OKAYAMA UNIVERSITY e-Bulletin

Vol.25, October 2019

岡山大学 OKAYAMA UNIVERSITY | SUSTAINABLE DEVELOPMENT GOALS

"Okayama University supports the Sustainable Development Goals"

1-1-1 Tsushima-naka, Kita-ku, Okayama 700-8530 Japan

Contents

Feature

News

Research Highlights

Topics

Further information

■ Feature

Two symposia commemorating the 70th anniversary of Okayama University to further contribute to the SDGs

Okayama University was established in 1949 and is celebrating its 70th anniversary in 2019. Authorized by the United Nations as the first institute in Asia to establish a UNESCO Chair in 2007, the university has launched initiatives to promote Education for Sustainable Development (ESD). In 1994 the university it became the first national university in Japan to establish an environment-focused faculty: The Faculty of Environmental Science and Technology. This is an example of Okayama University's continued efforts on promoting the SDGs with the involvement of members of local community. On 9th July the university organized two SDG-themed symposia in commemoration of its 70th anniversary.

The theme of the first symposium was "Water and Life in Okayama". This theme was chosen because one year has passed since torrential rain in July 2018 caused tremendous damage in western Japan.

Addressing an audience of local residents young researchers from Okayama University described their latest results on lifestyles and culture related to water—the source of life. Associate Professor Keisuke Yoshida from the Graduate School of Environmental and Life Science made a presentation about technology to make detailed measurements of wide-area landform from aircraft, for accurately predicting the flow of water during heavy rainfall. Other talks were on the development of Nishikawa Ryokudo Park in the center of Okayama, and on research focused on the DNA of marine creatures in the Seto Inland Sea, with the goal of conserving the sea environment.

The next symposium was, "Towards Greater Okayama as the Center for the U.S. and Japan Youth Development to Advance the SDGs", commemorating Okayama University's selection this year as the first national university in Japan to accept students under the Critical Language Scholarship (CLS) Program* sponsored by the U.S. Department of State. A panel discussion took place with the participation of President Hirofumi Makino of Okayama University,

Dr. David Patton, President and CEO of American Councils, and students participating in the CLS Program. The panelists exchanged opinions about the advantages of human resource development being conducted in Okayama, a place known for close ties amongst local communities, and how they can promote this initiative more effectively.

As a leader for SDG promotion in Japanese academia, Okayama University will continue its efforts to contribute to the SDGs in collaboration with local communities and partners worldwide to create new social values and advance global partnerships for the SDGs and ESD. Let's change the world with the SDGs and ESD with our partners worldwide!

* A program for university/graduate school students from top-class American universities to learn Japanese language and culture in Japan.

Further information

Okayama University (Japanese page)
http://www.okayama-u.ac.jp/tp/news/news_id8628.html

Okayama University (Japanese page)
http://www.okayama-u.ac.jp/tp/news/news_id8635.html

UNESCO Chair at OKAYAMA UNIVERSITY
https://edu.okayama-u.ac.jp/unesco_chair/public_html/en/index.html

Welcome reception held by Okayama University and
the U.S. Department of State for CLS American students
https://www.okayama-u.ac.jp/eng/news/index_id8639.html

United Nations
https://sustainabledevelopment.un.org/hlpf/2019

1-1-1 Tsushima-naka, Kita-ku, Okayama 700-8530 Japan

■ News

Whole Institution's Approach of SDG efforts presented at the UN headquarters: University officials led by President Makino participate in the High-Level Political Forum in July 2019

Presenter: President Hirofumi Makino, panelist : From the left to right: Ms. Stefania Giannini, Assistant Director-General for Education at UNESCO, Leich UNESCO ESD Manager

On July 15, President Hirofumi Makino made a presentation about Okayama University's initiatives at a side-event of the High-level Political Forum (HLPF) for Sustainable Development for 2030" held at the UN headquarters. It was organized by UNESCO and co-organized by the governments of Japan, Germany and Kenya.

To mark the beginning of the event, Ms. Stefania Giannini, Assistant Director-General for Education at UNESCO, explained the event's purpose: to inspire people's interest in the contribution of ESD to the achievement of the SDGs, and to discuss frameworks plans for ESD towards 2030. Then, Mr. Fumiyasu Hirashita, Deputy Director-General for International Affairs at MEXT and Senior Deputy Secretary-General of Japanese National Commission for UNESCO, delivered a congratulatory message to the event, referring to the important role the co-organizers (governments of Japan, Germany and Kenya) play in the promotion of ESD aimed at the achievement of the SDGs.

From the right to left Mr. Fumiyasu Hirashita, Deputy Director-General for International Affairs at MEXT and Senior Deputy Secretary-General of Japanese National Commission, President Hirofumi Makino The forth from the right is Haugg Director General for Vocational Training and Lifelong Learning, German Federal Ministry of Education and Research　The fifth from the right is Professor Kazuhiro Yoshida（Hiroshima University）

Following this, President Makino made the only presentation at the event to introduce the university's initiatives. He stated that the university has led ESD on a global scale since 2005 in cooperation with Okayama City, that university-wide and region-wide "whole institution's approach" toward the SDG achievement has been implemented under the Makino Vision, that the university received the first Japan SDGs Award from the government of Japan for its achievement through the approach, and that the university led the creation of the "Asia-Pacific Frameworks for Teacher Education on ESD" as a specific effort to achieve the SDGs. He also announced that the university will host an international conference on the global framework for teacher education on ESD in November 2019.

A panel discussion chaired by Ms. Giannini also took place, with the participation of Professor Kazuhiro Yoshida from Hiroshima University (Co-chair, SDG-Education 2030 Steering Committee), Ms. Kornelia Haugg (Director General for Vocational Training and Lifelong Learning, German Federal Ministry of Education and Research) and Ms. Kerstin Forsberg from Planeta Océano in Peru. They commented that the SDGs are a significant agenda that cannot be achieved without education, that ESD is the key for the achievement of the SDGs, that links and networks among diverse sectors are essential, and that Okayama University has taken the lead in the movement through the "whole institution's approach" with its capacity and reliability that meet the global standard. The panelists seemed to have been particularly impressed with the presentation about the "whole institution's approach" by President Makino, and the topic determined the direction of the discussion.

From the left to right: The Vice President Atsufumi Yokoi, The Ambassador Kouro, Besyo President Hirofumi Makino

Approximately 20 persons from the government, industry and academia constituting the Japanese governmental delegation to the UN HLPF were present at the dinner party held on that evening, hosted by Ambassador Extraordinary and Plenipotentiary, Permanent Representative of Japan to the United Nations. President Makino and Vice President Atsufumi Yokoi also attended, and exchanged information widely with other participants on Japan's present situation and future course of action regarding the SDGs.

From the left to right: The Councilor Mr. Kato, President Hirofumi Makino,The Ambassador Tomoya Hoshino, The Vice President Atsufumi Yokoi

Further information

United Nations
https://sustainabledevelopment.un.org/hlpf/2019

■ News

Welcome reception held by Okayama University and the U.S. Department of State for CLS American students

President Makino making his ceremonial speech

Greetings from CLS student representative Mr. David Anderson

Okayama University is the first national university selected to host American students who have been accepted to the Critical Language Scholarship (CLS) Program. The competitive scholarships funded by the U.S. Department of State were awarded to 26 outstanding undergraduate and graduate students who have shown outstanding academic ability and leadership potential at their colleges and universities. The program runs for eight weeks from June 14 to August 10, offering highly intensive course work in Japanese language and culture at Okayama University. A welcome reception was kicked off on June 17 at the Okayama University International House.

In his welcome speech, Okayama University President MAKINO Hirofumi said that, while studying abroad, he adopted a positive and optimistic attitude and learned to appreciate his own Japanese culture from a different perspective. He encouraged students, regardless of how they feel about the upcoming program and life in Okayama, excited or nervous, to take a new step forward and participate actively in the program. CLS students briefly introduced themselves in Japanese by telling where they were from and sharing any Japanese words and phrases they liked most. Then, Mr. David Anderson delivered an engaging speech on behalf of the CLS cohort, saying that they would spend eight productive weeks in Okayama so they could broaden their perspectives and knowledge through cross-cultural exchange and learn to see the world from diverse viewpoints.

Commemorative photo

Further information

American Councils for International Education
https://www.americancouncils.org/programs/critical-language-scholarship-program

■ News

Promote the SDGs across generations! The SDGs Youth Project launched

Mr. Morishita giving a lecture

Under the Makino Vision, Okayama University is making university-wide efforts to promote the Sustainable Development Goals (SDGs) suggested by the United Nations as one of its focused initiatives. In handling the SDGs, we need to achieve common goals with diverse stakeholders, and as such, it is important to foster relationships across generations. Thus Okayama University is working on the SDGs with the younger generations, reflecting their various ideas and opinions on the university's SDG activities. Recently, the nationwide project "SDGs Youth Project" designed by Mr. KOMURA Shunpei (Special Advisor to the President) to connect high school students with the SDGs, was launched with the involvement of the university's Tokyo Office. The kickoff event was held in the Tokyo Office (Minato-ku, Tokyo) on April 17.

Participants who perform graphic facilitation

Thirty-four high school students from across the country participated in the event, this time focusing on Goal 16: Peace, Justice and Strong Institutions. Mr. MORISHITA Yuichiro, a social activist, spoke as a guest. Being a former professional basketball player in the United States, he now travels around the world and is engaged in various activities to realize a peaceful society and promote regional revitalization. Referring to actual cases, he talked in front of high school students about what he felt and learned from his experiences. Professor KANO Mitsunobu, Vice Executive Director in charge of promoting Okayama University's efforts to help achieve SDGs and other officials participated in the cross-generational discussion with high school students on what a peaceful society should be like, based on Mr. Morishita's speech.

Participants listening to the story of Vice Executive

Commemorative photo with participants

Further information

OKAYAMA UNIVERSITY × SDGs
https://sdgs.okayama-u.ac.jp/en/

1-1-1 Tsushima-naka, Kita-ku, Okayama 700-8530 Japan

■ News

Okayama University accredited to implement the "Support Program on Collaborative Innovation Networks for Medical Device"

Okayama University was selected as an institution to implement the "2019 Support Program on Collaborative Innovation Networks for Medical Device" of the Japan Agency for Medical Research and Development (AMED).


The picture of the operation

The project, based on the results achieved through the "Project to Build Foundations to Support and Incentivize Development of Medical Devices Made in Japan" implemented for five years from 2014, pursues to increase the number of companies' hubs to foster human resources to be engaged in the development of medical devices, and create attractive medical hubs featuring characteristics of each medical institution and leading to the promotion of the medical device industry. Fourteen institutions including Okayama University were selected.

Okayama University has set the goal of developing a center for medical device development focused on open innovation and the promotion of commercialization. Okayama University Hospital and its affiliated five hospitals constitute a "mega-hospital." Making use of the advantage of its scale, the university will establish a system to collect wide-ranging medical needs, covering the fields of general medicine, nursing, nursing care, rehabilitation, dental medicine, and home healthcare. In addition, through close cooperation among the university, governments and the business world, the university will achieve seamless implementation of the creation of valuable business models, business matching and commercialization.

Making use of this opportunity, the university will continue its efforts to foster human resources for medical device development and further contribute to the development of medicine, based on the results achieved during the past five years.

Further information

OKAYAMA UNIVERSITY HOSPITAL
https://www.okayama-u.ac.jp/user/hospital/en/index.html

1-1-1 Tsushima-naka, Kita-ku, Okayama 700-8530 Japan

■ News

Okayama University Weight Training Club won the national championship!

Okayama University Weight Training Club won the first place at the 46th all-Japan intercollegiate powerlifting championship for MEXT Minister's cup held on June 30 at Hannan University in Osaka. The team members paid a call on President Makino on July 9 and reported the results.

Commemorative photo

Powerlifting is competed by the total weight of the best of three attempts at the three lifts: squat, bench press and deadlift. At this competition, the contestants competed in individual match for each weight class, and the ranking of the participating 16 universities is determined by the grades of individual rankings.

In the individual match, four students from Okayama University ranked first: Ms. Momoka Kumahara for women's 52 kg class (4th year, Faculty of Law), Ms. Kana Okada for women's 63 kg class (2nd year, Discovery Program for Global Learners), Mr. Takuro Teraoka for men's 53 kg class (2nd year, Faculty of Economics), and Mr. Koichiro Arioka for men's 105+ kg class (4th year, Faculty of Science). Among them, Ms. Okada achieved national university records for all of the three lifts as well as for the total score! Many students from Okayama University ranked high in individual matches, and the university as a team won the championship for the first time in three years!

Picture of the report

When they were asked by President Makino how they felt about winning the championship, the captain Mr. Yuki Yamato (4th year, Faculty of Environmental Science and Technology) answered, "We couldn't achieve satisfactory results last year, but I was glad to get our revenge." Last year, the team finished fourth prize, missing the podium. The frustration had led to this year's excellent results.

In its history of 30 years, the club has won the national championship 13 times so far. When they were asked "What was the secret of the strength?", the captain humbly answered, "It's all thanks to the guidance of our seniors." Traditionally, alumni of the Weight Training Club serve as directors and coaches to foster the next generation. Thanks to this system, club members can receive their seniors' shrewd advice

and appropriate assistance, and improve their technical skills without suffering from major injuries. This is the secret of their strength.

The Group Picture

Picture of the competition

Further information

Okayama University Weight Training Club (Japanese page)
http://www.ouwtc.com/

■ Research Highlights

Identification of the proteins governing the formation of “magnetic teeth” in chiton Chiton deposit magnetite (Fe_3O_4) on their mineralized radular teeth.

In order to form the magnetite under physiological conditions, it was suggested that chitons might use biomolecules, such as proteins, to control oxidation / reduction of iron oxides. However, due to the lack of detailed molecular biological analysis of chitons, mechanisms of magnetite teeth formation are not clear.

Michiko Nemoto, Graduate School of Environmental and life Science Okayama University and David Kisailus, Department of Chemical and Environmental Engineering, University of California, Riverside report the first comprehensive gene inventory of gumboot chiton, Cryptochiton stelleri, providing a broad overview of magnetite teeth mineralization. Furthermore, their work identified several proteins that may be involved in magnetite formation.

To reveal the proteins involved in magnetite mineralization, RNA (transcription products) were extracted from radular tissue and sequenced using a next generation sequencing platform. As a result, a comprehensive gene inventory of radular tissue that consists of more than 100,000 genes was successfully developed. The gene inventory was also used for a proteomic analysis of radular teeth proteins.

This is the first report describing a comprehensive analysis of genes and proteins expressed in chiton that has magnetite teeth. Furthermore, this study successfully identified several proteins associated with magnetite teeth that may be involved in magnetite formation in chiton.

The results of this study pave the way for developing a low temperature, environmentally benign biological process to produce magnetite for a wide range of applications including magnetic recording, secondary battery, and MRI contrast agents.

Figure caption: Cryptochiton stelleri (left) and its magnetic teeth (right).

Reference:

- Authors: Michiko Nemoto, Dongni Ren, Steven Herrera, Songqin Pan, Takashi Tamura, Kenji Inagaki and David Kisailus
- Title of original paper: Integrated transcriptomic and proteomic analyses of a molecular mechanism of radular teeth biomineralization in Cryptochiton stelleri
- Journal, volume, pages and year: Scientific Reports 9:856 (2019).
- Digital Object Identifier (DOI): 10.1038/s41598-018-37839-2
- Journal website: https://www.nature.com/articles/s41598-018-37839-2
- Affiliations: Graduate School of Environmental and life Science, Okayama University
- Department website: http://www.gels.okayama-u.ac.jp/index_e.html
- Okayama University Scientific Achievement Repository: http://ousar.lib.okayama-u.ac.jp/57012

■ Research Highlights

Observation of instabilities in metallic states for metal-to-insulator switch oxides

Vanadium dioxide (VO_2) shows a metal-to-insulator (MI) switch near room temperature (Fig. 1). Since switching phenomena near room temperature are rare, VO_2 has attracted attention for its switching mechanism, namely, the instability in the metallic state. Theoretical work on electronic structures of VO_2 40 years ago suggested that the instability is responsible for electron-phonon interaction [1]. Since then, much interest has been directed to experimental studies of electronic structures of VO_2 using angle-resolved photoemission electron spectroscopy (ARPES).

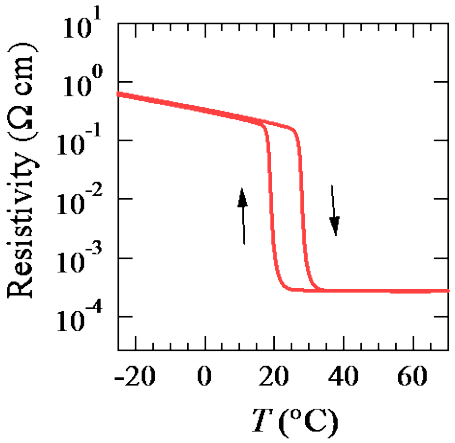


Fig. 1. Temperature dependence of the resistivity for a VO_2 epitaxial thin film on a TiO_2(001) substrate.

However, ARPES measurements of VO_2 single crystals are difficult to perform because of the difficulty in obtaining a chemically stable cleavage plane in VO_2 single crystals with three-dimensional crystal structure.

Now, Yuji Muraoka and colleagues at Okayama University, High Energy Accelerator Research Organization, and University of Tokyo have determined the electronic structures of the metallic phase of VO_2 through studies of VO_2 epitaxial thin films grown on TiO_2(001) substrates, using synchrotron radiation ARPES.

The electronic structures possessed a flat portion that is evidence for the presence of electron-phonon interaction predicted by theoretical work (Fig. 2).

The results obtained by Muraoka and colleagues strongly indicate the importance of electron-phonon interaction for the origin of the instability in the metallic state of VO2, and support the validity of theoretical work.

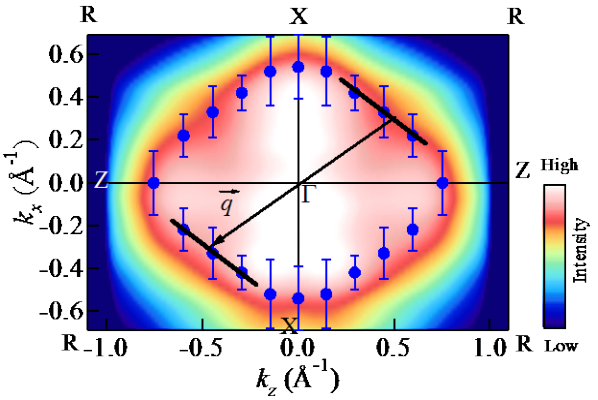


Fig.2. Electronic structure of a metallic phase of VO_2 epitaxial thin film on a TiO_2(001) substrate. A flat portion is indicated with a black line.

This research advances the understanding of the mechanism for the MI switch in VO_2, and provides fundamental knowledge for controlling the switching temperature for potential applications.

[1] M. Gupta, A. J. Freeman, and D. E. Ellis, Phys. Rev. B 16, 3338 (1977).

Reference:

- Authors: Yuji Muraoka1, Hiroki Nagao2, Yuichiro Yao2, Takanori Wakita1, Kensei Terashima1, Takayoshi Yokoya1, Hiroshi Kumigashira3,*, and Masaharu Oshima4.
- Title of original paper: Fermi surface topology in a metallic phase of VO2 thin films grown on TiO2(001) substrates.
- Journal, volume, pages and year: Scientific Reports 8, 17906 (2018).
- Digital Object Identifier (DOI): 10.1038/s41598-018-36281-8
- Journal website: https://www.nature.com/articles/s41598-018-36281-8
- Affiliations: 1Research Institute for Interdisciplinary Science, Okayama University, 2Graduate School of Natural Science and Technology, Okayama University, 3High Energy Accelerator Research Organization (KEK), Photon Factory, 4The Institute for Solid State Physics, The University of Tokyo.

  *Present address: Institute of Multidisciplinary Research for Advanced Materials, Tohoku University
- Department website: http://www.science.okayama-u.ac.jp/~surface/index.html
- Okayama University Scientific Achievement Repository: http://ousar.lib.okayama-u.ac.jp/57013

■ Research Highlights

Challenging the theoretical assessment of a hypothesis on protein folding stability that has been believed for 60 years

Understanding the dominant factor behind thermodynamic stability of proteins is still a challenging issue in biochemistry, biophysics, and molecular biology. Kauzmann's hydrophobic interaction hypothesis, which considers solvation effects mediated by water as the dominant factor in thermodynamic stability of proteins, has been widely accepted for about sixty years and attracted many scientists. However, the hypothesis has not been verified or disproved because it is difficult, both theoretically and experimentally, to quantify the solvent effects on protein stability.

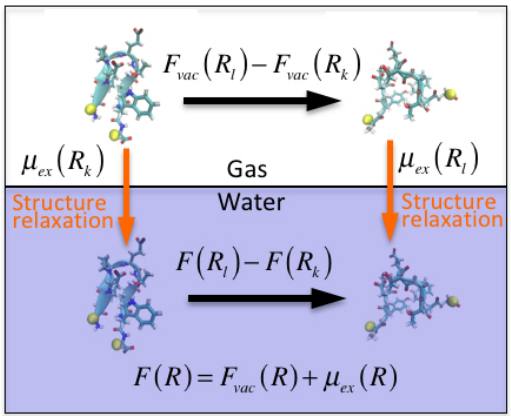


Fig. 1 Thermodynamic cycle on energetics of protein folding.

The theoretical physical chemistry group at the Research Institute for Interdisciplinary Science, Okayama University (Tomonari Sumi and Kenichiro Koga) developed a computational method to quantify energetics of protein folding stability and applied it to a small design protein chignolin. On the basis of results obtained for chignolin, they derived an obvious conclusion that was qualitatively different from the hypothesis: the driving force of the protein folding is attributed to the intramolecular interactions of the protein and the solvent effects rather stabilize unfolded states. These results provide new insights for strategies to design artificial proteins and developments of new biopharmaceuticals.

Reference:

- Authors: Tomonari Sumi and Kenichiro Koga.
- Title of original paper: Theoretical analysis on thermodynamic stability of chignolin.
- Journal, volume, pages and year: Scientific Reports 9, 5186 (2019).
- Digital Object Identifier (DOI): 10.1038/s41598-019-41518-1
- Journal website: https://www.nature.com/articles/s41598-019-41518-1
- Affiliations: Research Institute for Interdisciplinary Science, Okayama University.
- Department website: http://www.riis.okayama-u.ac.jp/en/
- Okayama University Scientific Achievement Repository: http://ousar.lib.okayama-u.ac.jp/57014

■ Topics

Radio Message from International Students (World Heartful Message)

Okayama University was broadcasted an internet radio program in which international students who have come to study at Okayama University from countries all over the world talked on topics such as their life as international students, what it is like to live in Okayama City, and their research themes. The broadcasts were produced in English or the native languages of the students.

Ms. IRSAN Raina Mentari (right)

Ms. IRSAN Raina Mentari of Discovery Program for Global Learners from Republic of Indonesia talked about her research and plans for the future.

Further information

https://www.youtube.com/watch?v=AOTCFQv5bOw

Radio Message from International Students
https://www.youtube.com/playlist?list=PLJikPQTwoCj4ggrOUY2cs_AJZIeWdG4t8

1-1-1 Tsushima-naka, Kita-ku, Okayama 700-8530 Japan

◆Further information

Okayama University
1-1-1 Tsushima-naka, Kita-ku, Okayama 700-8530, Japan

Public Relations
E-mail: www-adm@adm.okayama-u.ac.jp
Website: https://www.okayama-u.ac.jp/index_e.html

Okayama University e-Bulletin
https://www.okayama-u.ac.jp/user/kouhou/ebulletin/

Okayama University Medical Research Updates (OU-MRU)
https://www.okayama-u.ac.jp/eng/research/ou-mru.html

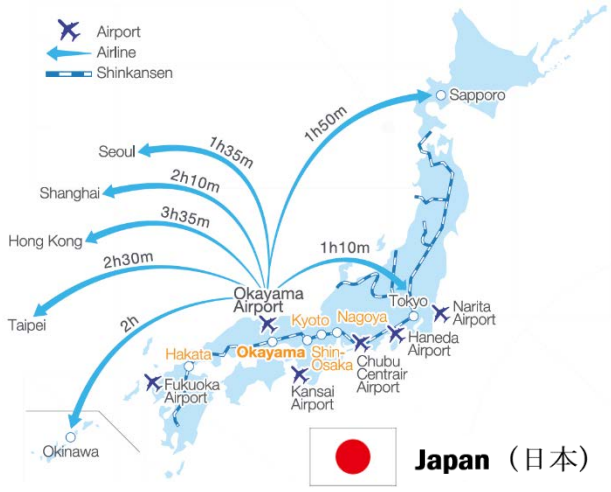
About Okayama University (YouTube 1)
https://www.youtube.com/watch?v=iDL1coqPRYI

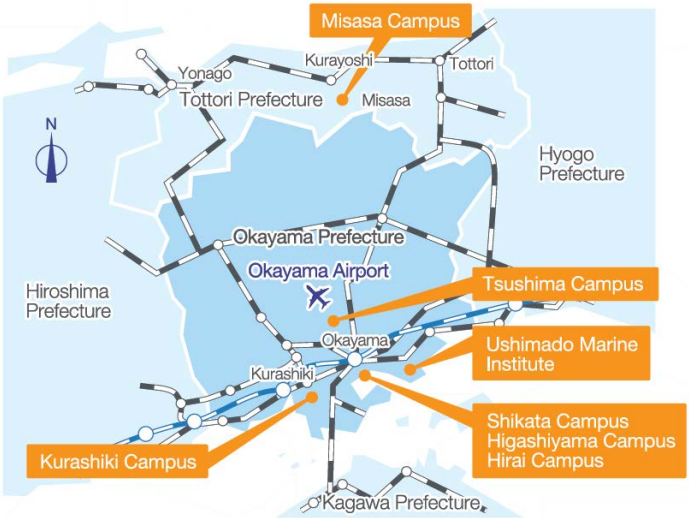
Okayama University Image Movie (YouTube 2)
https://www.youtube.com/watch?v=KU3hOIXS5kk

◆About Okayama University

Okayama University is one of the largest comprehensive universities in Japan with roots going back to the Medical Training Place sponsored by the Lord of Okayama and established in 1870. Now with 1,300 faculty and 13,000 students, the University offers courses in specialties ranging from medicine and pharmacy to humanities and physical sciences.
Okayama University is located in the heart of Japan approximately 3 hours west of Tokyo by Shinkansen.

Hirofumi Makino, M.D., Ph.D.
President, Okayama University





SUSTAINABLE DEVELOPMENT GOALS

"Okayama University supports the Sustainable Development Goals"

