims to shift the paradigm from "being taught and raised" to "taking the initiative to learn and grow." The focus is on discovering and fostering standout talent for scientific research at an early age.

Undergraduate Research Support Project

The Undergraduate Research Support Project is designed for students eager to do research in an area outside of the school in which they are enrolled and who do not want to wait until they are assigned to a seminar or lab. Through the project, students receive guidance from faculty and assistance with research funds needed to pursue research on a topic of their choice soon after enrollment in the university. The students present their research findings in each school. The outstanding research presented in each school is honored with commendations awarded by the Osaka University president at a university-wide research presentation held each year during the university festival in May.

University-Wide Selections' Independent Research Presentation

Educating Global Professionals

—Individuals possessing the expertise to address the pressing issues of our contemporary world—

Multilingual Expert Program (MLE)

The Multilingual Expert Program (MLE), which borrows on the strengths of the School of Foreign Studies offering majors in 25 languages, develops competent individuals to succeed globally. Students not affiliated with the school take classes at the level of a major specializing in a foreign language.

Program Participant's Comments

HOMMA Kosei

4th-Year Student
Department of Economics and Business
School of Economics
Osaka University

Why did you register for the MLE program?

Having made the decision to study a language, I wanted to study one of a country that I had never been to. I was also interested in Southeast Asian countries with growing economies, so I chose to pursue Indonesian Language and Indonesian Studies.

What were some of the differences between the classes in your school and the MLE program?

Classes in the School of Economics may have as many as 200 or as few as 30 to 40 students. The MLE program offered a small-class setting with 15 or 16 students. What I remember most about the difference in the learning environments was giving presentations in front of the class and the professors remembering each student's name. It was quite challenging having to remember the vocabulary, but I found it fascinating that each of the islands making up Indonesia has its own history. This one nation has a rich diversity of religions and cultures.

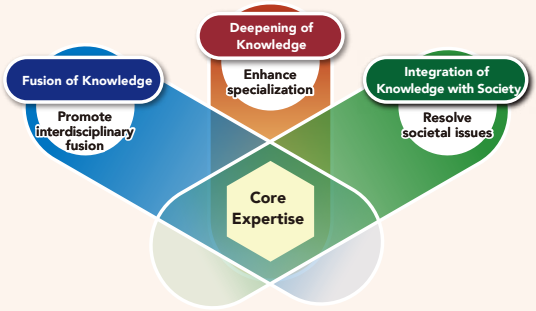
Osaka University's Graduate Education System That Allows Students to Design Their Own Learning

Institute for Transdisciplinary Graduate Degree Programs (i-TGP)

The Institute for Transdisciplinary Graduate Degree Programs (i-TGP) was established in August 2018 to enhance and reform graduate school education by promoting university-wide interdisciplinary education transcending the current graduate school and specialization framework. In addition to promoting graduate education reform based on DWAA, i-TGP provides coordination and assistance for the WISE Program (Doctoral Program for World-leading Innovative & Smart Education), Program for Leading Graduate Schools as well as Support for Pioneering Research Initiated by the Next Generation (SPRING), and other initiatives.

Double-Wing Academic Architecture (DWAA)

Educating Competent Individuals to Address New Needs in Our Society



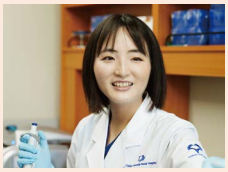
Program for Leading Graduate Schools

The purpose of the program is to foster global leaders playing active roles throughout industry, academia, and government. At Osaka University, five interdisciplinary educational programs are offered. Within the scope of the DWAA, these are positioned within the areas designated as the Fusion of Knowledge and Integration of Knowledge with Society.

WISE Program (Doctoral Program for World-leading Innovative & Smart Education)

The aim of the WISE Program is to develop doctoral professionals capable of spearheading the creation and utilization of new knowledge, maintaining the fortitude to create the value that drives the next generation, solve social challenges, and bringing innovation to society. Osaka University offers two doctoral programs, both designed to promote education that transcends disciplines, schools, and departments based on the DWAA. The WISE Program fulfills a leading role in the extension of degree programs transcending the traditional bounds of graduate school throughout the entire university.

Program Participant's Comments



IIJIMA Yura

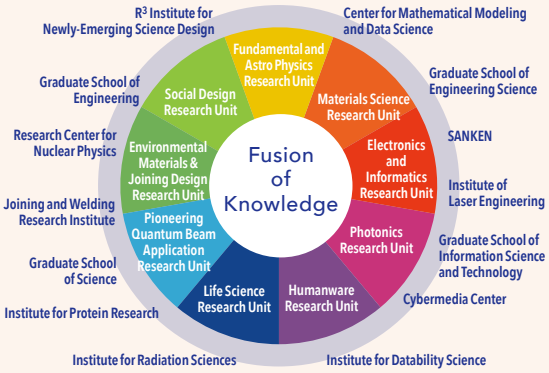
4th-Year in the Doctoral Course
Course for Oral Science
Graduate School of Dentistry
Osaka University

I am very impressed by the seminar series jointly offered by the Graduate School of Engineering and the WISE Program (Graduate School of Medicine/ Dentistry/ Pharmaceutical Sciences/ Frontier Bioscience). I have been able to objectively consolidate my own research topics based on design thinking. This has enabled me to study in a practical manner where we doctoral candidates participate in groupwork, enhancing our mutual understanding of research topics in different fields and creating novel social value based on our mutual core competencies. In addition, a variety of activities have been offered in the WISE Program, spanning industry, academia, and government, which have all provided meaningful experiences toward the future social implementation of the outcome of my research.

Osaka University Honors Programs for Graduate Schools

The Honors Program not only allows participants to pursue greater depth through research in their own area of specialization, but also broadens their perspective and equips them with the ability to decipher new and different fields. Adding to programs in science, engineering, and information sciences which began in 2020, programs in the humanities and social sciences are set to commence in 2024.

Honors Program for Graduate Schools in Science, Engineering, and Informatics



Support for Pioneering Research Initiated by the Next Generation (SPRING)

SPRING offers financial support to outstanding doctoral students, and integrates human resource development content for the creation of diverse career paths with a well-developed research environment.

Osaka University and the Business Community Roll out New Reskilling and Recurrent Education Project

Since 2021, Osaka University has been implementing the REACH Laboratory Project, which is based at the Research Alliance Laboratory established on campus with Shimadzu Corporation.

This project aims to enable individuals to earn a Ph.D. in 2 to 3 years in a promising environment. Companies dispatch employees to Osaka University's doctoral program where they are able to devote themselves to research and produce results with the support of a Research Alliance Laboratory.

Additionally, beginning in April 2023, an initiative was launched that will allow students in laboratories to which Shimadzu Corporation have been dispatched to join the corporation after earning a master's degree and then later aim to acquire a Ph.D. while engaging in joint research as part of the doctoral program. This project provides outstanding students with the backing to advance to a doctoral program and allows them to devote themselves to research in a stable scholastic environment as they receive financial support from the company while pursuing their doctorate and ensuring that they have a professional position after obtaining their degree.

Comprehensive Collaboration Agreement Signed with Shimadzu Corporation (March 2023)

The conclusion of this agreement will further promote research through industry-university co-creation at the Research Alliance Laboratory and transform the REACH Laboratory Project into the REACH Project.

https://www.osaka-u.ac.jp/en/news/topics/2023/04/21001

Project Participant's Comments

KURODA Hirotaka

2nd-Year in the Doctoral Course
Biochemical Engineering Area
Division of Biotechnology
Graduate School of Engineering
Osaka University

Analytical & Measuring Instruments Division
Shimadzu Corporation

Visiting Researcher,
Osaka University
Shimadzu Analytical Innovation Research Laboratories

In April 2022, I became a member of the second class of the REACH Laboratory Project, through which I have been pursuing research on the production of antibody drugs under the guidance of a world authority in the field Professor OMASA Takeshi.

The reason why I am participating in this project is straightforwardly to acquire expertise. When I was at the company, I was responsible for developing methods for analyzing media used in cell cultures as well as research on application of such techniques. I found specializing in cell cultures and data analysis methods challenging. So, I felt this program at Osaka University where I could devote myself to cutting-edge research would be a good opportunity and decided to apply. Since enrolling as a Ph.D. candidate, I've gained more expertise in these areas and honed my ability to discover and solve problems.

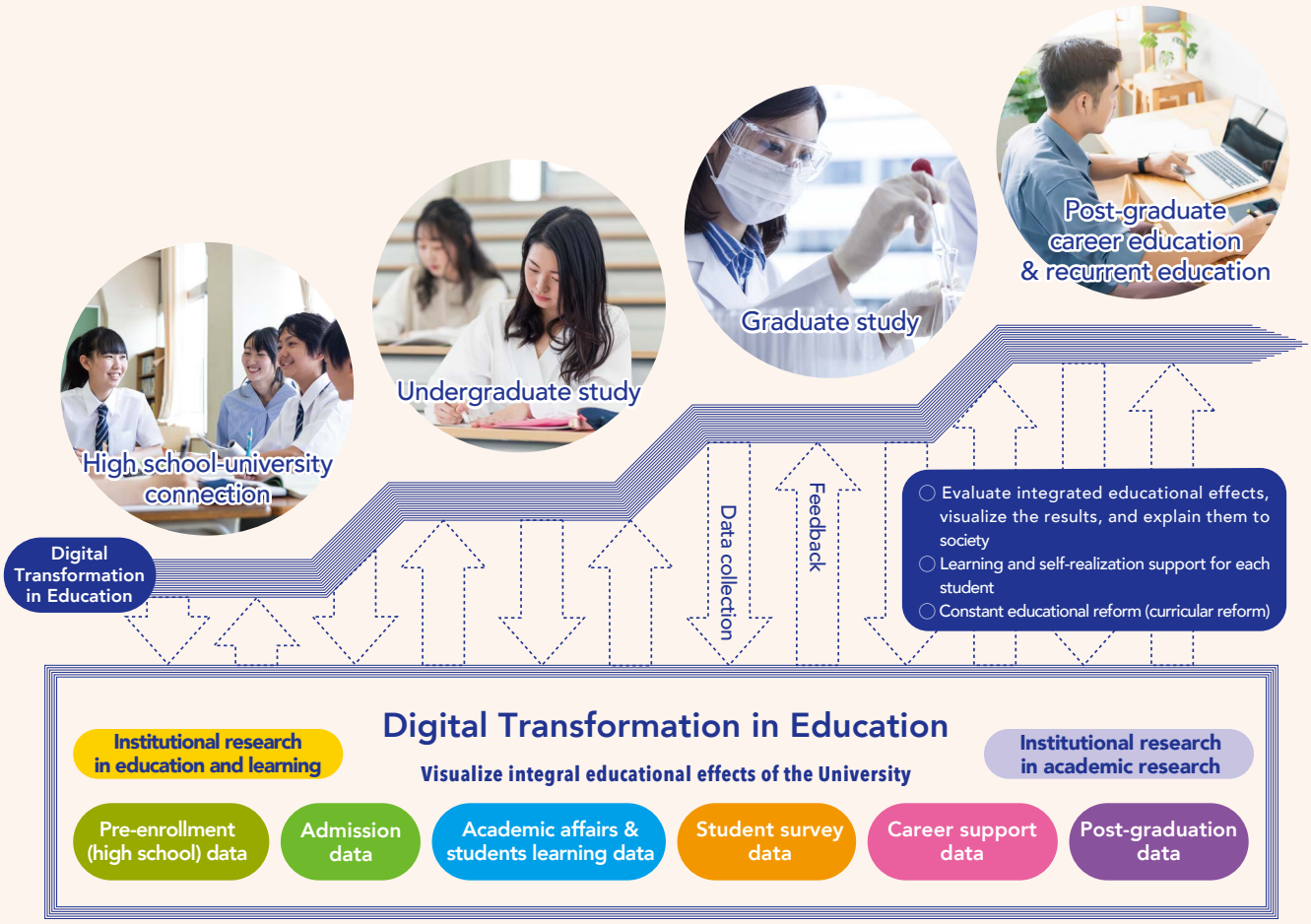
I feel the professional network here makes it particularly inviting to pursue research at this university. Because we are all peers with a common sense of purpose in advancing our research, we can have open in-depth discussions regardless of our position. I really appreciate this wonderful environment which is conducive to acquiring an understanding of the essence of things. Here, I hope to grow as a researcher, develop specialized skills that contribute to society, and become a leader in cell analysis after I graduate and return to the corporate world.

Passport to Learning in the 100-Year Lifespan Era

Osaka University has initiated construction of a system that we call the "Passport to Learning in the 100-Year Lifespan Era." The aim is not only to provide learner-centric university education, but also enable our students to reskill themselves and engage in lifelong learning opportunities as they each take their respective paths through life. The idea is to have "Student Life-Cycle Support System (SLiCS System)" utilize and analyze big data pertaining to each individual student's studies and other educational opportunities to provide feedback that will support that student in personalizing their studies at the time when they are considering learning new skills or engaging in other new studies after they graduate.

Support System for Students at Different Life Stages

—Data-based, personalized and optimal support from pre-enrollment to post-graduation—



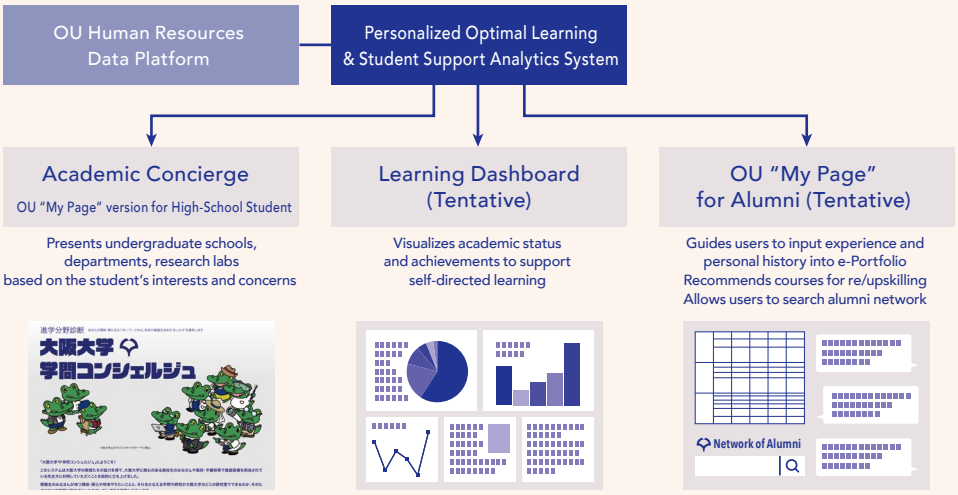
Osaka University aims to establish data-based, personalized and optimal academic and student support system, so we can provide continuous support for each student's life stage from pre-enrollment through post-graduation. The goal is to offer each student personalized assistance, visualize educational and learning outcomes to substantiate an evidence-based internal quality assurance system, and show clearly how an investment in university education contributes to society.

Center for Student Success Research and Practice, established in April 2022, is developing "Student Life-Cycle Support System (SLiCS System)" that will utilize digital technology to provide students with optimal information and support for their learning, research, and career path throughout their academic journey (pre-enrollment, during studying, and post-graduation). The goal is to nurture human resources who can navigate their own lives through unclear and uncertain times.

Under the OUDX* (Digital Transformation) Initiative, student information collected through the SLiCS System, such as on learning, health, and career information, is centrally managed on the OU Human Resource Data Platform linked to the OUID (an ID that uniquely identifies each member of the University), and the necessary information is analyzed using AI. The purpose of this system is to provide each student with a "Learning Dashboard" that provides information on his or her academic progress and achievements, as well as information on alumni who are on their desired careers, so that each student can use the information to realize his or her aspirations. In addition, by collecting and analyzing data on students who have graduated and completed their studies, we can visualize the medium- and long-term educational outcomes of the University, and by doing so we expect to increase public understanding of and support for the University's education.

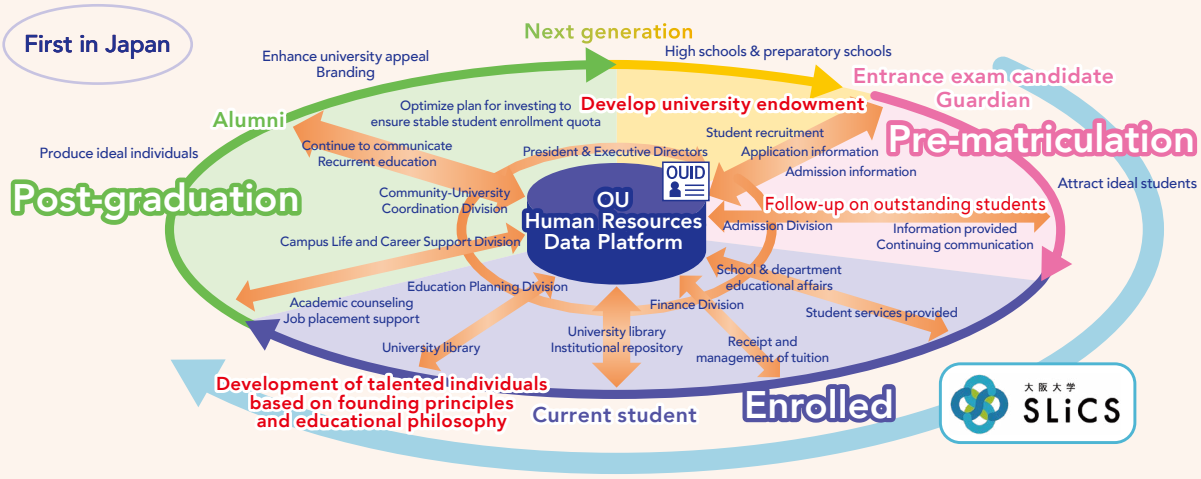
* More information about OUDX or Osaka University's digital transformation is available on p. 42.

Overall view of the SLiCS System's use at each stage of "pre-enrollment, during studying, and post- graduation"



OU Human Resources Data Platform

—Data analysis & visualization platform linked to OUID that collects all data about the university—



One of Osaka University's digital transformation (OUDX) initiatives has been commencement of construction on the OU Human Resources Data Platform in 2023. This platform applies the Customer Relationship Management (CRM) system commonly used in business to the university's environment. The system centrally manages human resources data about the Osaka University community (prospective students, current students, alumni, faculty, etc.) to analyze and visualize data in various ways so that it may be effectively leveraged. The platform affords the capability to contribute to various aspects of education, research, and management, and is particularly effective in terms of education as shown at right.

Examples of How the OU Human Resources Data Platform is Used for Education

- To aggregate and analyze students' academic progress so that plans for a more optimal curriculum may be drafted
- To analyze grades, class evaluations, and other metrics to measure the effect of educational programs
- To tabulate academic progress, student surveys, and other data to analyze students' behavioral patterns so that current challenges may be more accurately ascertained
- To provide a portal site for individual students and make use of FAQs as well as chat bots to quickly respond to inquiries

Toward a Future with Quantum Computers

Center for Quantum Information and Quantum Biology (QIQB)

QIQB's Mission

The first quantum revolution, which arose thanks to quantum mechanics established a century ago, produced semiconductors, lasers, and other technologies (Quantum 1.0) that underpin our current information society. Later, as the second quantum revolution has progressed leveraging wondrous properties of quantum mechanics such as superposition and quantum entanglement, the revolution has given rise to quantum technology innovations such as quantum computers, quantum communication, and quantum sensing (Quantum 2.0). The 2022 Nobel Prize in Physics was awarded for pioneering efforts in quantum information science and quantum entanglement experiments. Along with innovations in quantum technology and their social implementation, QIQB aims to pioneer new academic frontiers, such as quantum life science which integrates quantum information science and other branches of science.

Quantum Software Research Hub

The Quantum Software Research Hub, which was adopted in 2020 as part of the Japan Science and Technology Agency's Program on Open Innovation Platforms for Industry-academia Co-creation (Policy Focus Area), seamlessly envelops the full stack from electronics controlling quantum computer hardware to middleware, software, and talent development. The Quantum Software Research Hub is responsible for the spectrum extending from control electronics to cloud services as part of the initiative for developing the first quantum computer built in Japan under the auspices of RIKEN. A Japan-built quantum computer is also online at QIQB. Over 40 companies are participating in the hub's Quantum Software Consortium, and we are working to address the SDGs 2, 7, 9 and 13 with the goal of achieving a sustainable future society spearheaded with the Quantum Software Co-creation Platform. We are also recruiting entry members able to participate in quantum software study groups.

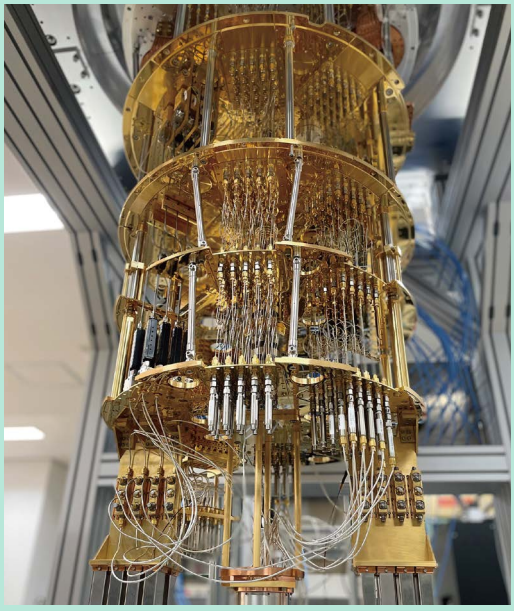
Moonshot Goal 6

—Aiming to realize a fault-tolerant universal quantum computer that will revolutionize economy, industry, and security by 2050—

As current quantum computers are prone to faults and unable to handle large calculations, the aim of Moonshot Goal 6 is to solve this challenge by the year 2050 through the realization of a fault-tolerant quantum computer capable of processing calculations at speeds faster than a supercomputer. The director of QIQB also serves as director of Moonshot Goal 6, and QIQB is participating in four projects related to this program.

Fujitsu Quantum Computing Joint Research Division

Osaka University is partnering with Fujitsu Limited on research for development of fault-tolerant quantum computers.



Japan-built quantum computer installed at QIQB

Quantum Software Research Hub
https://qsrh.jp/en/

Center for Quantum Information and Quantum Biology (QIQB)
https://qiqb.osaka-u.ac.jp/en/

Startups

Quantum 2.0 is estimated to grow into a 70 trillion yen or bigger market by 2050 thanks to its capability to surpass the limits of traditional computing, communications, and measurement technologies.

It is not just corporations, but startups that are noticeably active in these sorts of cutting-edge technologies, also referred to as Deep Tech. QunaSys Inc., which was cofounded by QIQB members in 2018, has grown to gain recognition globally for both its research and business operations in the field of quantum software. Also, in 2021, the technology for quantum computer control hardware was transferred from QIQB to QuEL, Inc., a company jointly founded by QIQB members who also serve as the company's directors. It is the world's first company to manufacture and sell hardware/middleware capable of controlling superconducting quantum bits on a scale exceeding 50 quantum bits. QIQB will strive to develop startup seedlings and talented capable individuals to willing to entrepreneur these sorts of quantum startups to support future development of the quantum technology industry.

QUNASYS

QuEL, Inc.

Young Researcher's Comments

NEGORO Makoto

Associate Professor
Center for Quantum Information and Quantum Biology
Osaka University

After serving as an assistant professor in the Graduate School of Engineering Science, I moved to the Quantum Information and Quantum Biology Division after it was established in the Institute for Open and Transdisciplinary Research Initiatives in 2018. It required courage to resign from a tenured position in the Graduate School of Engineering Science and except a fixed-term position, but I really wanted to help develop Osaka University's Quantum 2.0, so I took a risk and jumped at the opportunity. In April 2021, the center became the second hub of the International Advanced Research Institute. I have had a close-up view watching this project grow into a research center with numerous faculty and staff. My research has focused on applying quantum measurement technology to life medical sciences and medical treatment. I am also developing a quantum computer system. It was widely covered in the media that the first superconducting quantum computer built in Japan was released to the public on the cloud on March 27, 2023. This system uses a control unit and software developed by our team. I am proud of the contribution that we have made.

To learn more about quantum, see the feature series of articles entitled "Quantum Physics"
https://resou.osaka-u.ac.jp/ja/feature/specialite_002n
(in Japanese only)

Revolutionizing the World with Food Metabolomics

Metabolomics Research for an Abundant and Healthy Society

Sastia Prama Putri
Associate Professor
Division of Biotechnology
Graduate School of Engineering
Osaka University

—Reducing food loss is a pressing global challenge. Could you please share with us what led you to pursue research in Japan on food metabolomics, which a scientific study comprehensively analyzing food metabolites?

My home country Indonesia has very high biodiversity and rich soil that produces a tremendous variety of foods and agricultural products. Even though many Indonesian agricultural products have distinctive features and high quality, the level of agricultural management is inadequate compared to Japan and other countries.
It was an awareness of this problem that led me to start researching metabolomics in bio foods. My research focuses specifically on bio foods native to tropical areas such as coffee beans, cacao beans, fermented foods, and tropical fruits. We will not be able to reduce food loss unless we use metabolomics technology to control and maintain the quality of these foods through delivery to the consumer.

Associate Professor Putri's research also focuses on cacao beans.

—How will your research develop in the future?
A new focus of my research is uncovering the potential in super foods, such as tempeh. In the future, I aim to discover new super foods and analyze their bioactive components to enhance their functionality.

—Lastly, what sort of future do you envision for your own research and the way in which our society treats food?
I would like to enrich not only people's lives but also improve their health by having people enjoy meals of foods that are delicious and healthy. That is what I contemplate as I pursue my research.

Research on Food Loss Reduction and Metabolomics

According to the Food and Agriculture Organization (FAO) of the United Nations, one-third of food produced worldwide gets thrown away. The amount of food that is never eaten and discarded is enough to provide meals for 2 billion people. Food loss is a global challenge very familiar to all of us. One of the United Nations Sustainable Development Goals is to halve the amount of food loss by 2030.

At Osaka University also, research is underway on reducing food loss through a variety of approaches. One of the leading research initiatives is food metabolomics. This is a technology that uses information gained through comprehensive analysis of metabolites (products, such as sugars, amino acids and fats, resulting from an enzymatic reaction in the human body) to learn about the physical condition of the body. The application of this technology to food is known as food metabolomics.

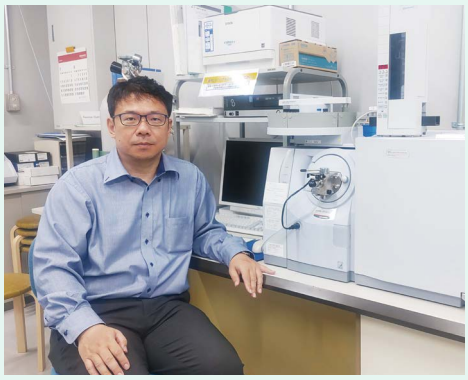
Professor FUKUSAKI Eiichiro of the Graduate School of Engineering is the foremost authority on food metabolomics, having studied the field for more than 20 years. Associate Professor Putri, who was covered on the previous page, has also been pursuing research on food metabolomics together with Professor Fukusaki. He has published numerous global groundbreaking papers thoroughly analyzing the deliciousness of tropical agricultural products. One of his research aims has been the development of a technology that will extend the shelf life and edibility of food without a significant loss in taste. This will make it possible to significantly reduce the amount of food disposed of.

Professor Fukusaki has also been active as director of the Industrial Biotechnology Initiative Division of the Osaka University Institute for Open and Transdisciplinary Research Initiatives (OTRI), an organization dedicated to creating new academic fields at the university.The division expands on results produced through interdisciplinary research and contributes to reducing food loss not only in Japan, but throughout the world.

Technical Staff Comments

DOI Tomoyuki

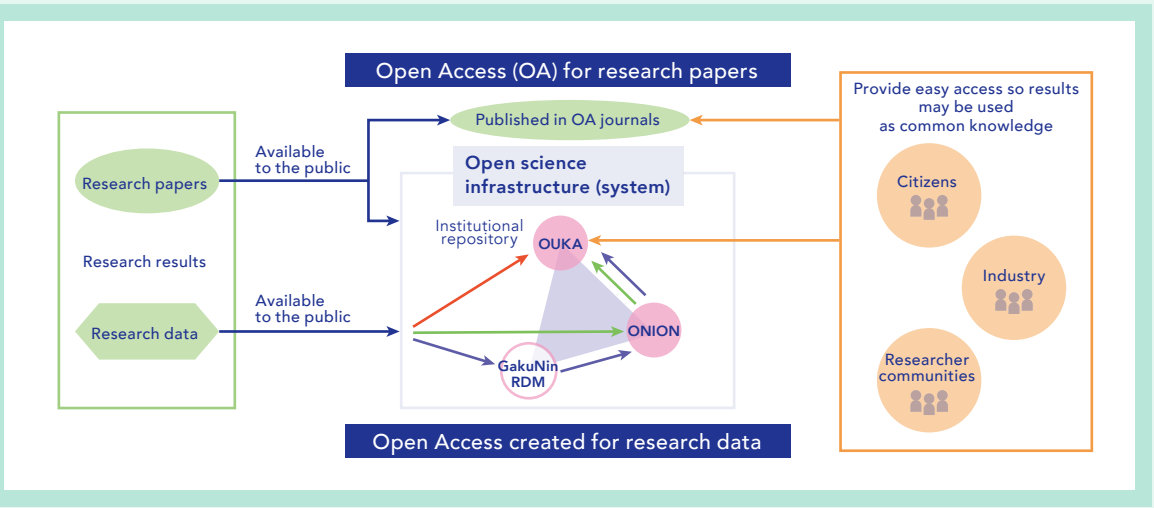
Technical Specialist
Analysis & Assessment Division
Department of Engineering
Graduate School of Engineering
Osaka University



Even though more than 20 years have passed since TANAKA Koichi received his Nobel Prize, mass spectrometry still has an important function in the investigation of vital activities. The reason is that we have learned much by comprehensively examining substances produced both inside and outside of living organisms.
In the case of Associate Professor Putri's research, we are able to learn about mature states and quality deterioration, among other aspects. However, we need to identify substances and precisely measure changes in their amount over time. To make a proper comparison, it is crucial to maintain accurate detection capability so that measurements are the same no matter when they are taken. To that end, it is important that equipment internal contamination as well as wear and tear be meticulously addressed and that the equipment always be appropriately operated so measurements are conducted in the same manner (without omitting any steps).
The technical staff is always nearby and ready to provide researchers with the support that they need. We are able to leverage resources and ingenuity that make continuing analysis feasible.

Fukusaki Laboratory
Laboratory of Bioresource Engineering
https://sites.google.com/fukusaki-lab.com/eng/welcome-to-fukusaki-lab

Open Science Promotion Initiatives

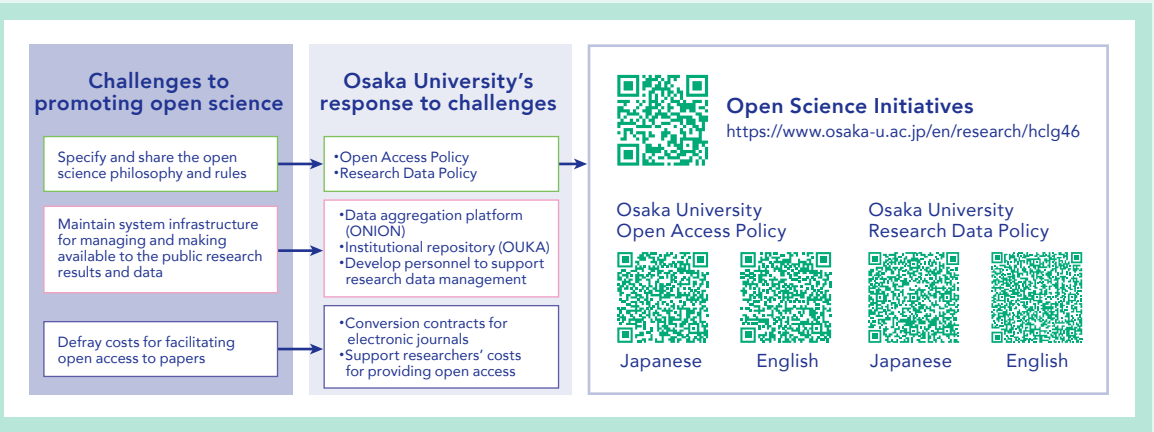


Open science refers to broadly and equitably disseminating the results of research by universities and other institutions (academic publications, research data, etc.). This is a critical issue that has been deliberated by the G7 and other forums. The promotion of open science creates new knowledge and innovations and, moreover, leads to solutions to global social issues.

Having recognized domestic developments and global trends toward open science, Osaka University established the Open Access Policy and Research Data Policy so that we may appropriately manage research results as well as data, and make these widely available to the world. Additionally, based on these policies, we have developed and expanded system infrastructure, including a data aggregation platform (ONION) and institutional repository (OUKA*1), to straightforwardly manage research data and publicly disclose research results. We are also moving forward to develop this infrastructure in collaboration with the NII Research Data Cloud (NII RDC) under the National Institute of Informatics (NII).

Furthermore, Osaka University has joined the Developing a Research Data Ecosystem for the Promotion of Data-Driven Science, for which NII serves as the core institution. Osaka University is the lead institution responsible for developing researchers with practical ecosystem skills as well as research data management support personnel. In addition, the university is at the forefront of such efforts in Japan, including introducing conversion contracts for electronic journals (a type of model agreement for redirecting electronic journal subscription fees to cover publishing expenses for Open Access).

These initiatives not only preserve and enhance the value of Osaka University's research outcomes, but also contributes to the future development of our research by creating mutually beneficial relationships with researchers and academic communities through the dissemination and return of universities' intellectual resources to society.



*1 OUKA: Osaka University Knowledge Archive is Osaka University's institutional repository. This service electronically stores and makes publicly available papers produced from educational and research activities at Osaka University as well as other academic outcomes, and the actual papers may even be viewed by anyone free of charge.

* Note: OUDX (Osaka University's Digital Transformation): This is the designation given to all activities that make use of information communication technology to accelerate the achievement of various targets and move forward reforms in education, research and management at Osaka University.

Formation of eResearch Environment Promotes Creation of Exceptional Research Outcomes

mdx: Platform for the Data-Driven Future

mdx was set up at the University of Tokyo in March 2021. It is an Infrastructure-as-a-Service*1 advanced information platform that users were given access to in September 2021. The platform is jointly administered by 11 institutions, including Osaka University and the University of Tokyo. mdx is also scheduled to be installed at Osaka University in March 2024 to introduce the next generation mdx prototype, which is interoperable with the current mdx, as well as to make use of the geographic distribution between Tokyo and Osaka to strengthen the platform's disaster resilience and fault tolerance.

While supercomputers (SQUID & OCTOPUS) fulfill the need and demand for high-performance calculations such as large-scale simulations and numerical analyses, mdx enables individual researchers to dynamically deploy a calculation environment—something which has been difficult to do with previous supercomputers—and satisfies general calculation uses and needs. This complimentary functional relationship realizes an academic computing infrastructure capable of accommodating the need and demand for increasingly diverse and complex high-performance computing, high-performance data analysis (machine learning, deep learning, and other AI research), as well as calculations in fields where these disciplines converge.

Data Aggregation Platform ONION

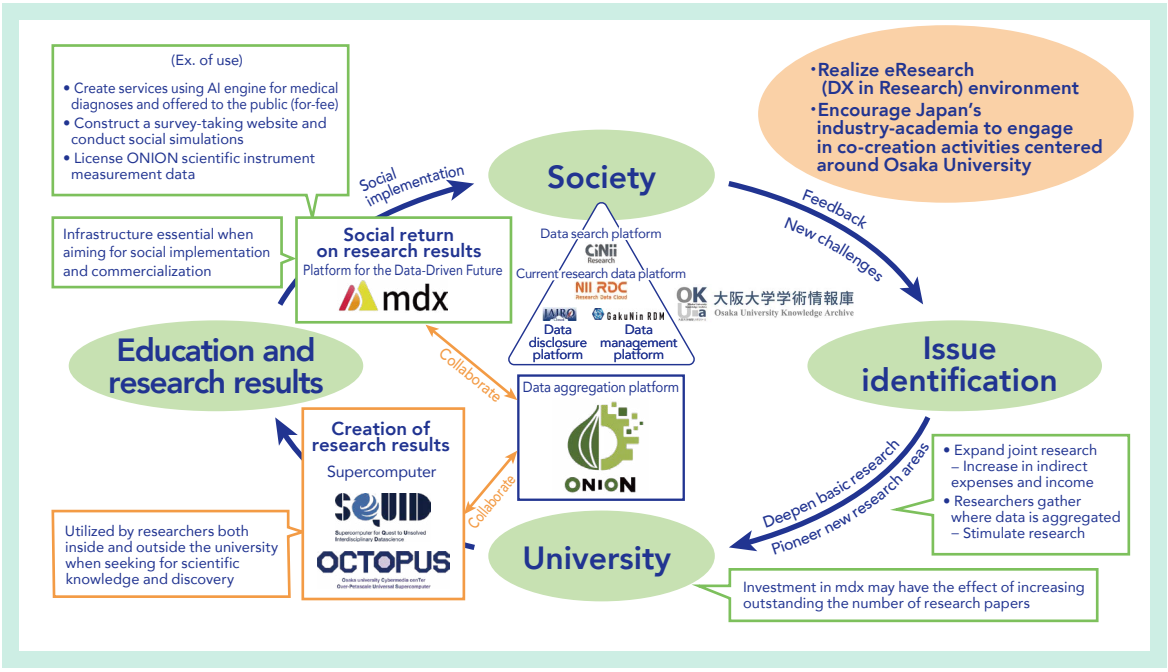
(Osaka university Next-generation Infrastructure for Open research and open InnovatioN)

In recent years, it has become even more important to manage research data in a manner that ensures reproducibility of the academic research. Osaka University is conducting a trial operation of ONION, which is central to our efforts to achieve a digital transformation in research. We are properly and securely managing research data essential for data-driven research. We are also planning to expand and improve ONION along with a closed network so that large-scale and high-capacity data may be transferred rapidly and efficiently. This is part of our efforts to develop an information infrastructure that makes use of funds available from the Osaka University Bond for Creating a Society Where Each Member Feels Worth Living*2. (Operation is scheduled to start in 2025.)

The complementary fusion of academic computing platforms (supercomputers, mdx) and ONION form the eResearch (DX (Digital Transformation) in Research) environment that will develop into a world-class large-scale high-capacity data-driven data science hub. This will strengthen Osaka University's research capabilities and contribute to the creation of excellent research outcomes as well as stimulate research transcending disciplines.

*1 IaaS: Service providing servers, storage, networks as well as other types of hardware and infrastructure. The specifications of CPUs, memory, storage, and other components may be freely selected, so server processing capacity is able to be flexibly enhanced.

*2 More details about the Osaka University Bond for Creating a Society Where Each Member Feels Worth Living are available on p. 52.



Expansion of Industry-Academia Co-Creation Expands Large Joint Research Projects with Companies and Other Organizations

Osaka University is promoting organization-to-organization collaboration between industry and academia to further expand co-creation between the two parties toward the aim of constructing the OU Ecosystem.

Joint Research Chairs and Research Alliance Laboratories: Over 100 Companies Working with Organizations

In 2006, Osaka University created the Joint Research Chair Program establishing joint research chairs to set up new research organizations in collaboration with companies (Industry on Campus). Then, in 2011, we introduced the Research Alliance Laboratory Program to attract corporate research institutes to our campus to facilitate a broader range of research and activities for developing capable individuals.

The Joint Research Chair Program transcends the boundaries of specific joint research projects that have been undertaken in the past to administer chairs with the university and companies operating on an equal footing. Utilization of intellectual property is emphasized and researchers from both industry and academia are able to devote themselves to researching challenges put forth by industry. In addition, the Research Alliance Laboratories form hubs for interdisciplinary and multifaceted industry-academia collaboration through close cooperation between companies and multiple schools as well as departments. These laboratories engage in research that is consistent throughout from basic research all the way through commercialization with the aim of promoting the industrial application of research results and the development of highly-skilled individuals. In 2022, a record-high 109 Joint Research Chairs and Research Alliance Laboratories were operating, achieving significant results through industry-academia co-creation.

Joint Research Chair & Research Alliance Laboratory Concept

Realization of Earnest Joint Research on Campus

Joint Research Chair

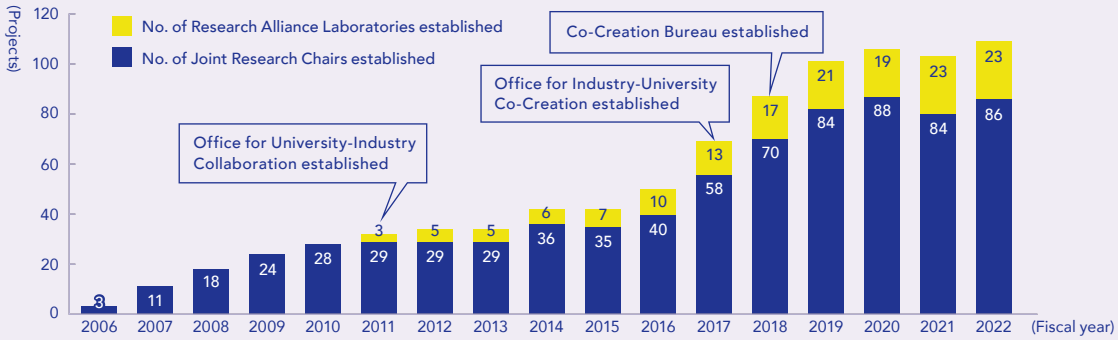
- Researchers from both parties committed to joint research (period of 2 ~ 10 years)
- Both parties confer with each other to administer the chair

Research Alliance Laboratory

- Corporate research organizations invited to set up on the Osaka University campus (period of 3 or longer)
- Form hubs for interdisciplinary and multifaceted industry-academia collaboration
- Conduct consistent research from basic through commercialization
- Industrial application of research results as well as development of highly-skilled individuals anticipated

- Face-to-face discussions, agenda setting, and research
- Exchange between corporate researchers and young researchers, faculty, and students
- Development of capable individuals based upon actual experience and education through internships on campus
- Formation of career paths based upon a full knowledge of each other

Growth in the Number of Joint Research Chairs & Research Alliance Laboratories Established

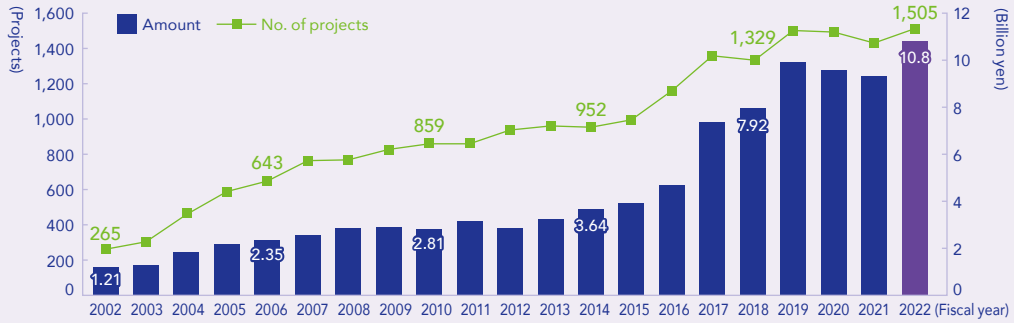


Cases are presented illustrating the particular features and advantages of the Research Alliance Laboratory Program.
Interview with the ULVAC-Osaka University Joint Research Laboratory for Future Technology
https://www.ccb.osaka-u.ac.jp/achievements/ral-interviews/
(in Japanese only)

Highest-Ever Amount Received for Joint Research Expenses: Over 10 billion yen

In 2016, Osaka University launched a new organization-to-organization large-scale collaboration between industry and academia based on comprehensive collaboration agreements with companies that further deepen alliances from the Joint Research Chair and Research Alliance Laboratory Programs. The promotion of organization-to-organization large-scale collaboration between industry and academia resulted in the receipt of joint research expenses by Osaka University in 2022 of 10.8 billion yen, significantly exceeding the previous record of 9.88 billion yen (2019). This is the first time that the 10 billion yen level has been surpassed.

Change in Amount of Joint Research Expenses Received



Promotion of Technology Transfer

Recipient of the National Commendation for Invention for Five Consecutive Years

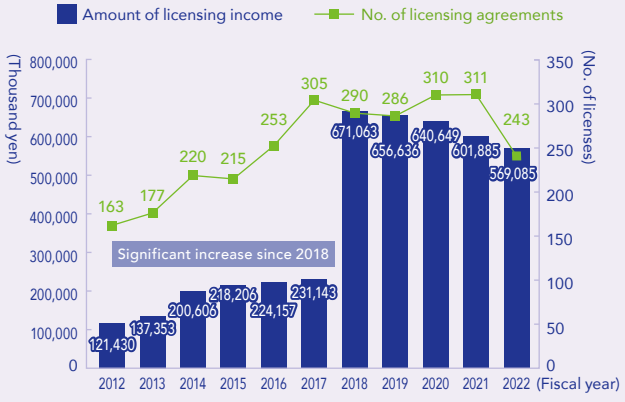
Efforts have been underway to strengthen intellectual property rights as part of the social implementation of research outcomes. In this regard, Osaka University has made some noteworthy achievements, including receiving the National Invention Awards, presented by the Japan Institute of Invention and Innovation, for five consecutive years since 2019. In 2023, Professor YAMAUCHI Kazuto and his team at the Graduate School of Engineering receive the Future Creative Invention Encouragement Award for their "development of a metrology for the fabrication of an ultraprecisely-figured mirror for nano focusing hard-x-rays."

Professor YAMAUCHI Kazuto, 2023 National Commendation for Invention Recipient (Future Creative Invention Encouragement Award)

Technology Transfer Achievements at Highest Levels in Japan

Osaka University is also identifying the seeds of promising research conducted by labs and other groups in order to promote technology transfer. We are promoting strategic transfer technology through the creation of university -initiated startups by strengthening single-inventor patent applications as well as joint applications with companies, and investigating intellectual property strategies in specific areas such as infectious disease vaccines and lithium-sulfur batteries.
These activities have generated licensing revenue for the university from patents and other rights in the amount of 500-600 million yen annually, a significant increase since 2018. Osaka University ranks third among universities in Japan in terms of income from licensing patents and other intellectual property.

Change in Licensing Income

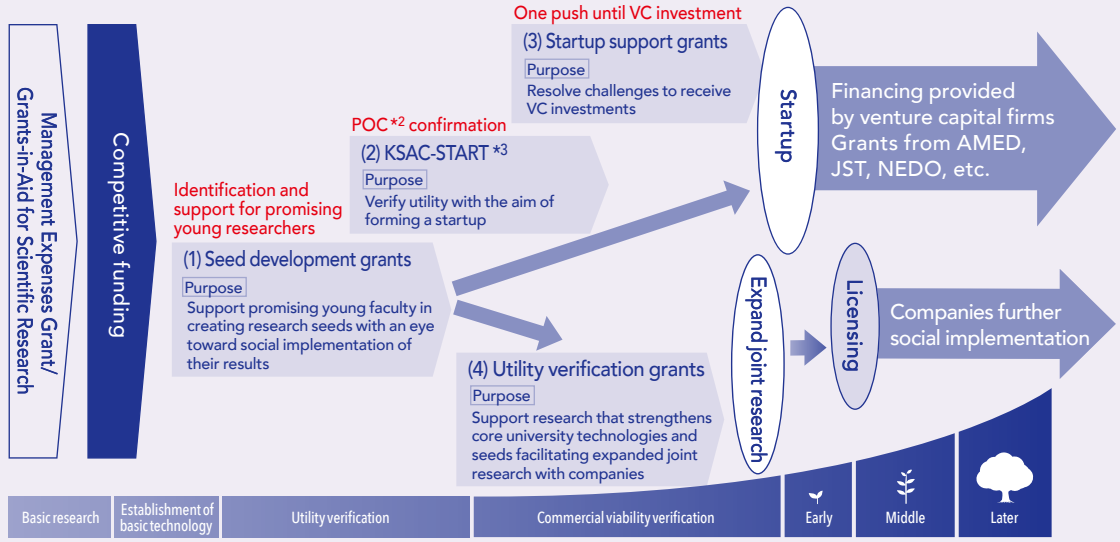


Creation & Development of University-Initiated Startups

Support for Venture Creation

Osaka University is intent on creating the OU Ecosystem, which will further enhance university research by implementing the results in society and receiving feedback from society about those outcomes. One way in which these research results are being implemented for the benefit of society is the creation of university-initiated startups. Osaka University is supporting entrepreneurship by taking the initiative to provide pre-incubation services that identify and develop technology seeds within the university that have commercialization potential as well as providing gap funds*1 to assist startups and licensing.

Overview of University Internal Grants Supporting the Identification and Development of Research Seeds and Business Startups



*1 Gap funds: Financing to fill the gap between the production of results from research affiliated with a research institution and the commercialization of those results.
*2 POC: Proof of concept is verification of the feasibility of an idea, theory, etc. prior to development of a prototype.
*3 KSAC-START: Name of a gap fund administered by Keihanshin Startup Academia Coalition (KSAC).

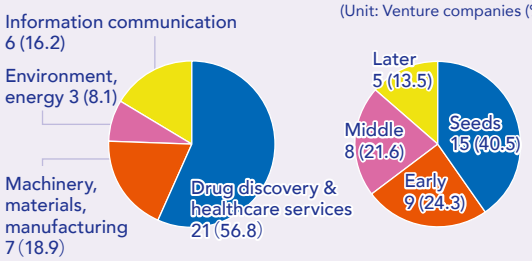
OSAKA University Venture Capital Co., Ltd. (OUVC)

OUVC was established in 2014 as a wholly-owned subsidiary of Osaka University for the purpose of supporting university-initiated ventures and other endeavors that make use of the university's research outcomes. The OUVC No. 1 Investment Limited Partnership (OUVC No. 1 Fund) was inaugurated in July 2015. This fund targets early-stage ventures applying the university's research results, mainly in the fields of drug discovery and healthcare services. The fund has invested in 37 venture companies. In January 2021, the OUVC No. 2 Investment Limited Partnership (OUVC No. 2 Fund) was established. The OUVC No. 2 Fund has leveraged know-how acquired from the OUVC No. 1 Fund and invested in 11 venture companies as of the end of 2022, including ventures making use of research results from other national universities.

(End of 2022)

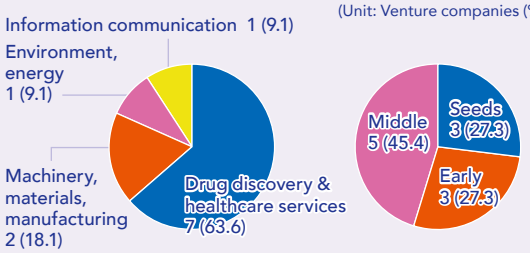
OUVC No. 1 Fund Investment Areas & Stages

(Unit: Venture companies (%))



OUVC No. 2 Fund Investment Areas & Stages

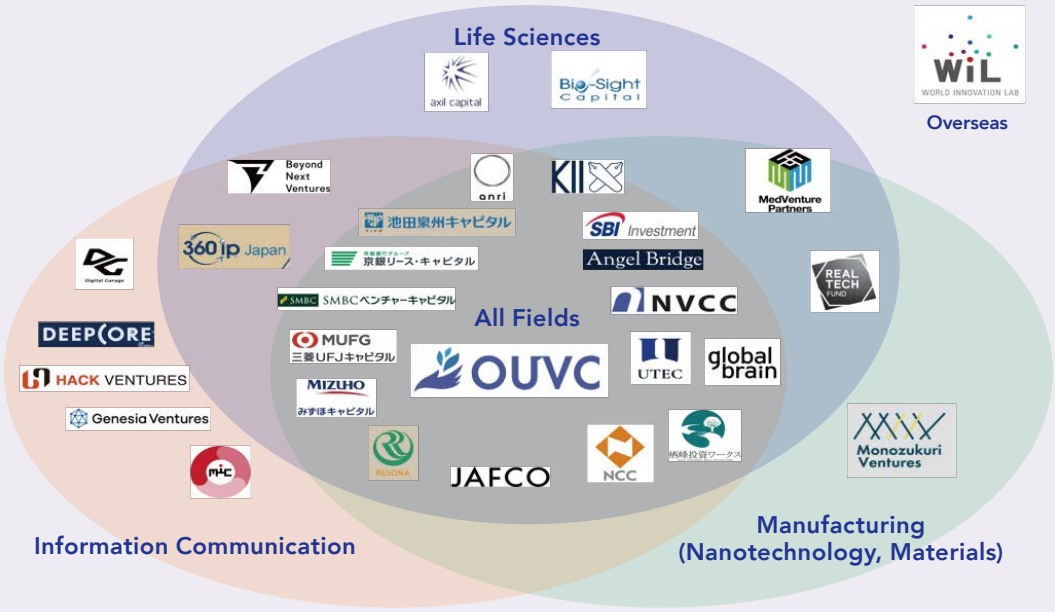
(Unit: Venture companies (%))



Networking with private venture capital firms

Osaka University provides support for formulating business plans and procuring financing when starting up a venture company. We make use of our network of partner venture capital firms, including OSAKA University Venture Capital Co., Ltd. (OUVC). Working together with venture capital firms to provide advice and investment for commercialization, these firms offer guidance on business models, introduce entrepreneurial talent, and facilitate other cooperation for developing these businesses. This collaborative approach enables us to bring the university's research seeds to social implementation at an early stage.

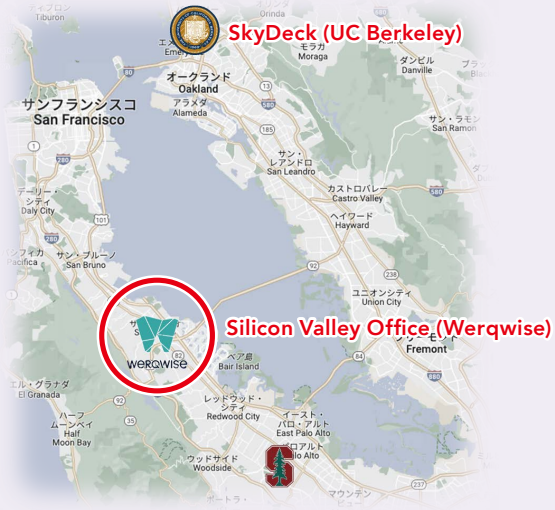
Network of Osaka University, OUVC, and Partner Venture Capital Firms



Overseas Hub in Silicon Valley

To step up support for students aspiring to start their own businesses and assist Osaka University-initiated startups with their global expansion, the Osaka University Co-Creation Bureau/OUVC Silicon Valley Office was opened in Silicon Valley in June 2023. This overseas hub will principally strive to strengthen collaboration with overseas venture capital firms. As part of this effort, the office will provide local support when the university's students, researchers, and personnel engaged in university-initiated startups participate in internships at US venture capital firms or the Innovation Partners Program offered by Berkeley SkyDeck, a globally-recognized startup accelerator and incubator program at the University of California, Berkeley (UC Berkeley).

Silicon Valley Office
(At Werqwise in the San Francisco Bay area)



Innovators' Club: Community of Students & Others Aspiring to be Entrepreneurs

Osaka University is providing entrepreneurship education to develop individuals capable of founding venture companies. This program provides a variety of interesting content facilitating entrepreneurship that helps students build their interest in innovation and new business model creation, and enables them to consider and gauge startups and entrepreneurship as a viable career path for their future.

As part of this program, we established the Osaka University Innovators' Club, a community that brings together people interested in innovation and student entrepreneurship. The club has over 1,800 members, mainly Osaka University students and young researchers who are actively engaged in a variety of activities. The Innovators' Club works to foster innovation talent by providing coaching, opportunities for members to bounce their ideas off mentors with a wealth of experience, as well as lectures by a diverse range of speakers.

Innovators' Club Kickoff Event

Comments by Innovators' Club Student Participant

YAMADA Tatsuya

6th-Year Student
Faculty of Medicine
Osaka University

I am working to develop a medical device that uses AI and robotics to automate infectious disease testing. When I was a fourth-year student in the Faculty of Medicine, I joined the Innovators' Club with a strong desire to solve the problem of infectious diseases. My initial idea focused on people overseas and did not work out well. However, the Innovators' Club provided a lot of assistance so that I could interview experts in the field, receive mentoring, and even use a 3D printer to prepare a prototype. That helped me to shape my next idea. As a result, I took first place in the largest healthcare contest for students in Japan at the time and received an award at Pitch Contest, an event sponsored by Osaka University.

Even today,I still receive advice from Innovators' Club professors and mentors as I continue my work to develop a medical device with the goal of bringing it to market in 2024. I am very grateful to the Innovators' Club for providing me with the opportunities to seriously engage and discuss ideas with others and to be able to fail!

First Prize in Healthcare Contest

First Prototype model

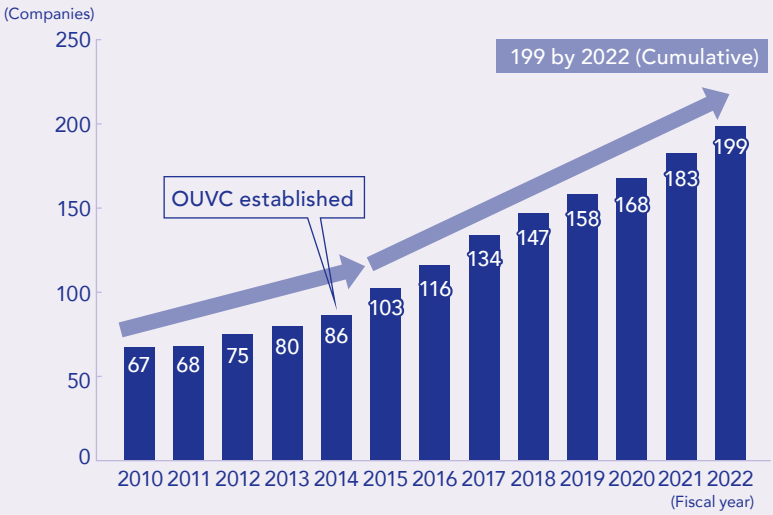
Current Prototype

The endeavors described here have steadily increased the number of university-initiated ventures. As of the end of 2022, a total of 199 venture companies have been created.

Osaka University's vision is to create a society where each member feels worth living. We are expanding large-scale joint research with companies and other organizations, promoting technology transfer, and further facilitating industry-academia co-creation to form university-initiated venture companies and other projects. These efforts will realize a virtuous cycle of knowledge, talent, and funds and contribute to social transformation.

(As of March 31, 2023)

Number of University-Initiated Venture Companies



Principal Uses of Industry-University-Government Partnership Promotion Expenses

Apart from the direct expenses that are unreservedly necessary for pursuing joint research that the university engages in, Osaka University also receives a 30% defrayment of these directly expenses in the form of Industry-University-Government Partnership promotion expenses. These promotion expenses contribute to maintaining and developing collaboration among industry, university and government. They are utilized for intellectual property patent filings, maintenance and management, joint research consultations and agreements, as well as other activities promoting partnerships between industry and academia. The expenses also help maintain a research environment forming the infrastructure for joint research and other collaborations.

Industry-University-Government Partnership Promotion Expenses: Final Accounting (2022)

(Unit: Million yen)

Amount received	1,854
Expenditures	1,713
Balance carried over to the next fiscal year	140

Note: The balance carried over to the next fiscal year is scheduled to be used to maintain and develop a research environment that produces joint research and other collaborative outcomes.
Note: Figures in the table have been rounded off.

(Unit: Million yen)

Breakdown of expenditures			
	Labor expenses	513	• Coordination of industry-university-government partnership • Intellectual property management • Joint research agreements, industry-university-government partnership management & operation
	Business expenses	285	• Supercomputer maintenance & management
	Application maintenance expenses	235	• Intellectual property maintenance & management
	Utility expenses	204	• Electricity, gas & water charges required for maintaining research environment
	Operating expenses	100	• Co-Creation Bureau office operation • Collection and preparation of research seeds • Umeda office and Tokyo office operations • Co-Creation Bureau & Department of Co-Creation Promotion operations
	Building & maintenance expenses	69	• Maintenance of facilities & equipment contributing to maintenance and improvement of research environment
	Miscellaneous	308	• Maintenance and support for joint research structure of large collaborative partnerships • Electronic journal use
	Total	1,713	

Carbon Neutral & Sustainable Campus Initiatives

Unique Initiatives by Osaka University for ZEB New Construction & Renovation

Osaka University is aiming to reduce greenhouse gas emissions by 55% or more compared to the 2013 level by the year 2030. Our ultimate goal is to be carbon neutral by 2050.

For the facility management aspect of this effort, Osaka University's basic policy is, in principle, to have new construction, expansion, renovation, or significantly refurbished structures be at a minimum ZEB Ready*. We have formulated and are steadily implementing the ZEB Design Guidelines to manifest our basic policy. These guidelines embody the concept of "ZEB using general purpose technology," in that ZEB Ready is able to be achieved at the ordinary construction cost. Pharmaceutical Sciences Building 4 on the Suita Campus and the Minoh Campus Research and Education Hub have been ZEB certified. We are also continuing our ZEB efforts with other facilities currently in the planning or design stage.

In addition, while the current ZEB certification system provides a framework only for assessments during the design stage, we are continuing to take energy measurements as well as monitor and analyze air conditioning and ventilation equipment even after certification. This involves continuing to implement the PDCA (Plan-Do-Check-Act) cycle for "maintaining ZEB standards even during the operation phase."

Our "ZEB using general purpose technology" and "maintaining ZEB standards even during the operation phase" initiatives were evaluated as some of the most excellent approaches in Osaka in terms of continuity and innovation from a comprehensive perspective at the 2022 Osaka Climate Change Action Awards and were honored with the Osaka Governor's Award in the area of mitigation. Our aim is to similarly apply this know-how not just to new construction, expansions, and major renovations, but also to extend the service life of existing facilities. By managing the energy of buildings throughout the entire university, we are seeking to ensure that energy-conservation performance satisfying the ZEB standard be the stock average by 2050. In addition, our goal is to return and implement in society the know-how that the university has acquired so as to contribute to Japan's achievement of carbon neutrality.

* ZEB or Net Zero Energy Building is a structure designed to make the annual balance of primary energy the building consumes zero while also realizing a comfortable interior environment. ZEB Ready refers to a building that has reduced necessary energy consumption by more than 50% below conventional buildings.

Presentation of Awards at the Osaka Climate Change Action Awards

Course Opened with Aim of Facilitating Carbon Neutrality

The Japanese government has declared that the nation will achieve carbon neutrality by 2050 as part of its commitment to address global warming, a shift which becomes more acute each year. This is a major challenge for today's students who will play a central role in our future society.

In 2022, we opened a course entitled "Carbon Neutrality and Our Future," which is part of the university-wide general education courses that students in all schools take during the first year and a half of study.

This unique course comprises omnibus lectures by Graduate School of Engineering Professor SHIMODA Yoshiyuki and other faculty teaching in a variety of fields well as forerunners of industry presenting carbon neutral initiatives. The course also comprises group discussions about global warming. Students attending the course have rated it very high in their class evaluations.

Student Presentation (Group Discussion)

Improving the Toyonaka Campus Environment

The Osaka University campuses have many plants and wooded areas. To maintain a healthy environment, it is essential these wooded areas be thinned out, grass trimmed and weeded, and the entire area cleaned. Bamboo, in particular, grows quite vigorously. It will dominate the surrounding vegetation if left unattended. For over 10 years, the university has been actively maintaining the bamboo groves in partnership with the Bamboo Forest Thinning Group (Take no Kai) formed together with residents of the community along the east side of Toyonaka Campus. The group thins two bamboo groves, one located north of the sports field and the other north of the Student Commons. Five times a year, the group thins and maintains the bamboo forests. The trimmings are used during community culture festivals and as New Year's decorations placed at the gates of nearby elementary and junior high schools.

Also, every April, many of the local children help dig up young bamboo shoots. We will be expanding these activities in the future and promoting environmental conservation in other areas of the campus still not properly maintained.

Bamboo Forest Maintenance on Toyonaka Campus

Minoh Campus Recognized with 2023 ISCN Excellence Award and 64th BCS Prize

In 2021, Osaka University relocated the Minoh Campus to the Minoh Semba area. The relocation project was recognized with the 2023 ISCN Excellence Award (Partnerships for Progress Category). This is the second award presented to a university in Japan since Chiba University received the honor in 2017 and the first for a university in the Partnerships for Progress Category. In addition, the Minoh Campus Research and Education Hub was the recipient of the 64th BCS Prize in 2023.

Overview of ISCN Excellence Awards

The ISCN Excellence Awards hosted by the International Sustainable Campus Network (ISCN) honors outstanding efforts relating to the promotion of sustainable campuses. The efforts made by Osaka University were presented during the ISCN annual conference held at National Autonomous University of Mexico in June 2023.

With the cooperation of local municipalities, corporations, landowners, and local residents, the campus relocation project realized the following outcomes. Osaka University also gained high praise for raising community awareness about sustainability and creating an innovative collaborative model to reduce the burden on the environment.

1. High sustainability campus that obtained environmental performance certifications
2. Efficient facility utilization reduced the campus area and environmental footprint
3. Collaboration with private companies to use the campus as a real-life demonstration experiment for environmental and energy management
4. Collaboration with the community through dialogue with the local government and exchange with nearby residents

Overview of BCS Prize

The BCS Prize was founded in 1960. Each year, for the purpose of generating a fine national architectural heritage and contributing to cultural development and global environmental conservation, the prize recognizes outstanding architectural works in Japan. The selection criteria that the committee uses to review works uses a comprehensive evaluation method taking a broad perspective consisting of project planning, design, construction, as well as operation, maintenance and management of the environment and building.

The Minoh Campus Research and Education Hub has gained high recognition for its embodiment of the university's motto of "Live locally, grow globally" through its presence as a global campus with community exchange that unfolds toward the future, and a sustainable campus that is, at the same time, global and open to the city.

Minoh Campus Research and Education Hub

2023 ISCN Excellence Award Plaque

Video of Relocation Project
https://youtu.be/aqG1T6WXSKw?si=Zkc63zc76YEKttYy

Note: Data on Osaka University's energy consumption and other environmental data are available as part of the Non-Financial Highlights on p. 59.

Financial Topics

University Bond Issued for Creating a Society Where Each Member Feels Worth Living

To create a society where each member feels worth living as well as be a globally-ranked research university, Osaka University believes the development of state-of-the-art education and research foundations is an urgent challenge that we must address.
In April 2022, to meet these challenges and shape the new Osaka University that we envision, the university issued the "Osaka University Bond for Creating a Society Where Each Member Feels Worth Living," which is the first sustainability bond* offered by a university in Japan.
The funds procured will be used to improve and maintain the Innovation Commons (Forum for Co-Creation) promoted by the Ministry of Education, Culture, Sports, Science and Technology to promote co-creation activities among industry, academia, and government.

University Bond Overview

Name	National University Corporation Osaka University Bond Issue No. 1 Osaka University Bond for Creating a Society Where Each Member Feels Worth Living
Issue amount	¥30 billion
Interest rate	1.169%
Issue date	Thursday, April 28, 2022
Maturity date	Friday, March 17, 2062
Rating	AA+ (Rating and Investment Information, Inc.) AAA (Japan Credit Rating Agency, Ltd.)

*Sustainability bonds: Bonds issued to procure financing needed for projects working to address both environmental issues and social issues.

GIFT Development Concept

The Green Infrastructure Facility Transformation or GIFT is the development concept behind the use of the funds procured with university bonds. Architecture is advanced with the aim of implementing state-of-the-art technology to achieve the best design, constructing a facility that all types of researchers and students aspire to use. This will be a contribution linking the present to the Osaka University of the future. Our aim is also to aggregate the results gained from this project during development and operation, leveraging them to enable Osaka University to grow into an even more outstanding institution as well as to return that knowledge to society so that we may create a society where each member feels worth living.

Osaka University Bond Wins "Best Deals of 2022" in the Zaito Agency Bonds Division of the Capital Eye Awards

Osaka University Bond for Creating a Society Where Each Member Feels Worth Living captured the "Best Deal of 2022" prize in the Zaito Agency Bonds Division of the Capital Eye Awards, which is selected by Capital Eye Ltd.
The Capital Eye Awards recognize the year's best and most reputable capital market transactions. Capital Eye Ltd. selects and presents the awards based on a survey of securities companies and institutional investors.
Capital Eye Ltd. gave the following assessment of the Osaka University Bond for Creating a Society Where Each Member Feels Worth Living.
"Osaka University Bonds are the second university bonds in Japan, Osaka University's first bonds, and the first sustainability bonds in this category. Osaka University's appeal is that it has put much effort into industry-university collaboration through progressive investor relations activities, attracting investment of some 240 billion yen from 35 investors, a substantial number for 40-year bonds. Osaka University received expressions of intent from 24 institutional investors, expanding the market for both SDG bonds and university bonds."

Revision of National University Corporation Accounting Standards

Osaka University has adopted the National University Corporation Accounting Standards for our accounting process. In 2022, this accounting standard was revised to make financial statements easier to understand to a variety of stakeholders. In this revision, we will introduce the "discontinuation of contra-accounts for assets," which has a significant impact on the financial statements.
With regard to fixed assets acquired with management expense grants or other sources of revenue, the financial standard through 2021 would include "contra-accounts for assets" in the balance sheet and, along with incurred depreciation, revenue in the same amount would be included as "reversal of contra-accounts for assets" in the annual Statement of Income. (Fig. 1)
However, this treatment is generally difficult to comprehend, so the 2022 accounting standard revision abolished the treatment of booking "contra-accounts for assets," in principle. The entire amount is included in revenue for the fiscal year when the fixed asset is acquired. (Fig. 2)

(Fig. 1) Up To 2021

Balance Sheet

Assets 60 (Buildings)	Liabilities 60 (Contra-accounts for assets) → Abolished by revision

Statement of Income

	1st year	2nd year	3rd year
Expense (Depreciation)	20	20	20
Revenue (Reversal of contra-accounts for assets)	20	20	20 → Abolished by revision

Accounting standard revised

(Fig. 2) Starting 2022

Balance Sheet

Assets 60 (Buildings)	Net assets 60 (Current gross profit) → Contra-accounts for assets not included

Statement of Income

	1st year	2nd year	3rd year
Expense (Depreciation)	20	20	20
Revenue (Revenue from management expense grants)	60	0	0

Full amount booked as revenue in fiscal year when asset acquired

Financial Statement Data

More details about the financial statements are available here
https://www.osaka-u.ac.jp/en/guide/publications/zaimu

Balance Sheet (unit: million yen)

	FY2021	FY2022	
Assets	500,954	530,910	
Non-current assets	413,172	409,387	
Property, plant and equipment	396,332	392,642	
Land	219,255	219,935	
Buildings and structures	118,364	113,761	
Machinery and equipment	28,499	28,874	
Books	21,407	20,771	
Other	8,804	9,299	
Intangible fixed assets	1,269	1,316	
Investments and other assets	15,570	15,428	
Current assets	87,782	121,523	
Cash and deposits	65,793	92,011	
Accounts receivable	13,114	14,037	
Other	8,873	15,474	
Liabilities	151,744	132,981	
Non-current liabilities	81,282	56,758	
Contra-accounts for assets	61,373	-	*1
Long-term deferred subsidies	-	5,574	
Long-term loans	7,751	9,171	
National university corporation bonds payable	-	30,000	
Long-term accounts payable	10,358	9,787	
Other	1,798	2,224	
Current liabilities	70,461	76,222	
Management expense grants liabilities	-	1,074	
Subsidies for facilities received	-	3,123	
Donations liabilities	27,225	28,822	
Advances received for contract research	14,102	15,701	
Current portion of long-term loans payable	1,104	1,190	
Accounts payable	22,576	20,133	
Other	5,454	6,175	
Net assets	349,210	397,929	
Capital	284,409	284,409	
Capital surplus	308	△ 2,129	
Retained earnings	64,492	115,608	
Reserve fund carry-over from previous mid-term objective period	45,186	61,988	
Reserve fund for specific purposes	5,486	-	
Reserve fund	6,919	-	
Unappropriated retained earnings for the period (Current gross profit)	6,900	53,619	*2
Valuation and translation adjustments	-	41	
Total of liabilities and net assets	500,954	530,910	

Statement of Income (unit: million yen)

	FY2021	FY2022	
Ordinary expenses	155,001	160,003	
Education expenses	4,627	4,450	
Research expenses	18,529	20,225	
Medical service expenses	31,212	33,051	
Expenses for supporting education and research	2,547	2,700	
Contract research expenses	27,855	29,696	
Personnel expenses	63,602	62,843	
General and administrative expenses	5,804	6,124	
Financial expenses	75	425	
Miscellaneous loss	746	484	
Ordinary revenues	160,169	163,680	
Revenues from management expense grants	44,894	43,903	
Revenues from student fees	12,629	13,839	
Revenues from the university hospital	45,963	48,618	
Revenues from contract research	31,538	33,107	
Revenues from donations	4,726	9,139	
Revenues from subsidies for facilities	606	349	
Revenues from subsidies	7,076	7,764	
Financial revenues	116	122	
Miscellaneous income	6,195	6,835	
Reversal of contra-accounts for assets	6,422	-	*3
Ordinary income	5,167	3,677	
Extraordinary loss	51	2,806	
Extraordinary income	1,043	51,810	*2
Net income	6,159	52,681	
Reversal of reserve fund carry-over from previous mid-term objective period	740	938	
Gross income	6,900	53,619	

Statement of Cash Flow (unit: million yen)

	FY2021	FY2022
Cash flow from operational activities	23,288	21,325
Cash flow from investment activities	△ 11,503	△ 24,192
Cash flow from financing activities	△ 1,298	29,083
Translation adjustments on funds	△ 0	1
Beginning balance of funds	55,307	65,793
Ending balance of funds	65,793	92,011

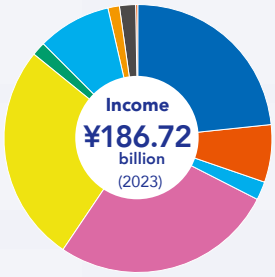
Note: Total amounts given in the financial statement data may not add up correctly due to figures having been rounded off.

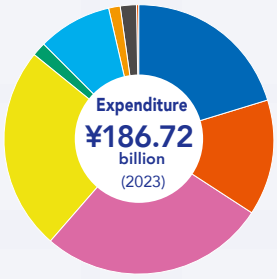
Principal Effects of Revision of the National University Corporation Accounting Standards
*1 Contra-accounts for assets which were included through 2021 have been abolished and are not included in 2022.
*2 Contra-accounts for assets which were included through 2021 are included collectively with revenue in 2022. This has increased extraordinary income on the Statement of Income compared to 2021 as well as unappropriated retained earnings for the period (current gross profit) on the Balance Sheet. This income on the books is not backed up by cash which is generated on account of the extraordinary accounting treatment due to the revision.
*3 Reversal of contra-accounts for assets which were included through 2021 has been abolished and is not included in 2022.

Financial Highlights

Budget

(Unit: Billion yen)





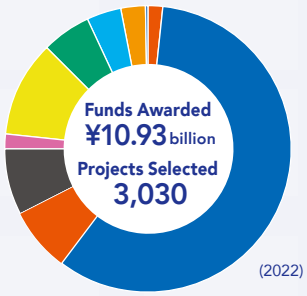
- Management expense grants 43.98
- Income from student fees 12.81
- Miscellaneous income 3.91
- University Hospital income 50.62
- Income - industry-university collaboration, etc. 49.13
- Income - facility maintenance expense subsidies, etc. 3.34
- Income - long-term borrowings 16.33
- Reversal of reserve fund for specific purposes 2.57
- Facility/equipment maintenance expenses (carryover) 3.65
- Investment project expenses 0.4

- University operating personnel expenses 38.02
- University operating non-personnel expenses 26.04
- University hospital expenses 50.62
- Expenses - industry-university collaboration, etc. 45.75
- Expenses - facility maintenance expense subsidies, etc. 3.34
- Expenses - borrowings 16.33
- Reversal of reserve fund for specific purposes 2.57
- Facility/equipment maintenance expenses (carryover) 3.65
- Investment project expenses 0.4

Note: Total amounts given in the above charts may not add up correctly due to figures having been rounded off.

Change in Budget Amounts

Research Projects Selected for Grants-in-Aid for Scientific Research



- Grants-in-Aid for Specially Promoted Research ¥200 million 2 projects
- Grants-in-Aid for Scientific Research ¥6.41 billion 1,587 projects
- Grants-in-Aid for Challenging Research ¥780 million 233 projects
- Grants-in-Aid for Early-Career Scientists ¥830 million 539 projects
- Grants-in-Aid for Research Activity Start-up ¥160 million 115 projects
- Grant-in-Aid for Transformative Research Areas ¥1.21 billion 92 projects
- Grant-in-Aid for Scientific Research on Innovative Areas ¥610 million 68 projects
- Funds for the Promotion of Joint International Research ¥420 million 52 projects
- Grants-in-Aid for JSPS Fellows ¥300 million 332 projects
- Other ¥10 million 10 projects

Note: Total amounts given in the above charts may not add up correctly due to figures having been rounded off.

Change in Commissioned Research Accepted

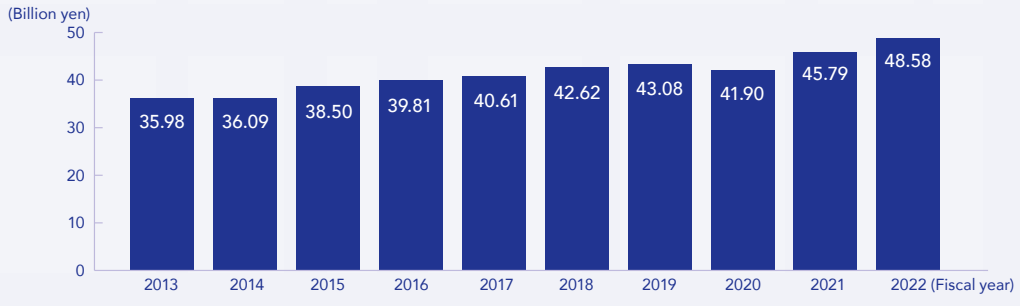
Note: Excluding clinical research on pharmaceuticals, etc.

Change in Joint Research Accepted

Change in Donations for Research Accepted

Note: Excluding equipment, etc.

Change in University Hospital Income



Non-Financial Highlights (1)

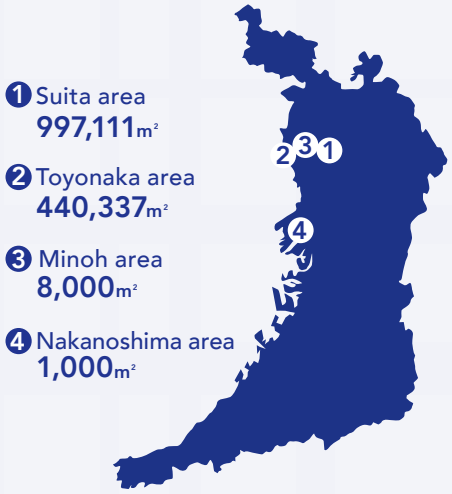
Organization (As of May 1, 2023)

11 Undergraduate Schools	10 Graduate Schools	5 Independent Graduate Schools
6 Research Institutes	2 National Joint-Use Facilities	10 Joint-Use Facilities
4 University Libraries	2 University Hospitals	3 International Advanced Research Institutes

Other (Center for Education in Liberal Arts and Sciences, etc.)

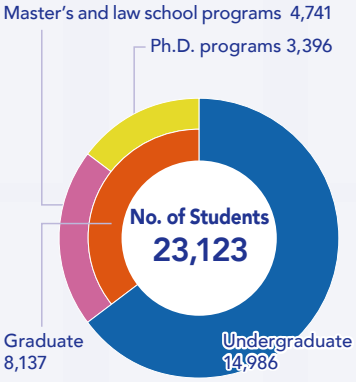
41 Endowed Chairs and Endowed Research Divisions	83 Joint Research Chairs & Joint Research Divisions	23 Research Alliance Laboratories

Campus (As of May 1, 2023)



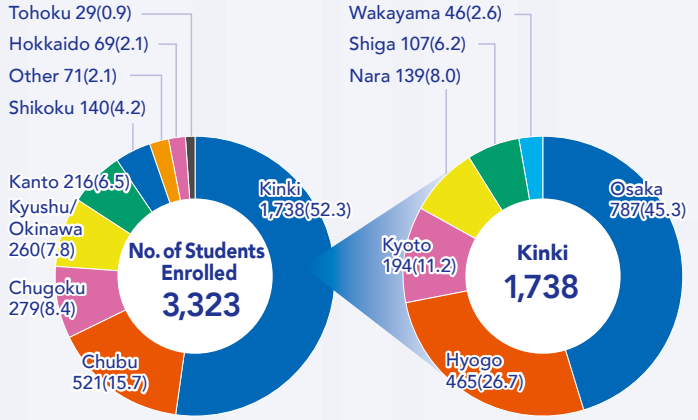
No. of Students (As of May 1, 2023)

(Unit: Persons)



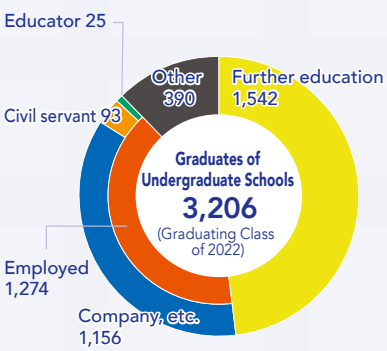
No. of Students Enrolled According to Location of High School, etc. (Undergraduate) (Enrolled April 2023)

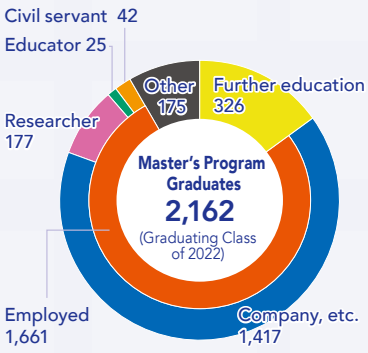
(Unit: Persons (%))

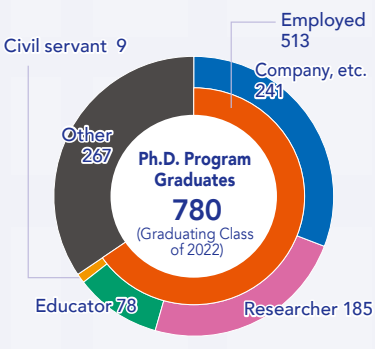


No. of Graduates (Undergraduate & Graduate School)

(Unit: Persons)

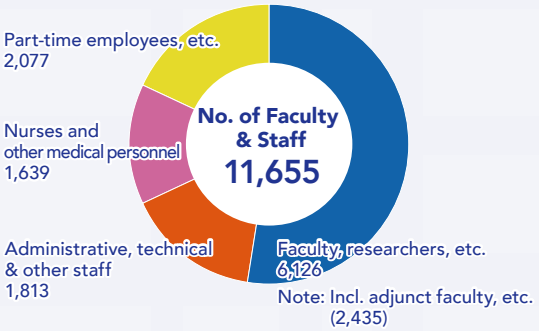






No. of Faculty & Staff (As of May 1, 2023)

(Unit: Persons)



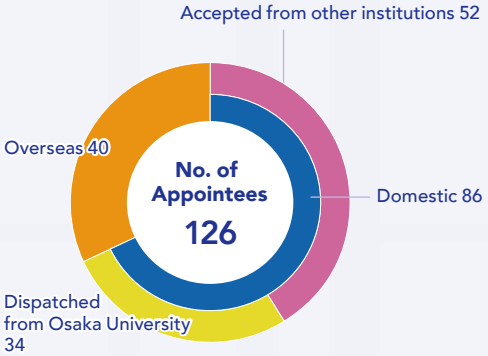
Note: Incl. adjunct faculty, etc. (2,435)

Percentage of Female Researchers and Female Researchers in Senior Positions (Full-Time)

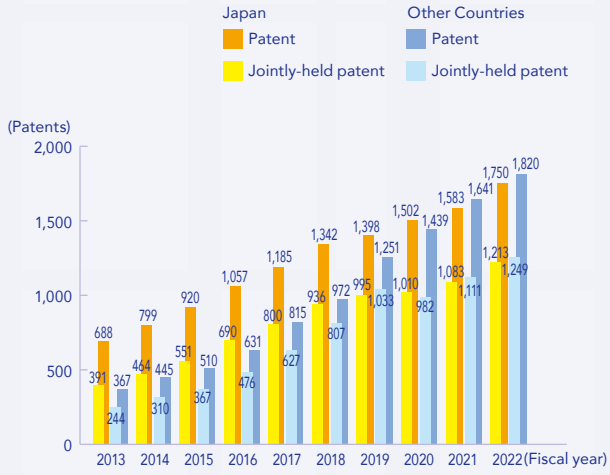
(Annually as of May 1)

Cross Appointments (2022)

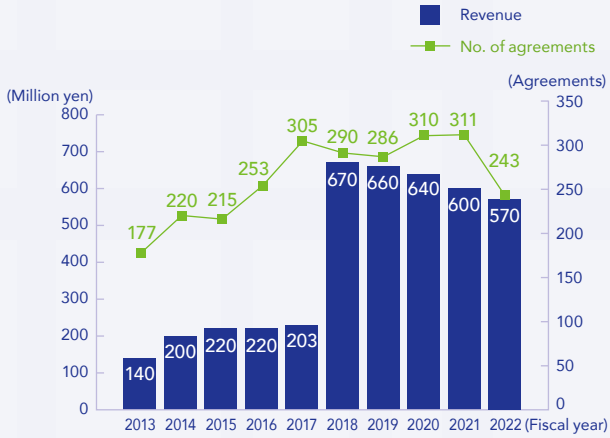
(Unit: Persons)



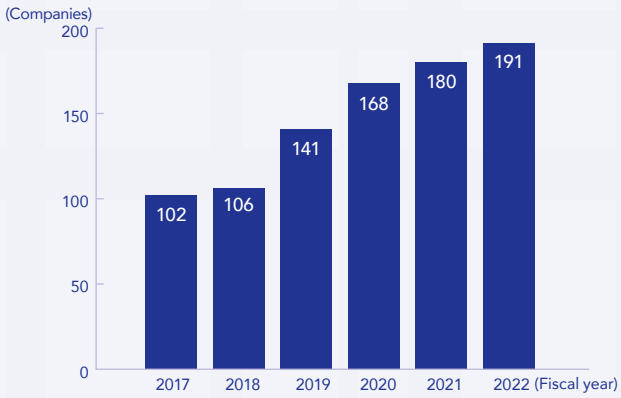
Change in No. of Patents Held



Change in License Revenue from Patent & Other Rights



Change in No. of Osaka University-Initiated Venture Companies



Non-Financial Highlights (2)

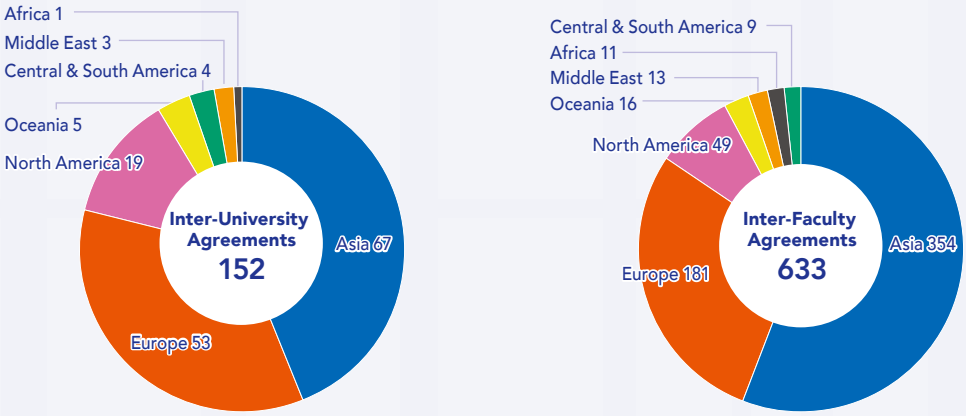
Overseas Centers, Osaka University ASEAN Campuses, & Global Knowledge Partners

(As of August 1, 2023)

Academic Exchange Agreements

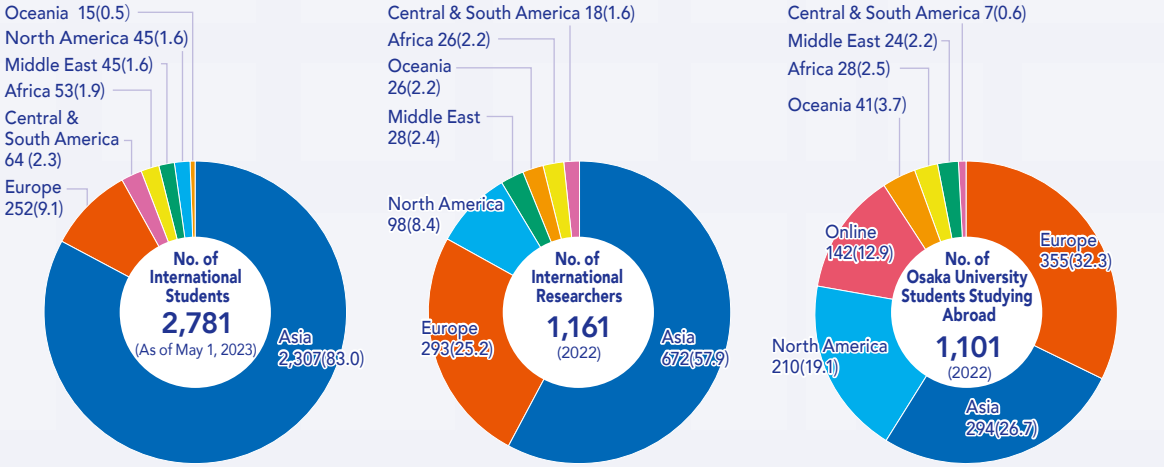
(As of May 1, 2023)

(Unit: Agreements)



International Exchange Involving Students, Researchers, etc.

(Unit: Persons (%))



Material Balance

IN PUT

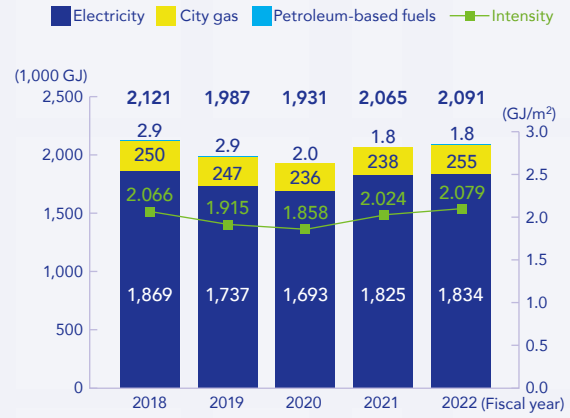
Total energy inputs	2,091,000 GJ
・Electricity usage	188,545,000 kWh
・City gas usage	5,674,000 m³
City water usage	430,000 m³
Well water usage	440,000 m³
Paper usage	376 t
PRTR substances	40 t

OUT PUT

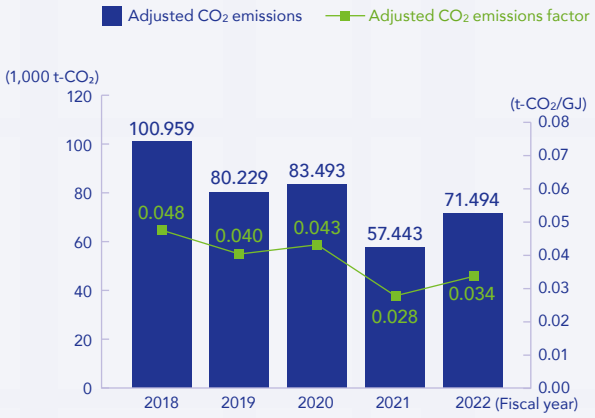
CO_2 emissions	71,494 t-CO_2
General business activity waste	2,079 t
Industrial waste	8,905 t
Specially-controlled industrial waste	2,162 t
Wastewater	775,000 m³
PRTR substances	40 t
CFC leakage	863 t-CO_2

Energy Usage

Primary Energy Usage

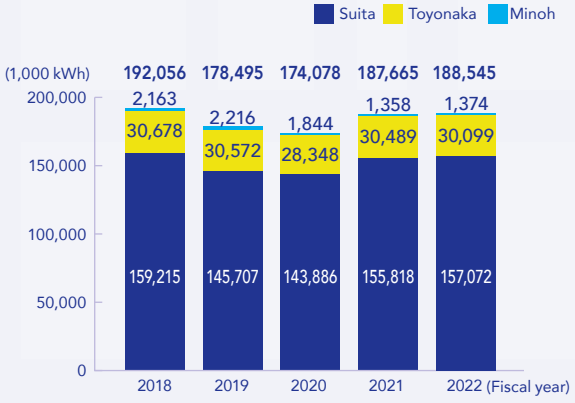


CO_2 Emissions

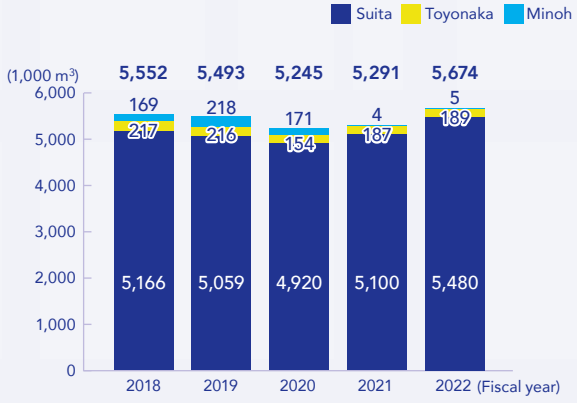


Note: The adjusted CO_2 emissions factor is the value obtained by dividing total emissions by total heat.

Electricity Usage



City Gas Usage



Osaka University Foundation for the Future

Even though Osaka University is a national university, it has an unusual history. It was founded with private donations from the local business community and citizens passionate in their call for an imperial university to be established in Osaka. Osaka University has continued to carry on this distinctive legacy and contributes to the resolution of social issues with our vision of creating a society where each member feels worth living, which we seek to achieve through co-creation with a diverse range of stakeholders.

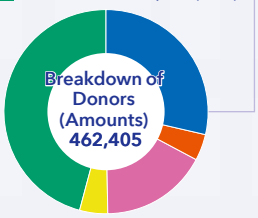
It is essential that we strengthen our financial base for long-term stability as well as ensure a substantial university endowment so that we may not only continue to maintain our tradition, but also enhance education and research to address the needs of our new age and society in seeking to fulfill our aim of creating a society where each member feels worth living. In May 2009, we established the Osaka University Foundation for the Future. We are tremendously grateful for the warm support that so many people have shown.

Osaka University has produced outstanding research and many talented and capable individuals who are excelling in society. We are working to more actively communicate our initiatives and challenges to companies, groups, communities, and citizens so they have a better understanding of what we have achieved and what we are working to achieve. In partnership with the Osaka University Federation of Alumni Associations, we are also reaching out to our alumni through events and various platforms to promote better understanding of the Osaka University of "today" as well as of "tomorrow." We sincerely hope that all of our valued stakeholders will continue to support Osaka University.

Breakdown of Donators & Donation Purposes (2022)

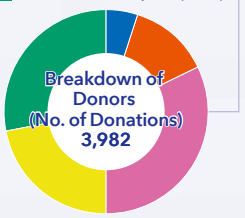
(Unit: Thousand yen (%))

Companies	133,384 (29%)
Faculty & staff	19,462 (4%)
Graduates	77,465 (17%)
Parents/guardians	21,070 (4%)
Others	211,024 (46%)

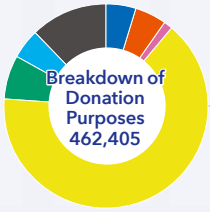


(Unit: Donations (%))

Companies	206 (5%)
Faculty & staff	497 (13%)
Graduates	1,270 (32%)
Parents/guardians	889 (22%)
Others	1,120 (28%)



(Unit: Thousand yen (%))



General Purpose Fund	22,442 (5%)
University-wide projects (Incl. anniversary project)	22,590 (5%)
Learning / Research support	6,867 (1%)
Support for Schools / Graduate Schools / Institutes and Facilities	300,749 (65%)
Crowdfunding	32,568 (7%)
Support for Sports / Culture-oriented Activities	21,916 (5%)
Other Projects	55,274 (12%)

Status of Osaka University Foundation for the Future Programs & Activities

The total amount of donations received by the Osaka University Foundation for the Future reached 12.3 billion yen (with a balance of 5 billion yen). The donations that you have so graciously gifted are being effectively utilized to support students and young researchers as well as the university's research activities and other programs. Messages of gratitude from recipients for your generous support are posted on the Osaka University Foundation for the Future website. We encourage you to take the opportunity to see how appreciative we all are for your assistance.

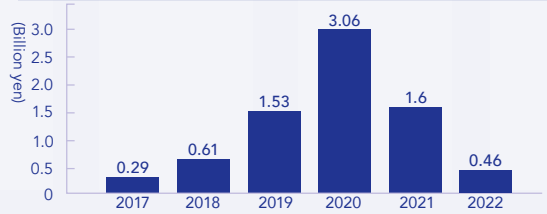
Osaka University Foundation for the Future –Activity Report 2023– (in Japanese only)

Breakdown		Total amount (billion yen)
Income	Donations received	12.05
	Operating profit	0.24
	Subtotal	12.29
Expenditures	Expenditures for fund projects	7.19
	Activity expenses	0.09
	Subtotal	7.29
Fund balance (as of March 31, 2023)		5.00

Note 1: Excludes subsidies
Note 2: Rounded off to the nearest hundredth

(May 2009~March 2023)

Change in Amount Received by Osaka University Foundation for the Future (By Fiscal Year)



Note: Excludes subsidies

Structure of Osaka University Foundation for the Future

The Osaka University Foundation for the Future has a General Purpose Fund and Specific Support Fund.

大阪大学 未来基金
Osaka University Foundation for the Future

大阪大学未来基金 ゆめ基金
(For Our Future Society)

The General Purpose Fund supports Osaka University in realizing dreams for our future society. The profits generated from managing assets of this fund are used to support students who are our future in addition to education and research, international exchange, social cooperation, and many other programs.

Specific Support Fund

(For Specified Purposes)

The Specific Support Fund comprises contributions solicited to be used to support specific projects.

- University Project
- Learning / Research Support
- Support for Schools / Graduate Schools / Institutes and Facilities
- Support for Sports / Culture-oriented Activities
- Designated Donation Project

Note: Assets of both the General Purpose Fund and Specific Support Fund are managed according to their specific demarcations.

OSAKA UNIVERSITY mascot
Dr. Wani

For information about the
Osaka University Foundation for the Future
as well as how to donate is available here
https://www.miraikikin.osaka-u.ac.jp/en

Donor's Comments

OGIHARA Hiroko

In Front of the New Building 4, School of Pharmaceutical Sciences

It was during the summer of 2019 as the Osaka University Graduate School of Pharmaceutical Sciences and our company (Apricot Co., Ltd.) were pursuing joint research that I learned from the dean that the School of Pharmaceutical Sciences would be transitioning to a six-year program ahead of all other national universities in Japan. The dean mentioned that the school's current facilities did not have any training laboratories able to accommodate the 80 members of the first-year class and that there was also a shortage of lecture rooms.

I expressed my commitment to support construction of a new building for the students of Osaka University's School of Pharmaceutical Sciences so they could attend high-quality practical training courses. This aligned with the philosophy of my grandfather OGIHARA Hiroshi, founder of KYORIN Pharmaceutical Co., Ltd. that "We must socialize medicine to help the sick and the suffering and contribute to the welfare of all mankind."

After numerous consultations with the School of Pharmaceutical Sciences, the new Building 4 was completed in March 2022. It is based on the concept of "Cross Innovation: Fusing knowledge and encounters in a future-oriented space fostering a stream of new innovation." The first and second floors house the lecture and training labs with capacity to accommodate large numbers of students. There is also an open area that serves as a hub promoting industry-academia collaboration, and the third and fourth floors are where faculty offices and laboratories are located.

Energy-conservation techniques were purposefully incorporated into the design of the new Building 4, which is the first newly-constructed research building of a national university corporation to acquire ZEB Ready certification. This accomplishment will also contribute to the sustainability of the global environment.

It is my hope that this place of learning will foster the development of highly-capable global professionals possessing abundant creativity as well as the capacity to think logically and flexibly.

Lastly, on a personal note, I established the ANZU no MORI FOUNDATION in April 2023 with the mission of "extending healthy lives to realize an active and healthy society." The foundation will focus its activities on supporting researchers, citizens, and companies in furthering this aim.

I am looking forward to continuing to support Osaka University, not just its buildings, but also with multi-faceted assistance.

Responses to the National University Governance Codes

Osaka University Governance
https://www.osaka-u.ac.jp/ja/guide/publications/governance
(in Japanese only)

Compliance with the National University Governance Code

In March 2020, the Ministry of Education, Culture, Sports, Science and Technology, the Cabinet Office, and The Japan Association of National Universities jointly formulated the National University Governance Code, the purpose of which is to ensure transparency in the management of national universities as well as direct these institutions not only to govern management, but also to enhance that governance function.
The Governance Code is the driving force pushing Osaka University to achieve our goals. We are taking the initiative to listen to what society's various stakeholders are saying. We continually review our compliance with the Governance Code and implement any necessary improvements.

Status of Compliance with the National University Governance Code

Osaka University has implemented all the principles of the National University Governance Code. The Osaka University Administrative Council and auditors have also verified implementation status of these principles. The status of our compliance with the Governance Code including comments by the Administrative Council and auditors has been compiled in a report available to the public on the university website.

Noteworthy Initiatives

■ Construction of a framework enabling president to exercise leadership toward realizing the OU Master Plan

Evidence-Based Management
Research promotion by URA and IR
- Construction of projects based on analysis and other evaluations
- Securing large-scale external funding of various types
- JST Program on Open Innovation Platforms for Industry-Academia Co-Creation
- MEXT's Quantum Leap Flagship Program
- Cabinet Office's Moonshot R&D Program

Budget Allocation System Conducive to More Dynamic Schools & Departments
Projects accelerating realization of OU Master Plan
- Budget allocations for programs to achieve the OU Master Plan and assessment metrics, as well as create social impact
- In 2023, a total of ¥740 million prioritized for allocation to 13 selected projects

Strengthened Structure to Realize Mission
Positions appointed at president's discretion
- In addition to the 100 positions allocated during the third term, framework constructed to allocate another 100 positions
- Budget allocated to strengthen university management functions, enhance research capacity, support young researchers, promote diversity & inclusion, etc.

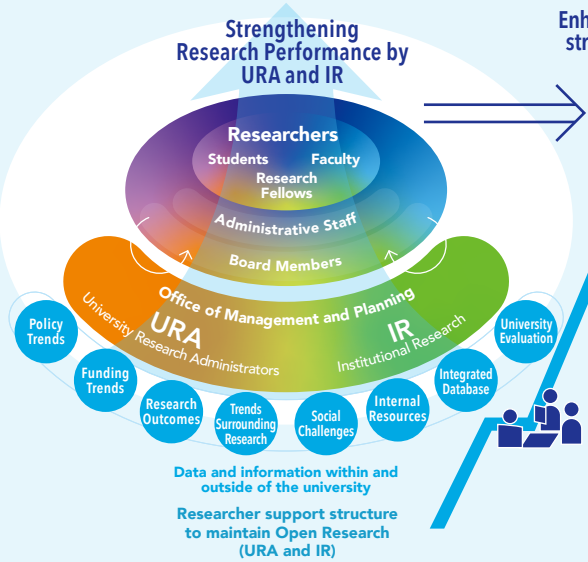
¥4.4 billion allocated in 2023
President's discretionary expenditures
- Structure constructed enabling both senior executive vice presidents and the competent executive directors to make comprehensive determinations
- Priority budget allocations based on comparative analyses of results, achievements, and other performance mainly focused on financial data, education, and research

Initiatives enhanced that contribute to more advanced and dynamic education and research to realize the OU Master Plan
- Promotion of diversity & inclusion
- Education and support aligned with students' life stages
- Improvement of financial support for doctoral students
- Formation of preeminent research institutions
- Promotion of activities for co-creation with society

Etc.

■ Evidence-Based Management Support Structure & Advancement of Administrative Staff

Osaka University has constructed a support structure enabling URA (University Research Administrator) and IR (Institutional Research) collaboration to facilitate evidence-based management. The university has also upgraded a progressive system promoting the advancement of administrative staff as well as highly specialized professionals expected to play a principal role in faculty-staff collaboration.



Enhanced structure supporting management in making strategic management and policy decisions

More than 50 URAs and IRs assigned to offices and frontline organizations

Obtained various large external funds!

Promotion of Faculty-Staff Collaboration

Progressive System Enabling Advancement of Administrative Staff
- Systematic development of individuals capable of contributing to management in accordance with the basic policy
- Introduction and expansion of new career paths for personnel to pursue managerial track positions participating in planning of university management or specialist track positions handling specialized operations

- In 2021, three administrative staff assigned to the Office of Management and Planning and Co-Creation Bureau, both of which are organizations where faculty and staff collaborate
- In 2022, four personnel took responsibility for the following operations as advanced specialists.
  - ·Promotion of quality assurance and PDCA cycle
  - ·Planning comprehensive international student policies, including recruiting international students
  - ·ICT promotion to realize OU digital transformation
  - ·Enhancement of legal affairs, compliance and risk management structures
- In 2023, an additional five positions will be established as specialist track positions

Promotion of Compliance at Osaka University
https://www.osaka-u.ac.jp/en/guide/policies/compliance

Enforcement of Strict Compliance

As a world-leading comprehensive research university upholding the motto "Live locally, grow globally," Osaka University is required to ensure sound and fair management of the university as well as act in strict compliance with all applicable laws and regulations. This is founded in a deep sense of ethics in light of our social mission to contribute to the progress of the community, nation, and humankind as well as the public nature of our activities. Osaka University has set out the following five principles to enforce strict compliance, raise awareness about protecting human rights and compliance as well as striving to manage risk. Through these measures, we will endeavor to win the greater trust of society.

1. Respecting Human Rights

Principal Risks:
Harassment, gender inequality, and other types of discrimination involving race, nationality, disability, etc.

Examples of Risk Responses:
To prevent harassment, Osaka University takes a strict stance against any form of harassment on campus in order to foster and maintain a healthy and comfortable environment based on the three principles of harassment prevention: "Don't overlook it. Don't allow it. Deal with it strictly." In embodying this policy, the university has set up harassment counseling offices on each campus which offer consultation services to the entire university community. In addition to counseling provided by counseling experts, these offices also work to educate the university community through harassment awareness checks, workshops, and other events.

2. Promoting Fair Research Activities

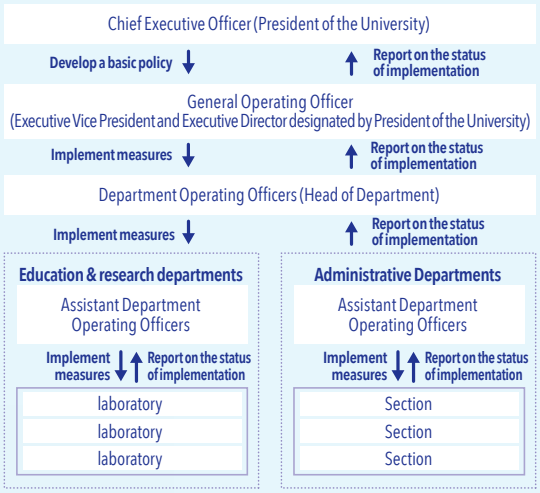
Principal Risks:
Inappropriate experiments and handling, unwanted transfer of sensitive technology, new risks associated with internationalization and opening of research, misconduct in papers, etc.

Examples of Risk Responses:
In accordance with laws, regulations, guidelines, and other rules related to medical and biological research involving human subjects, animal experiments, genetic recombination experiments, security export controls, research integrity, research fairness, and other activities and norms, Osaka University has established a mechanism in university regulations for necessary review as well as the responsibilities to be met by organizational members, and developed a structure needed for implementation of that mechanism. Moreover, we promote initiatives to enforce strict compliance with laws, regulations, and other rules through education and training for faculty, staff, and students.

3. Ensuring Proper Use of Funds and Appropriate Management of Assets

Principal Risks:
Fraudulent deposits relating to purchase of items, wrongful receipt of travel expenses, wrongful receipt of salaries or honorariums, infringement of intellectual property rights, and impairment or loss of research data

Examples of Risk Responses:
As part of the university's efforts to eliminate factors that may lead to misuse of public research funds and create an environment and system that have deterrent functions, Osaka University holds explanatory meetings that include explanations about identified risk factors for Department Operating Officers every year. The Department Operating Officers who attend the meetings provide compliance training for faculty, staff, and others in the departments that they manage and supervise.
In addition, Osaka University promotes the appropriate use of public research funds by compliance awareness-raising activities using handbooks on the rules for the use of public research funds, e-learning materials, and publishing a public relations magazine as well as by setting up consultation services in departments and offices.



Responsibility and Roles to Prevent the Misuse of Public Research Funds (as of April 2023)

4. Protecting Personal Information and Enhancing Information Security Measures

Principal Risks:
Erroneous email transmissions, removal of data outside secure locations, unauthorized access

Examples of Risk Responses:
In order to enhance education, research, and related support activities, as well as further promote the maintenance of an information environment that appropriately protects any confidential information held and maintains its appropriate use, Osaka University has adopted multi-tiered information security measures institutionally and systematically. Each year, the university provides information security training, individual information protection officer training, as well as initiates self-assessments, audits, and other investigations.

5. Ensuring Safety and Health and Protecting the Environment

Principal Risks:
Accidents during experiments, pandemics of infectious diseases, natural disasters

Examples of Risk Responses:
In order to create a safe and comfortable environment for learning, research, and work as well as to prevent occupational accidents, Osaka University strives to maintain the health and safety of all members of our university community, and promote initiatives that raise awareness about safety, health, and environmental conservation. Each year, the university holds lectures and briefings on health, safety, and environmental conservation in an effort to raise awareness among our university community. In addition, an environmental safety newsletter is published three times a year to provide members of our community with the latest information about environmental conservation.

www.osaka-u.ac.jp/en

OSAKA UNIVERSITY