HIROSHIMA UNIVERSITY UPDATE

HIROSHIMA UNIVERSITY

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Find Hiroshima University's latest news and high-impact research here!

HIROSHIMA UNIVERSITY

Embodying its founding principle of “a single unified university, free and pursuing peace,” Hiroshima University is one of the largest comprehensive research universities in Japan.

Today, HU is making steady progress as a global university, taking on worldwide challenges and strengthening its global educational network by signing international exchange agreements with universities around the world and opening overseas bases at strategic locations.

HIROSHIMA UNIVERSITY

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RESEARCH FOCUS

MEET OUR RESEARCHERS

HU researchers talk about their exciting fields of study and latest outcomes!

Group photo
Members of the new International Institute for Sustainability with Knotted Chiral Meta Matter" (SKCM²)

New World Premier International Research Center Initiative (WPI) opens on campus

Researchers from around the world will study "knotted chiral meta matter" to understand the laws of nature and to develop new materials that help with sustainability.

More here

A world-class institute for interdisciplinary science dedicated to a new research field called "knotted chiral meta matter" opened at Hiroshima University (HU) this November. The new "International Institute for Sustainability with Knotted Chiral Meta Matter" (SKCM²) was selected to be funded through the World Premier International Research Center Initiative (WPI) of Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT).

SKCM² will be led by Dr. Ivan Smalyukh, Professor of Physics at the University of Colorado, Boulder and a world leader in material research who has received numerous scientific awards, including a presidential career award from the U.S. White House. The institute will allow for collaborations among researchers at HU and other Japanese and international institutions, including the University of Tokyo, Cambridge University, the Massachusetts Institute of Technology, and the Max Planck Institute for Theoretical Physics.

The international institute interlinks a list of experts in a broad range of fields such as mathematics, physics, chemistry, biology, medicine, and engineering. Using a highly interdisciplinary approach, these researchers will deepen our understanding of the laws of nature by studying "knotted chiral meta matter," which are artificial versions of the building blocks that make up everything.

The center will focus on avenues that have direct applications for sustainability and human flourishing.

HU scientist wins L'Oréal-UNESCO's Japan fellowship for women in science

Hiroshima University Assistant Professor Haruna Katayama was among the four winners of the 17th L'Oréal-UNESCO For Women in Science, Japan Fellowship Award 2022. The ceremony took place last September 7 at the United Nations University in Shibuya.

Katayama from the Graduate School of Advanced Science and Engineering received the award in the field of materials science from Dr. Maki Kawai, Director-General of the National Institutes of Natural Sciences (NINS). She is the youngest of the four recipients at 25 years old.

Her research proposed a method to observe Hawking radiation — which has peculiar quantum correlations emitted from an analogue black hole created in an electric circuit.

By "creating a universe in an electric circuit," the research is a major step toward the integration of relativity and quantum theory. It is expected to contribute to the realization of next-generation information processing and communications, such as quantum computers, as well as be applied in materials science and quantum information science.

"I am very honored and humbled to receive this prestigious award. I truly feel that I could not have received this award without the guidance and support of my professors, family, and friends. I would like to express my sincere gratitude," said Katayama.

> **"I would like to gain more experience not only in Japan but abroad, and [...] become a scientist who can contribute to society."**

HARUNA KATAYAMA
Assistant Professor
Graduate School of Advanced Science and Engineering

About the award

The L'Oréal-UNESCO For Women in Science Japan Fellowship Award was established in 2005 by L'Oréal Japan in cooperation with the Japanese National Commission for UNESCO.

The award is open to young female researchers, including students enrolled in doctoral programs. Two winners are selected from two fields: materials science and life sciences. Winners receive a scholarship of 1 million yen to support their continued research.

© Courtesy of L'Oréal Japan

Commemorative photo
(on the far left: Assistant Professor Katayama)

2022 ranking names HU researcher as Japan's top rising star of science

TETSUSHI SAKUMA
Associate Professor
Graduate School of Integrated Sciences for Life

A biotechnologist and associate professor at Hiroshima University topped the 2022 "Best Rising Stars of Science in Japan" rankings by Research.com, a research portal for science rankings.

HU Associate Professor Tetsushi Sakuma from the Graduate School of Integrated Sciences for Life bested other researchers in Japan. The ranking is part of the "Rising Stars of Science World Ranking" which lists young and impactful scholars around the world. Sakuma placed 440th globally.

He is also part of the 2021-2023 batch of HU's Distinguished Researchers Program, which recognizes junior faculty members who are engaged in extraordinarily distinguished research activities.

The global ranking, which is in its 1st edition, examined 166,880 scientist profiles on Google Scholar and Microsoft Academic Graph. The position in the ranking is decided according to the scientist's general H-index, which measures an author's scholarly output and citation impact. Only scientists whose oldest publication is from 12 years ago or less were considered for the rankings. Sakuma received 7,005 citations from his 188 publications.

Japanese singer MISIA presented with 30th Pestalozzi Education Award

31st Pestalozzi Education Prize

2022's award recipient is Satoko Kitagawa, President and General Facility Director of Social Welfare Corporation Muginoko-kai, for her continued efforts to foster and develop inclusive education. In 1983, Kitagawa and her colleagues established "Muginoko Gakuen," a childcare facility in Sapporo City that supports preschoolers with developmental difficulties and their parents.

An award ceremony will take place on December 22.

Satoko Kitagawa
Muginoko-kai

On August 31, the School of Education at Hiroshima University awarded the 30th Pestalozzi Education Prize — named in honor of Johann Heinrich Pestalozzi, the father of modern education — to Japanese singer MISIA for her outstanding educational activities. Since 2007, MISIA has been working to build a better world by providing educational support in Africa, and she has been steadily working to support the lives and learning of children growing up in an adverse environment.

In her commemorative lecture, MISIA said that during her visit to Africa, while seeing the poverty, sadness, and long-suffering of children under severe conditions, she felt hope for children who, even in such situations, were not beaten by the hardships and went to receive education and attend school.

During the Q&A session that followed, students asked what they should do now if they are interested in supporting education in Africa or other impoverished areas overseas and what they should think about while they are students, and MISIA gave a very valuable talk about her own experiences.

> **“Education is first of all about keeping life alive and helping people to have the strength to live their lives**
>
> **MISIA**

The HIRAKU-Global Program Retreat was held at HU

The HIRAKU-Global Program held its first-ever retreat from September 30 – October 1 at MIRAI CREA. This event was open to all the HIRAKU-Global Researchers (HGRs), talented Early Career Researchers (ECR) from various research fields who have been selected for their potential to become world-class researchers. The retreat gave everyone the chance to meet and interact with each other for the first time in person. The two-day retreat was attended by 16 HGRs.

As the aim of the retreat was to enable the HGRs to learn more about each other and their research, a schedule that allowed for this was planned and undertaken. This included an opportunity for the HGRs to “break the ice,” pitch their own research, and interact with each other in a free and casual manner via various activities (including a lab tour).

Overall, the eagerness of the HGRs to communicate with each other and share their experiences meant that this event was a hugely successful one, and will no doubt be held again in the future.

More here

About the HIRAKU-Global Program

The HIRAKU-Global Program is an ECR development program funded by MEXT (Japan). Hiroshima University acts as the Lead Organization, with Yamaguchi University, Tokushima University, and Ehime University acting as the Partner Organizations.

creating a *peaceful* world

HU holds annual peace project:

Passing on the wish for peace through film and music

06 AUG 2022

Hiroshima University marked the 77th anniversary of the atomic bombing last August 6 with its annual Peace Project on the Higashi-Senda campus.

This year's Peace Project focused on film and music as tools to pass on the wish for peace to the world.

A story about nuclear war and the power of love and forgiveness

The event started with the screening of 8:15 Hiroshima: From Father to Daughter, a hybrid documentary-narrative film portraying the life of A-bomb survivor Shinji Mikamo — who was 1.2 km from the hypocenter when the bomb dropped.

Following the greetings of HU President Mitsuo Ochi, film executive producer and book author Akiko Mikamo — who created the piece based on her father's experience — gave some words and shared her thoughts on her work.

Violin made from nuclear-bombed trees unveiled

President Ochi also unveiled at the event a violin made from trees and buildings that survived the nuclear explosion. This new violin joins the university's collection of instruments made from A-bombed trees and other materials — a viola, a cello, and two violins. HU started this project in 2019.

The event ended with a short concert for peace. The university hopes these instruments will play a role in peace-building through their music.

About the Peace Project

The Peace Project has been held on August 6 every year since 2017 to pass on the memory of the atomic bombings and play a role in building a free and peaceful international society that fosters diversity based on the pursuit of peace — the first of HU's five guiding principles.

Disappeared Towns, Tracing Memories

The world of A-bomb survivor Shigeo Moritomi's pencil drawings

17 SEP 2022

Twenty-six original drawings depicting Hiroshima City before the atomic bombing by *hibakusha* (A-bomb survivor) Shigeo Moritomi were exhibited at the Hiroshima City Peace Memorial Park Rest House last September 17 to 30, 2022.

Moritomi's pencil drawings were based on his memories before the atomic bombing. He started drawing in his 60s, hoping the younger generation could see what the city and its neighborhoods used to look like back in the day. His collection — published in 2011 — was referenced for producing the animated film *In This Corner Of The World*. Moritomi died last year at age 92.

The exhibition introduced Moritomi's life, background, and the influence of his work in animated films, domestic and international visual works, and peace initiatives. The event also gathered Japanese and international experts to discuss utilizing the power of memories in facilitating peace.

The Japan Society for the Promotion of Science (JSPS), the Hiroshima Fieldwork Committee, and the Hiroshima City Peace Memorial Park Rest House organized the event with the support of the City of Hiroshima.

The Graduate School of Humanities and Social Sciences, The Center for Peace, and the Research Center for Diversity and Inclusion at HU were co-organizers of the event.

"The impact of Hibakusha's lived memories is visceral: It sews a seed of borderless peace," said Associate Professor Luli van der Does, the project's lead researcher, a member of its organizing committee, and the co-chair of the Hiroshima Fieldwork Committee.

This project was funded through a JSPS grant (JSPS21KK0032) and a Daiwa Anglo-Japanese Foundation Grant (13512/14343) awarded to Dr. van der Does at the Center for Peace and the Graduate School of Humanities and Social Sciences.

Novel device monitors breath sounds to predict respiratory failure in ICU patients after extubation

Scientists developed a novel device that predicts whether an ICU patient taken off mechanical ventilation is likely to suffer from respiratory emergencies, helping critical care teams to provide immediate life-saving interventions.

Researchers developed a novel device that detects abnormal breathing sounds to predict whether an ICU patient is likely to suffer from respiratory complications after removal from a mechanical ventilator, alerting intensive care teams to the need for emergency interventions at an early phase after extubation.

The monitoring device designed by Hiroshima University (HU) emergency and critical care medicine specialists is powered by an AI they previously created and trained to analyze and visualize abnormal respiratory sounds. The device's creation was funded by the Japan Agency for Medical Research and Development (AMED).

In their pilot study published in the *Journal of Clinical Monitoring and Computing*, the researchers detailed how converting abnormal respiratory sounds into quantitative values as a real-time monitor through their device proved to be useful in predicting respiratory complications after extubation.

The interface of the continuous respiratory sound monitoring device.
© *Nobuaki Shime, Hiroshima University*

According to the researchers, respiratory failure occurs in 10-20% of post-extubation cases in ICUs, with a mortality rate of 25-50%. Non-invasive ventilation (NIV), such as oxygen delivery via face mask, or high-flow nasal cannula (HFNC) may prevent respiratory failure and the need for reintubation. However, they noted that the high cost of these devices makes it difficult to provide them to all patients who are removed from breathing support.

"Respiratory failure in the intensive care unit (ICU) frequently occurs, particularly in patients after extubation, but there has been a lack of sufficient monitors to detect such abnormalities earlier," said Nobuaki Shime, professor at HU's Graduate School of Biomedical and Health Sciences, who led the research team.

Shime noted that auscultation of the respiratory system, or listening to breathing sounds with a stethoscope, could be a "simple and useful method to assess respiratory status." It is, however, "subjective and non-continuous."

Their device solves these problems by providing a continuous monitoring system for respiratory sounds as well as improving prognosis by assisting critical care staff in objectively evaluating respiratory status.

Although the device's predictive score remains to be validated due to the small sample size, the researchers believe that the continuous objective evaluation of respiratory sounds made possible by their apparatus might lead to increased patient safety in ICUs after extubation.

Recently, with the support of another AMED grant, they used their technology to develop another remote respiratory sound monitoring device that could be helpful during a pandemic. The remote medical device combines an electronic stethoscope with a smartphone app that can easily be used by non-doctor medical staff or even patients themselves to auscultate and quickly send information to a specialist for diagnosis.

Their research received the 2022 Best Presentation Award from the Japanese Airway Management Society.

Remote respiratory sound monitoring device developed through AMED Funding
© *Hiroshima University*

About the study

Kikutani, K. et al. Quantification of respiratory sounds by a continuous monitoring system can be used to predict complications after extubation: a pilot study. J Clin Monit Comput (2022). https://doi.org/10.1007/s10877-022-00884-4

Human 'blastoids' offer medical hope but also deep ethical challenges

Research performed on human blastoids, a research model of an early embryo built out of stem cells, may allow scientists to understand better what causes birth defects and lost pregnancies, and so prevent them. But such research is also ethically fraught, warn bioethicists, due to differing beliefs on whether the blastoid possesses sentience or has the potential to do so. A paper outlining some of these ethical challenges was published in *EMBO Reports*.

The scholars in their paper did not set out to make an argument for or against different regulatory or ethical attitudes toward human blastoid research, but instead wanted to explore what problems might arise around regulation of them to inform political, scientific and societal conversation about this research.

What makes the issue ethically fraught is that just as people have different views as to the moral status of embryos, especially in the context of research, they are likely to have different views on the moral status of blastoids. Some feel that the key question is whether embryos or blastoids have properties such as sentience — the ability to feel pain or experience consciousness, while others feel that the key question is whether they have the potential to do so.

The team led by Tsutomu Sawai, associate professor at the Graduate School of Humanities and Social Sciences, also noted that research regulation can be affected by whether human blastoids are derived from pluripotent stem cells such as embryonic stem cells (ESC) or induced pluripotent stem cells (iPSC) and discussed the ethical position regarding regulation and its limitations.

More here

About the study

Sawai, T., Akatsuka, K., Okui, G., & Minakawa, T. (2022). The regulation of human blastoid research. In EMBO reports (Vol. 23, Issue 10). EMBO. https://doi.org/10.15252/embr.202256045

HU starts trial of promising stem cell therapy for post-stroke brain function recovery

Therapeutically superior mesenchymal stem cells derived from the cranial bone offer hope in reversing paralysis and language impairment in moderate to severe cases of stroke.

Hiroshima University started in August the human trial for a promising treatment that offers hope in potentially reversing paralysis and language disorder after moderate to severe stroke using therapeutically superior mesenchymal stem cells (MSCs) derived from the cranial bone.

The proposed therapy uses patients' own cultured MSCs taken from their cranial bone, known as autologous cranial bone-derived MSCs, as a treatment for moderate to severe cerebral infarction — from which neurological dysfunction recovery is extremely difficult with standard treatment. Cerebral infarction, which clinically manifests as ischemic stroke, happens when blood and oxygen supply to the brain is disrupted, most commonly due to a blood clot blocking blood vessels.

The HU researchers leading the clinical study — Department of Neurosurgery's Professor Nobutaka Horie and Assistant Professor Takafumi Mitsuhara, and Bio-Environmental Adaptation Sciences Professor Rui Yuge — have been studying the use of MSCs for nerve regeneration therapy. They have successfully demonstrated that cranial bone-derived MSCs effectively restored neurological function in rat models of brain infarction and spinal cord injury.

The researchers said that cranial bone-derived MSCs are superior to the ones isolated from the iliac bone, the most exploited source of MSCs, as they possess greater (1) expression of neurotrophic factors, (2) neuroprotective effect of culture supernatant, and (3) ability to differentiate into nerves.

The clinical trial is being conducted by the HUMAN (Hiroshima University Mesenchymal stem cell Application for Neuro-regeneration) Project, a collaboration among HU's Department of Neurosurgery and Bio-Environmental Adaptation Sciences and HU-originated venture companies TWOCELLS Co., Ltd. and Space Bio-Laboratories Co., Ltd.

More here

Researcher team investigates sex-determination mechanisms in birds

Scientists have known that sex-determination in vertebrates happens in the germ cells and the somatic cells. Yet they have not fully understood the mechanisms by which it happens. To better grasp the process of the germ cell's sex determination, a research team has analyzed germ cells in chickens using RNA-sequencing to predict the mechanism that determines the sex. The study, published in *Scientific Reports*, provides insight into the mechanism of sex determination in birds.

"While previous studies have demonstrated that chicken primordial germ cells possess a characteristic feature in sex determination, its mechanism remains unclear. To solve this challenge, we revealed gene expression profiles of male and female primordial germ cells derived from early chick embryos and then predicted the sex determination mechanism," said Kennosuke Ichikawa, a postdoctoral researcher at Hiroshima University's Genome Editing Innovation Center. This research is the first to predict the sex-determination mechanism by comparing the gene expression profiles of avian primordial germ cells at each embryonic stage, as well as by using a stimulation test.

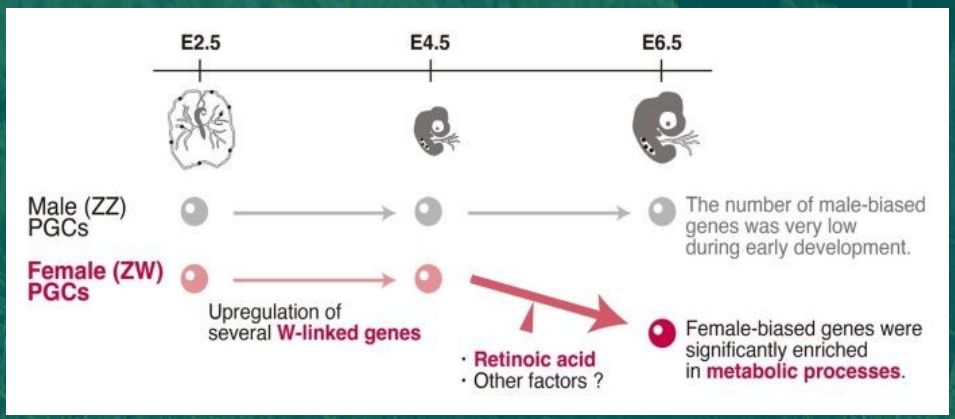
Birds have unique mechanisms of sex determination, that are different from mammals. In mammals, which have an XX (female) — XY (male) sex chromosome system, their sex determination depends on the action of the Y -chromosome. In birds, which have a ZZ (male) – ZW (female) sex chromosome system, their sex depends on the action of the Z chromosome. Yet the molecular mechanism of sex determination remains unclear. The researchers' investigation of the sex-determination mechanism in birds provides them insight into the evolution of vertebrate sex-determining mechanisms.

The team purified male and female primordial germ cells from the blood and the gonads, using fluorescence-activated cell sorting. They determined gene expression profiles of the primordial germ cells at each developmental stage for each sex using RNA-sequencing analysis, where next-generation sequencing is used to examine the quantity and sequences of RNA in a sample. They then predicted the sex-determination mechanism of the primordial germ cells using bioinformatic analysis, where computer tools are used to understand biological data. To evaluate the prediction, they stimulated male primordial germ cells with retinoic acid in vitro and examined the changes in gene expression.

Before settling in the gonads, the female circulating primordial germ cells obtained from blood displayed sex-biased expression. The primordial germ cells from the gonads also exhibited sex-biased expression, and the number of female-biased genes detected was higher than that of male-biased genes. The team realized that the female-biased genes in the primordial germ cells were enriched in some metabolic processes. To reveal the mechanisms underlying this process, the researchers performed stimulation tests.

The team used retinoic acid to stimulate the cultured primordial germ cells collected from male embryos. This stimulation resulted in the upregulation – the process where a cell's components increase – of several female-biased genes. Overall, their results suggest that sex determination in avian primordial germ cells involves aspects of both cell-autonomous and somatic-cell regulation. Moreover, it appears that sex determination occurs earlier in females than in males.

"We successfully predicted female-specific potential processes and pathways in chicken primordial germ cells. We believe our data set can significantly contribute to elucidating the avian sex determination mechanism," said Ichikawa.



© *Kennosuke Ichikawa, Hiroshima University*

"We successfully predicted female-specific potential processes and pathways in chicken primordial germ cells. We believe our data set can significantly contribute to elucidating the avian sex determination mechanism.

KENNOSUKE ICHIKAWA
Researcher
Genome Editing Innovation Center

About the study

Ichikawa, K., Nakamura, Y., Bono, H., Ezaki, R., Matsuzaki, M., & Horiuchi, H. (2022). Prediction of sex-determination mechanisms in avian primordial germ cells using RNA-seq analysis. In Scientific Reports (Vol. 12, Issue 1). Springer Science and Business Media LLC. https://doi.org/10.1038/s41598-022-17726-7

Wrapping of nanosize copper cubes can help convert carbon dioxide into other chemicals

As the need to mitigate climate change accelerates, scientists are trying to find new ways to reduce carbon dioxide emissions. One process, called electrochemical reduction or electrolysis, uses electricity and a catalyst to convert carbon dioxide into organic products that can be used in other ways. Unlike conversion between water and hydrogen, chemical recycling of carbon dioxide can produce various useable products because carbon can develop vast varieties of organic structures.

One way to achieve electrochemical reduction of carbon dioxide uses very tiny pieces of copper. While bulk copper metal has known to convert carbon dioxide into various organic molecules, these small pieces of copper can further improve catalytic activity not only by the increase of its surface area but also by the unique electronic structure of copper emerged from nanosizing.

In a paper published in *Chemical Communications*, researchers explain a process for improving the way the copper nanocubes convert carbon dioxide, by improving their selectivity. Selectivity refers to the ability of a catalyst to produce a desired product over unwanted byproducts.

"Recent developments in carbon dioxide reduction using copper electrocatalysts can convert the gas into hydrocarbons and alcohol, but the selectivity of various copper-related electrocatalysts developed so far is still elusive, because they tend to lose activity through structural reorganization during the catalysis," said Shoko Kume, associate professor at the Graduate School of Advanced Science and Engineering at Hiroshima University.

Researchers discovered that this problem can be solved by growing an organic layer on top of the nanocubes. First, a pair of monomers were added to the copper oxide nanocube. These monomers were tethered by the chemistry on copper oxide and an even organic layer grew on the surface of the cubes. This new organic layer helps improve carbon dioxide reduction selectivity, in part because carbon dioxide has poor solubility and the organic layer the researchers produced has hydrophobic properties, meaning it repels excessive water, from which unwanted hydrogen is produced.

Another important factor for improving the quality of the organic layer was the temperature at the time of the growth, with the best results found at room temperature. Under the best conditions, the layer is flat with a thickness of several molecules. Even the thin layer readily permeates carbon dioxide and allows the wrapped copper to undergo electroreduction, protecting the metals and helping the cubes retain their shape.

Currently, copper nanocubes are not widely adopted as a method for carbon dioxide reduction because they are unstable and do not have the level of selectivity needed to effectively recycle the carbon dioxide into other chemical products. The findings of this paper highlight a new method of creating an electrocatalyst using copper nanocubes that can solve some of these problems. Researchers also point out, looking ahead, that the method can be modified to control both the selectivity and improve how the catalysts work.

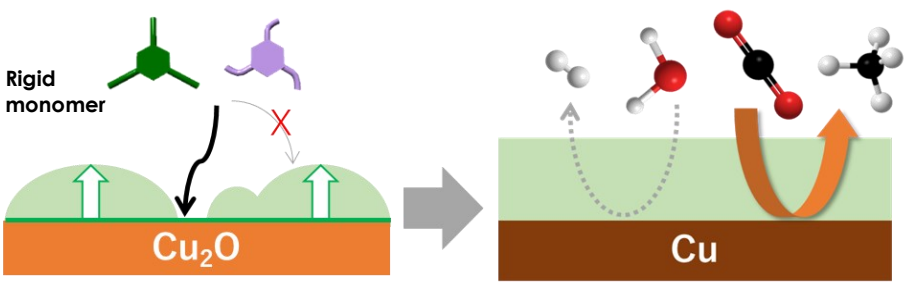
"Our current method can introduce a vast variety of organic structures within the layer, which can be involved in the carbon dioxide reduction process to control its selectivity and efficiency," said Kume. "It can also be used to control the dynamic behavior of metal species during catalysis, which can develop catalysts with long life and a tolerance for impurities."

The wrapping improved carbon dioxide reduction of the copper beneath this organic layer by suppressing hydrogen evolution, and also maintained the cubic structure throughout the catalyst operation.

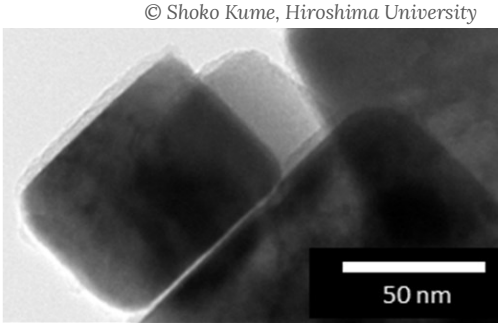
SHOKO KUME
Associate Professor
Graduate School of Advanced Science and Engineering

About the study

Umeda, T., Kurome, T., Sakatmoto, A., Kubo, K., Mizuta, T., Son, S. U., & Kume, S. (2022). Uniform wrapping of copper(i) oxide nanocubes by self-controlled copper-catalyzed azide–alkyne cycloaddition toward selective carbon dioxide electrocatalysis. In Chemical Communications (Vol. 58, Issue 58, pp. 8053–8056). Royal Society of Chemistry (RSC). https://doi.org/10.1039/d2cc02017c



Specific layer growth on the surface **CO_2 reduction through layers**



Uniform layer formation on copper cube

Study finds tactile impressions add product value

New research shows that consumers are willing to pay extra for products that give them more to feel.

YOSHIHIKO KADOYA
Professor
Graduate School of Humanities and Social Sciences

YUICHI KURITA
Professor
Graduate School of Advanced Science and Engineering

A pioneering study found that the value of a product could be increased by differentiating its tactile impression.

The study conducted by researchers from Hiroshima University and DIC Corporation was carried out on 139 HU students and staff who were also smartphone users. Their findings were published in *IEEE Access*.

Participants were asked to show a willingness to pay for smartphone covers with four types of surface texture — which were differentiated by surface smoothness, height, slipperiness, dampness, granularity, stickiness, and dryness — when the reference smartphone cover price was 100 yen and 1000 yen.

The experiment shows that smartphone users were willing to pay a premium for most of the surface textures irrespective of the reference price.

HU's Professor Yoshihiko Kadoya from the Graduate School of Humanities and Social Sciences and Professor Yuichi Kurita from the Graduate School of Advanced Science and Engineering, members of their laboratories, and a group of researchers from DIC Corporation conducted the experiment from July 4 to July 11, 2019. A questionnaire covering smartphone cover textures and related tactile impressions, as well as demographic, socioeconomic, and usage-related features of smartphone users, was used to collect information.

The study used a contingent valuation method and an open-ended question on how much respondents were willing to pay for a certain type of surface texture. The reference product was a 100-yen plastic smartphone cover from a 100-yen shop without surface texture for which the reference prices were fixed at 100 yen and 1000 yen. Participants were asked to compare between the reference smartphone cover and smartphone covers with surface textures A, B, C, and D and to show their willingness to pay when the reference price was 100 yen or 1000 yen.

Kadoya, the first author and lead researcher of the experiment, said that surface texture could be an important aspect of product design, having the ability to influence the price. However, the commercial viability of the surface texture has hardly been empirically examined. We conducted this pioneering study to lay the foundation for full-scale studies in the future, he added.

The study results show that participants' willingness to pay premiums for tactile impressions could be quite high. Moreover, willingness to pay for tactile impressions had a statistically significant association with users' age, usage time, and living conditions.

Kadoya further added that the experiment would benefit manufacturers in understanding the commercial value of surface textures. Manufacturers of electronic devices, laptops, wallets, furniture, and others could also benefit from designing appropriate surface textures for their products. Additionally, the findings of the study have implications for online business trends, particularly during the COVID-19 pandemic. Since customers value surface textures, further efforts should be made to digitize the feeling of surface texture for online trading.

Experimental setup
© *Yoshihiko Kadoya, Hiroshima University*

About the study

Kadoya, Y., Khan, M. S. R., Watanapongvanich, S., Fukada, M., Kurita, Y., Takahashi, M., Machida, H., Yarimizu, K., Kimura, N., Sakurai, H., Nakamura, K., & Ebara, R. (2022). Consumers' Willingness to Pay for Tactile Impressions: A Study Using Smartphone Covers. In IEEE Access (Vol. 10, pp. 85180–85188). Institute of Electrical and Electronics Engineers (IEEE). https://doi.org/10.1109/access.2022.3197891

Two-hour prenatal course may reduce postpartum depression and increase parental confidence

Knowledge may be even more powerful than the adage implies: It could help reduce postpartum depression in mothers. Postpartum depression is on the rise in Japan, especially as traditional support systems shift to more contained, nuclear groups, especially in more urban areas.

"Mothers in urban Japan are at a high risk for postpartum depression," said Hiroshima University Professor Yoko Shimpuku. "We found that a two-hour course, called Help, Understanding, Guidance (HUG) Your Baby, significantly reduced that risk and increased parental confidence."

Shimpuku and the multi-institutional team's findings were published in *Women and Birth*.

The HUG Your Baby program was developed by a US family nurse practitioner. Shimpuku and co-author Mariko Iida, of Yokohama City University, translated it into Japanese and introduced it to healthcare providers and midwifery students in 2013. It has been well-received, but has not been rigorously assessed.

More than 220 women were recruited to the study from 2015-2016. The control group received regular prenatal treatment and a leaflet with some more information, while the intervention group participated in a two-hour course consisting of a lecture about how to recognize and respond to a baby's behavior and hands-on learning with a doll.

The participants' scores in both groups at one month indicated that they were at a higher risk for postpartum depression than a national survey, but the intervention's group was lower than the control's score. "It can be said that the HUG Your Baby intervention decreased maternal depression in high-risk mothers living in urban Japan."

More here

About the study

Shimpuku, Y. et al. (2022). Prenatal education program decreases postpartum depression and increases maternal confidence: A longitudinal quasi-experimental study in urban Japan. In Women and Birth (Vol. 35, Issue 5, pp. e456–e463). Elsevier BV. https://doi.org/10.1016/j.wombi.2021.11.004

Study reveals the unseen havoc natural disasters can wreak on our brain

Research shows that natural catastrophes may trigger or exacerbate attacks of incapacitating migraine in disaster victims.

Acute migraine attacks can be triggered by sleep disturbance and psychological stress, a tremendous amount of which are likely to be experienced when a natural catastrophe strikes. As the world experiences more frequent and increasingly destructive natural disasters, a team of Japanese researchers argued for a need to improve our understanding of how disaster-related diseases unfold. The study published in *Headache* is the first to prove a causal link between a natural disaster and the frequency of migraine attacks using big data.

The researchers conducted a retrospective longitudinal cohort study and looked at triptan and ergotamine prescriptions — medications for acute migraine — entered in the National Database of Health Insurance Claims. For the study, the researchers focused on people aged 15 to 64 who were located in the hardest-hit areas a year before and after the 2018 Japan floods, one of the country's largest water disasters. Those who had a victim code certificated by a local government were assigned to the victim group while others were designated to the nonvictim group.

Of the 6,176,299 people registered in the national database who live in the areas observed in the study, some 3,475,515 were between the ages of 15 and 64 years.

The findings showed that among the people enrolled in the study, some 3,447,356 had no previous treatment for acute migraine. Among the victim group, 0.70% (111) were newly prescribed acute treatment after the disaster compared to 0.43% (14,626) among nonvictims.

"The 2018 Japan floods, the second largest disaster of this century in Japan, increased the number of prescriptions for acute migraine medications among victims. The study suggests that a natural disaster caused or exacerbated acute migraine attacks among victims," said study co-author Masatoshi Matsumoto, a professor at the Graduate School of Biomedical and Health Sciences.

More here

About the study

Okazaki, Y., Yoshida, S., Kashima, S., Koike, S., & Matsumoto, M. (2022). Impact of the 2018 Japan Floods on prescriptions for migraine: A longitudinal analysis using the National Database of Health Insurance Claims. In Headache: The Journal of Head and Face Pain (Vol. 62, Issue 6, pp. 657–667). Wiley. https://doi.org/10.1111/head.14301

Feature

GET TO KNOW OUR DPs & DRs

We asked four scientists in the prestigious Distinguished Professors and Distinguished Researchers program questions about their fields and exciting developments in their work.

Distinguished Professors

The DP program believes that active research pursuits by individual researchers is essential for the "formation of unique Centers of Excellence in research." To secure outstanding researchers, the university offers institutional priority status to select extraordinarily distinguished professors trying to solve pressing problems in their fields.

Takeharu Haino

Distinguished Professor

Graduate School of Advanced Science and Engineering

Organic chemist Takeharu Haino's curiosity to solve chemical mysteries led him to explore supramolecules' many potentials in developing unique materials. His work ushered in the creation of new supramolecular polymers that self-heal and are customizable.

Discovering various uncommon features associated with non-covalent chemical bonds

The focus of my research is supramolecular chemistry, which is a part of organic chemistry. General chemistry deals with molecular structures that are assemblies of atoms connected by chemical bonds (covalent bonds) where atoms share electrons. In contrast, supramolecular chemistry deals with supramolecules that are assemblies of molecules as a structural element which are weakly associated with each other by non-covalent bonds.

Uncovering unknown properties of supramolecules

There is no material that has properties that perfectly satisfy our desires; this is why research work for the development of functional materials is so exciting. For example, the first cars were made mainly of wood and metal. These heavy materials have since been replaced with plastic, and with the progress of polymer science, this plastic continues to be replaced with lightweight, durable polymer materials. The lightweight properties achieved by polymer science continue to make huge contributions toward carbon neutrality.

A burning curiosity to solve chemical mysteries

We are also looking at the development of materials that can contribute to a low-carbon society, such as light-modulating materials that can block heat when applied to vehicle windows. At the very root of my role as a researcher is a curiosity to uncover the unknown.

Elsewhere, I think it's disappointing that chemistry is often seen as a branch of natural science that is particularly difficult to approach. Chemistry has just as many mysteries as the universe, and what is more, it is one of the most familiar areas of science to us. I hope we can attract more people to the field of chemistry and the excitement it holds.

Takashi Yamamoto

Distinguished Professor

Graduate School of Integrated Sciences for Life

Molecular geneticist Takashi Yamamoto's work advances the development of safe and low-cost gene editing tools. His research aims to solve shared human challenges in areas such as food, energy, and diseases.

Developing inexpensive, highly safe genome editing tools

We are conducting research to develop and apply basic technologies for genome editing, the process of rewriting the genome at will. Potential applications include genetic improvement of crops, livestock, and fishery products, use of microorganisms to produce highly functional materials, treatment of diseases, and drug discovery. We also developed an improved version of the TALEN genome editing tool called Platinum TALEN, and then a more powerful version called FirmCut Platinum TALEN.

Fusing genome editing with digital technology

We believe that even when a certain technology already exists, making that technology widely accessible will spark innovation. Based on this belief, we launched the Japanese Society for Genome Editing in 2016 to accelerate genome editing research in Japan. The Genome Editing Consortium for Industry-Academia Co-creation, an organization for industry-academia collaboration, was later established as a program of the Japan Science and Technology Agency (JST) based at HU. In 2019, the HU Genome Editing Innovation Center was established.

A project to build a BioDX Industry-Academia Co-Creation Center at HU was selected to receive support from a JST funding program in 2020, and this has allowed us to further expand our industry-academia co-creation initiatives. For example, we took this opportunity to enhance our joint research on biofuels with Mazda.

Making Hiroshima a center for learning about genome editing

Some genome-edited crops, livestock, and marine products, such as GABA-rich tomatoes and meaty red sea bream, are already commercially available. Eventually, we would like to create an environment where people from all over Japan will come to HU to learn about genome editing.

Distinguished Researchers

The DR program recognizes distinguished junior faculty members who are expected to become DPs in the future, enabling the university to ensure an environment where these faculty members can devote themselves to their research.

More here!

**Answers in the questions were edited for clarity and brevity.*

Masakoto Kanezashi

Distinguished Researcher

Graduate School of Advanced Science and Engineering

As a chemical engineer, Masakoto Kanezashi develops new materials that can be used in the gas or liquid separation process. In particular, he explores the use of amorphous silica, a kind of quartz glass, as a tool for molecular separation. He aims to create high-performing and economically feasible membranes for use in industrial settings that can aid in the global effort in achieving the SDGs.

Q: Could you introduce us to your research field?

I specialize in membrane science and technology. I am currently working on the development of novel porous materials for applications such as gas separation and liquid separation.

Q: Why is membrane science important, and how is this related to your research?

Separation processes, such as distillation, evaporation, and extraction, are ubiquitous in conventional chemical plants, including petrochemical plants. These processes typically consume huge amounts of energy for the purification of specific components. In contrast, membrane separation provides a more energy-efficient alternative. This is why membrane science and technology could help us reach the United Nation's Sustainable Development Goals (SDGs).

Q: What are some key questions being asked by researchers in your field?

Many researchers, including myself and my team, recognize that not only the performance but the cost and robustness of the developed membranes are critical for successful industrialization. In other words, we want membranes that not only have a high permeation rate, selectivity, and stability, but that are also inexpensive and durable. Thus, the selection of materials and the optimization of the fabrication process are two important aspects for these purposes.

Q: Do you have any advice for young students or researchers?

All my students are very diligent, but sometimes, they're afraid of failure. Always try and challenge this fear; even if you fail, you will come out of it strong and learn something.

Satoyuki Tanaka

Distinguished Researcher

Graduate School of Advanced Science and Engineering

Structural systems engineering expert Satoyuki Tanaka's research is in the field of computational mechanics. He develops numerical simulation methods that can help in better understanding the mechanical behaviors and improving the structural design of transportation structures and vehicles such as automobiles, trains, aircraft, ships, offshore jackets, and pressure vessels.

Q: What got you into this field?

I was fascinated by the mechanics of nature, like the current of water, flame burning, and stream of clouds, since my childhood. My interest in these mechanics became stronger due to my high school physics mentor. Then, I have been studying related subjects more passionately from my higher education levels until now.

Q: What are the discoveries that have led up to your current work?

It is the damage and fracture phenomena of materials and structures. Our laboratory has been mainly focused on the steel structural material which have been widely used in several industrial sectors. So, its damage phenomenon becomes a common target in mechanical, naval, aeronautical, civil, and architectural research fields nowadays and this led up to my current work.

Q: What are the economic or social stakes of your study from your perspective?

Ultimately, it is a safe and reliable industry through efficient, advanced, and optimized structural designs. For example, if structural weight can be reduced, transportation will be more efficient. If structural damage can be prevented, we can save, the economy and the environment. I am delighted to say that these aspects can be evaluated through knowledge of mechanics.

Q: What achievement are you most proud of?

My original numerical method for solid and structural mechanics simulation. It was published in a high-ranking international journal. I was very happy with it.

WOMEN IN *Meet our researchers* ACADEMIA

This doctor is leading the 'e-girls culture' in Japanese hospitals, but it's not what you think

Dr. Yuko Nakashima, Hiroshima University

The ability to see what's happening inside the body in real-time and at a high resolution is a capability that ultrasound grants orthopedists at a low cost to patients. Ultrasound-guided diagnosis, however, remains relatively new in the field. Dr. Yuko Nakashima is here to change that for Japan with the help of her fellow "e-girls."

If you go to Hiroshima University Hospital for a persistent shoulder pain that's bugging you, chances are you're going to be checked by orthopedist Dr. Yuko Nakashima, Japan's leading "e-girl." Except she's not an e-girl as you may think. Rather than the electronic girls, a subculture that has gained mainstream popularity thanks to social media, these e-girls doing rounds in hospitals stand for echo girls. It is an allusion to the echoes of high-frequency sound waves that form into images in an ultrasound — their expertise.

Ultrasound gives orthopedists the ability to see underneath the skin in real time and check for musculoskeletal abnormalities in a low-cost and non-invasive manner. Despite this, ultrasound-guided diagnosis remains relatively new in their field. Nakashima is here to change that for Japan. Much like how electronic girls conquered popular culture, Nakashima hopes the echo girls' influence could soon make ultrasound use widespread in Japanese orthopedics — potentially transforming the culture of care in hospitals into a more exceptional experience for patients.

"For ob-gyn and internal medicine, ultrasounds may be the first choice. But for orthopedic clinics, the general image of diagnostic imaging may be X-rays, CT scans, or MRIs," she said.

"Although in recent years, with technological advancements, ultrasound also came into use in the field. We can now see what we couldn't see before in real-time, such as the bone surface and soft tissues like muscles, tendons, ligaments, nerves, and blood vessels."

Nakashima started her "E-Girls Project" in 2019 to help fellow female orthopedic surgeons build capacity and confidence in ultrasound use. But there was a time she wasn't comfortable calling herself an orthopedic surgeon.

Dr. Nakashima demonstrating how ultrasounds show muscle contraction.

"I started my practice when I was 24 years old. So, it's been about 24 years now. But I was kind of away from work when I was raising my kids so I kind of feel like I'm so behind. I'm unable to spend time training for surgery for a long time. That's why I'm hesitating to say that I'm an orthopedic surgeon," she said.

Looking back, what she felt to be a lag in her career turned out to be an opportunity to forge her own path.

"One day, I found a machine covered with cloth in a storage room in the outpatient clinic. When I opened it, it was an ultrasound machine. The machine worked when I turned it on. I didn't know who bought it, when, or why but I wondered why it wasn't being used even though it was usable," she said.

Nakashima immediately realized its potential and started looking for textbooks and seminars on it. She found one seminar in Tokyo and quickly signed up.

"I thought it was exciting. It was fun. So, I decided to continue training, even though it was only me doing it in the hospital. I wanted to do a job where people could rely on me, even if it was just one thing."

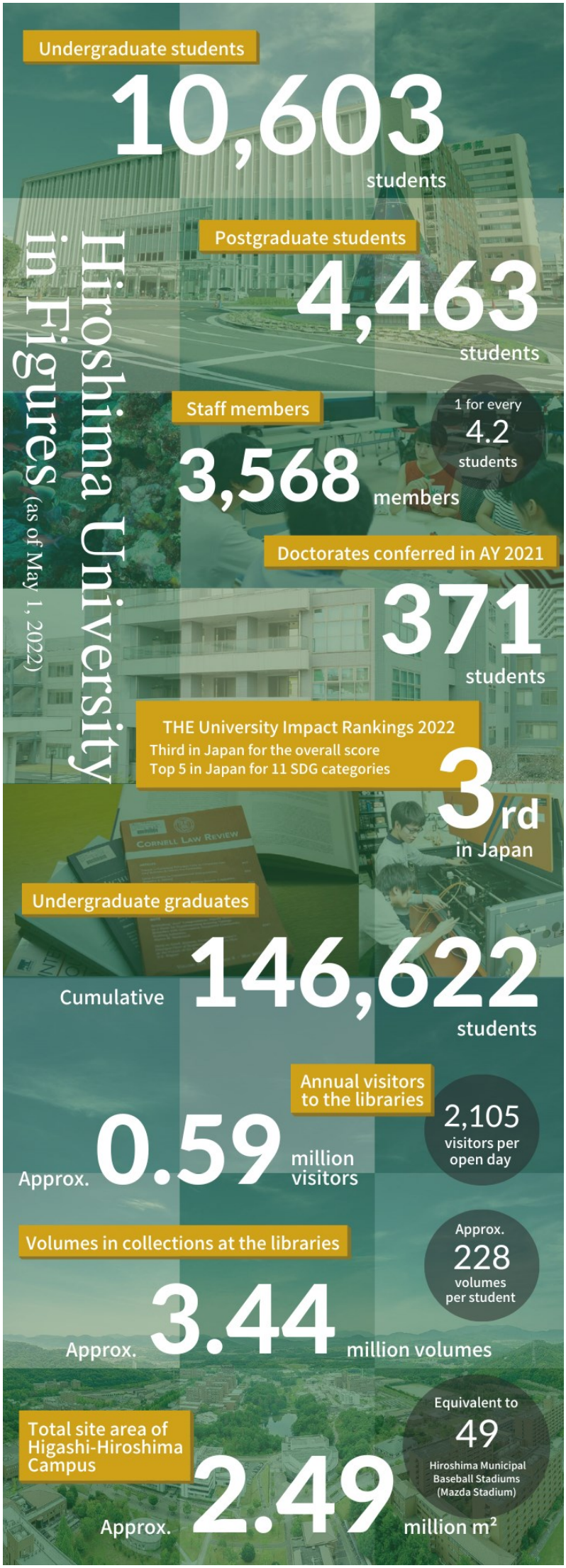
Her work has since led to advances in orthopedics. In 2014, five years since she started learning about ultrasonography, she and her co-researchers were the first to detect via preoperative imaging the presence of hourglass-like fascicular constriction, a condition that causes palsy, in patients' hands. They used a high-resolution ultrasound to evaluate telltale signs of the lesion. Before this, constrictions have only been discovered through surgical exploration.

Seeing the similar passion in fellow e-girls is something that both surprise and delight her. "The desire to learn seem to flow from their whole body," she said.

Learning is also the theme of this year's 33rd Annual Meeting of the Japanese Society of Orthopedic Ultrasonics, which Nakashima chairs.

Although she knows ultrasound's many advantages in evaluating musculoskeletal problems, she admits it does have limitations.

"I don't think ultrasound can solve everything. But I believe that it will help reduce unnecessary tests, many of which are expensive, and reduce the medical costs of patients. It also means reduced radiation exposure, which benefits both doctors and patients," she said.



SCHOOLS AND GRADUATE SCHOOLS

SCHOOLS (UNDERGRADUATE)

For undergraduate level, Hiroshima University consists of 12 schools which provide undergraduate courses including majors in the natural sciences, humanities, the social sciences, and many others.

School of Integrated Arts and Sciences
School of Letters
School of Education
School of Law
School of Economics
School of Science
School of Medicine
School of Dentistry
School of Pharmaceutical Sciences
School of Engineering
School of Applied Biological Science
School of Informatics and Data Science

GRADUATE SCHOOLS

Graduate level studies at Hiroshima University consist of 4 graduate schools below.

Graduate School of Integrated Sciences for Life
Graduate School of Biomedical and Health Sciences
Graduate School of Humanities and Social Sciences
Graduate School of Advanced Science and Engineering

ADVANCED COURSE

Special Course of Special Support Education

INTERDISCIPLINARY GRADUATE EDUCATIONAL PROGRAM

In addition, three unique program offerings combine graduate level academic coursework with integrative research components.

Phoenix Leader Education Program (Hiroshima Initiative) for Renaissance from Radiation Disaster

TAOYAKA PROGRAM for creating a flexible, enduring, peaceful society

The Frontier Development Program for Genome Editing

CAMPUS LOCATION & ACCESS

❶ 〈Hiroshima City (Midori District)〉
Elementary School
Junior High School
Senior High School

❷ 〈Higashi Hiroshima City〉
Kindergarten

❸ 〈Hiroshima City (Shinonome District)〉
Elementary School
Junior High School

❹ 〈Mihara City〉
Kindergarten
Elementary School
Junior High School

❺ 〈Fukuyama City〉
Junior High School
Senior High School

NEW SPACES ON CAMPUS

14 JUL 2022

Radiation Disaster Medical Training Building

A new training facility on radiation disaster medicine.

21 JUL 2022

Materials MBR Building and Data-driven Research Building

An open innovation center where co-creation activities are carried out to address issues that are difficult for individual companies to solve.

16 OCT 2022

Hiroshima University Kiteminsai Lab

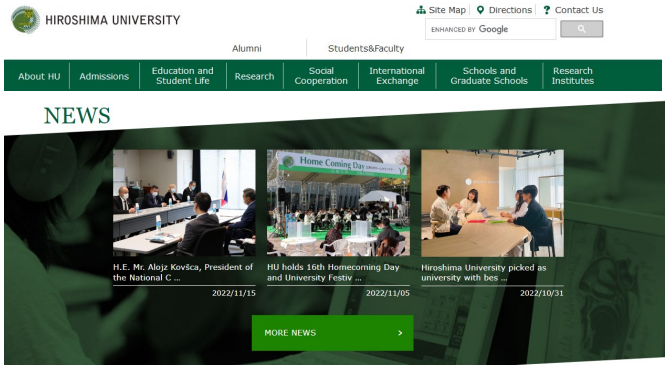
A co-working space on the second floor of the Hiroshima JP Building located adjacent to the south exit of Hiroshima Station.

FIND MORE ABOUT HU

HU OFFICIAL WEBSITE – ENG

Latest News, Events and Research, as well as links to each university section are available from this webpage.

https://www.hiroshima-u.ac.jp/en



UPDATES FROM OUR LABORATORY

This webpage is the source for visitors worldwide to stay updated about what happens in the lab at HU.

https://www.hiroshima-u.ac.jp/en/laboratory-updates

HU STUDENT VLOGS

What is it like being an international student at HU? Our student vlogger takes you through her journey as an international student at HU as she shares the charms of the university and its surroundings.

https://youtu.be/TRxoBTcmTWo

Finding researchers at HU is now easier than ever!

Introducing the Researcher Directory — HU's researcher search system. Users may now search the research fields and achievements of approximately 1,900 researchers affiliated with HU by topic, Sustainable Development Goals (SDGs), discipline, alphabetical order, or simply entering a keyword in the built-in search box.

Check out the site here ↓

https://www.guidebook.hiroshima-u.ac.jp/en

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Connect with us!

30 NOV 2022

Ryoun Lecture Building

A new lecture building in the Kasumi campus for medical and law students, with spaces to host conferences, training sessions and other events.

HU celebrates its
75+75th anniversary
in **2024**

Hiroshima University 75+75th Anniversary Project

Introducing new catchphrase and logo

Born under a new system in 1949, Hiroshima University's history dates back to 1874, when the Hakushima School — its oldest predecessor school — was founded. In over 140 years, the university has produced numerous talented individuals.

In this sense, 2024 marks 75 years since the foundation of HU and 150 years since the founding of its oldest predecessor school.

As part of HU's 75+75th anniversary project, the university has created a new catchphrase and logo.

Catchphrase

Row out into a sea of chaos; go beyond the horizon of creativity.

HIROSHIMA UNIVERSITY

University of World-wide Repute and Splendor for Years into the Future

Hiroshima University
Public Relations Office
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Cover photo: Winter illumination, Higashi-Hiroshima Campus