HIROSHIMA UNIVERSITY

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HIROSHIMA UNIVERSITY

VOLUME 17 · SUMMER 2022

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

CONTENTS

MEET OUR RESEARCHERS

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

HU Alumni Association's launch of
Indonesia chapter a big success!

"

This chapter is very different from previous alumni associations. The purpose is to actively collaborate with industry, academia, and government to build a platform for creating new value in various fields. Let's work together as 'Team HIRODAI.

MITSUO OCHI

President
Hiroshima University

Hiroshima University alumni in Indonesia gathered in its capital of Jakarta on May 28, 2022, to mark the inauguration of the Hiroshima University Alumni Association (HUAA) Indonesia Chapter.

The event was held at the Shangri-La Hotel, with approximately 100 guests in total, composed of 50 alumni, people involved in industry-academia-government collaboration between Japan and Indonesia, and staff from HU in attendance. Around 50 alumni living far from the venue also participated online.

The commemorative event, sponsored by the HUAA Indonesia Chapter and co-sponsored by HU, was opened with greetings from HU President Ochi, the Co-President of the chapter.

In the future, the Indonesia Chapter will start activities as the first model of "the Hiroshima University Overseas Co-Creation Platform Plan" aiming to solve social issues and create new value for the realization of Society 5.0 and the SDGs in collaboration with HU's stakeholders, which include companies and related organizations.

Relive de highlights of the event here!

creating a *peaceful* world

HU's mission to contribute to the well-being of humankind by realizing a free and peaceful international society

HU professor leads JICA mission to assist displaced Ukrainians

MAR MAY 2022

A Japan International Cooperation Agency (JICA) needs assessment survey team led by a Hiroshima University professor was dispatched to Moldova with a mission to assist displaced people from Ukraine. The six-member mission led by Professor Tatsuhiko Kubo of HU's Graduate School of Biomedical and Health Science traveled to Moldova on March 19 to survey emergency humanitarian assistance and cooperation needs in healthcare. JICA dispatched two additional survey teams in April and May. Prof. Kubo was also part of the team dispatched in May.

Prof. Kubo spoke of the need to strengthen crisis management and disaster medicine systems in light of the possibility of a worsening war situation in the future and stressed the need for continued support during a press conference upon his return.

"We, the people of Hiroshima, should keep appealing that we are against war. Our thoughts are with the people and refugees in the region," he said.

Images courtesy of the Japan International Cooperation Agency

Prof. Kubo with the medical support team from Israel and the World Health Organization (WHO).

6th Peace Lecture Marathon
Dedication to peace is more important than ever before

07 APR 2022

On April 7, Hiroshima University invited Dr. Ana Polak Petrič, Ambassador Extraordinary and Plenipotentiary of the Republic of Slovenia as a guest speaker at the 6th Peace Lecture Marathon.

Ambassador Petrič gave a lecture titled "Dedication to Peace is More Important Than Ever Before," drawing on her knowledge as an expert in international law and as someone who has experienced armed conflict in the former Yugoslavia. While introducing international humanitarian law and the history of the UN Charter, Ambassador Petrič stressed the need to speak out for peace, respect for human rights, and international order in this day and age where we are witnessing the invasion of Ukraine by Russia.

Going forward, HU hopes to further the collaboration with universities and research institutions in Slovenia.
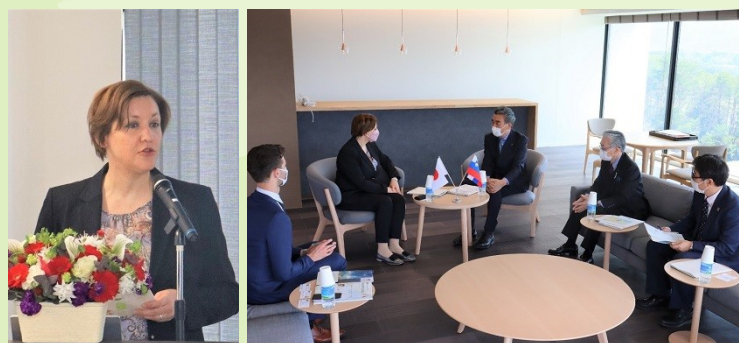
HU moving to accept students from Ukraine

SUMMER 2022

Hiroshima University is set to accept a 22-year-old Ukrainian student as a research student in the Department of Mathematics, School of Science. While his research period will be from six months to one year, he eventually hopes to enter HU's graduate school.

Following the Russian military invasion of Ukraine on February 24, HU issued a President's Message the following day protesting the invasion and appealing for a peaceful resolution. HU has also been promoting efforts to support Ukraine, including an on-campus emergency fund-raising campaign.

HU conference encourages more women to become entrepreneurs

Hiroshima University organized in March Asia's first conference on effectuation, the method expert entrepreneurs use to create ventures that thrive under highly unpredictable situations.

The two-day conference was held on March 8-9 at HU's Phoenix International Center MIRAI-CREA and online. The "Women in Entrepreneurship Education Symposium" was conducted on the first day of the event to mark International Women's Day followed by the main "Effectuation Conference" the next day.

Speaking at the conference was University of Virginia Darden School of Business Professor Saras Sarasvathy, who first articulated effectuation 20 years ago under the supervision of Nobel laureate in Economics Herbert Simon.

Amid hurdles posed by the pandemic, HU Associate Professor Emi Makino, one of the event's brainchild, said Japan's first effectuation conference came at the perfect time. As a mode of entrepreneurial action and logic, effectuation is gaining attention in the country's startup community and among marketers and management consultants.

> " I think the timing was ripe. And Japan has been investing heavily in entrepreneurship education for the past, maybe six or seven years.

EMI MAKINO
Associate Professor

Makino hopes to continue having the symposia on a regular basis, rotating from one university to another, and start developing a community of people interested in developing more women entrepreneurs and female entrepreneurship educators.

THE Impact Rankings 2022

HU ranks 3rd among Japanese universities

The British higher education journal Times Higher Education (THE) published its Impact Rankings 2022 — a list that assesses universities against the United Nation's Sustainable Development Goals (SDGs) — last April 28.

Hiroshima University placed 3rd in Japan with Keio University, Kobe University, Tohoku University, and the University of Tsukuba. For the overall ranking, HU ranked 101-200th among 1,406 universities worldwide. The overall ranking is calculated by combining the score in SDG 17 (Partnerships for the Goals) with the top three scores out of the remaining 16 SDGs.

HU was also listed in the top 100 globally in five of the 17 UN SDGs:

✓ 42nd for SDG 9 (Industry, Innovation, and Infrastructure)

✓ 60th for SDG 1 (No Poverty)

✓ 62nd for SDG 2 (Zero Hunger)

✓ 71st for SDG 6 (Clean Water and Sanitation)

✓ 80th SDG 17 (Partnerships for the Goals)

International efforts to achieve the SDGs

THE also placed HU among the eight finalists — the only nominee in Japan — for the International Strategy of the Year category of THE Awards Asia 2022, an international platform to recognize outstanding reform efforts by Asian universities.

By continuing and developing its sustainable development efforts, HU hopes to help achieve the SDGs by 2030 and to realize a peaceful world.

Hiroshima University
RANKED 101–200

THE IMPACT RANKINGS 2022
www.thewur.com

HU student's noise-canceling innovation places in top 10 of Red Bull Basement final

Koki Soeda

First-year master's student
Physics Program
Graduate School of Advanced
Science and Engineering
*Fourth-year student in the School of
Science at the time of the competition.

Koki Soeda is a physics student at the Graduate School of Advanced Science and Engineering. Soeda partnered with high school classmate Ryohei Kasai, currently a student at Mie University, to participate in the Red Bull Basement Global Final, placing in the top 10 among 44 teams around the globe.

Tell us about the competition.

Red Bull Basement — a program sponsored by Red Bull — aims to give university students the chance to showcase their ideas to change society and nurture the next generation of innovators.

Considering that virtual meet up spaces and events have increased in popularity due to COVID-19, our team proposed a noise-free space, an idea highly evaluated at the national selection round due to its effectiveness.

How did you come up with this idea?

I think we are all familiar with the impressive features of noise-canceling headphones.

Yet, a problem with these devices is that since all noises are blocked, users cannot notice when others are talking to them. Hence, we thought, "If we can partially create a noise-free space around the head, we can eliminate such inconvenience."

Tell us about your future plans.

We plan to turn our idea into an actual product in cooperation with the companies that supported us during the competition.

I would like to cherish the experience and ties with people gained from the competition and hope to advance my research and realize my ideas at graduate school.

About the project
From the website of Red Bull Basement

The Noise Cancelling Moving Space, or NCMS, reduces the effect of external sounds like trains and traffic. When the NCMS headphone set recognizes external sounds, it generates waves with the opposite phase to cancel them out.

MEET our STUDENTS

HU life, passion for languages, and a HIRAKU 3MT award-winning research

Mutia Kusumawati is an Indonesian student from the Graduate School of Education passionate about the Japanese language and culture.

Why Hiroshima University?

When I was in university in Indonesia, I heard many stories about HU, as several of the teachers in my department were HU alumni. I had also heard that HU is one of the best universities in Japan when it comes to the field of Japanese language education.

Last year you participated in the HIRAKU 3MT Competition, right?

Yes, I did. It's an exciting opportunity for doctorate students to effectively explain the vision behind and appeal of their research within a time limit of 3 minutes. I presented my research titled "Intercultural Understanding through Compliments" in Japanese and was awarded the "People's Choice" award.

Those who hear about this topic for the first time may wonder, "What's the point of studying compliments?" I really wanted people like that to be able to understand the importance.

What do you think of compliments used by Japanese people?

Compliments are used in places I would never have thought of. Why do they give compliments in this situation? What meaning or function do these compliments have? I'm now focusing on such questions and comparing them with compliments used in Indonesia.

What are your goals for the future?

After completing my studies at HU, my goal is to return to the field of Japanese language education and teach Japanese to Indonesians and other non-native speakers of Japanese. In order to achieve this goal, I would like to learn and absorb as much as possible here while I can.

Mutia Kusumawati

4th year Ph.D. student
Division of Educational Sciences
Graduate School of Education

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

# Muscle biopsy test for biomarker could lead to earlier diagnosis of ALS

Researchers outline preliminary research that could pave the way for a future test to diagnose ALS, a progressive disease of the nervous system.

Amyotrophic lateral sclerosis (ALS) is a progressive disease of the nervous system. It affects nerve cells in the brain and spinal cord called motor neurons. Motor neurons control muscle movement and ALS causes them to deteriorate and eventually die. The motor neurons lose the ability to send messages to the muscles in the body, affecting voluntary muscle movements. There have been recent advances in treating ALS, but current treatments can only slow disease progression. That is why it is important to diagnose ALS as early as possible.
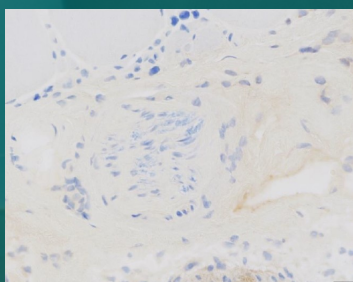
ALS is difficult to diagnose because, currently, there is no single test that can confirm the disease. Doctors look for neurological symptoms such as muscle weakness and upper and lower motor neuron symptoms. They will also do diagnostic tests to rule out other conditions like cervical spondylosis. A diagnostic test that could confirm ALS would help people get a diagnosis earlier and start treatment as soon as possible.

In a paper published in JAMA *Neurology*, researchers outline preliminary research that could pave the way for a future test to diagnose ALS.
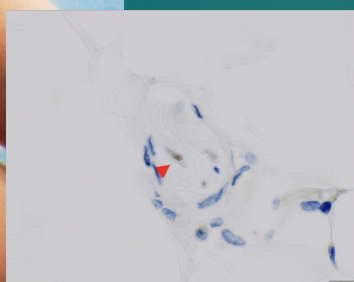
ALS   Non-ALS

Accumulation of TDP-43 with ALS patients
© Takeshi Kurashige, Kure Medical Center

"It is difficult to diagnose ALS in its early stages because there is not a known biomarker," said researcher Hirofumi Maruyama, a professor at the Graduate School of Biomedical and Health Sciences at Hiroshima University. "Muscle is possible to biopsy, and transactive response DNA-binding protein 43 (TDP-43) accumulates in the peripheral nerves inside muscle. TDP-43 is a protein that plays a key role on motor neurons, and accumulation of TDP-43 may be a biomarker for early diagnosis of ALS."

Previous research in mice has revealed a crucial function of TDP-43 in axons, the part of the neuron that sends signals to other neurons. This is important for ALS, because axonal degeneration causes the lower motor neuron problems that can be a symptom of ALS. Researchers hypothesized that TDP-43 accumulation in muscular nerve bundles could be an early predictor of ALS.

To test this theory, researchers first examined the muscle tissue of 10 individuals who had confirmed cases of ALS at the time of their death and 12 who did not. All 10 ALS patients had TDP-43 accumulations in their intramuscular nerve bundles, while 12 non-ALS controls had no TDP-43 accumulation.

Next, researchers targeted 114 patients who underwent a muscle biopsy and did not have a family history of ALS or another muscle or neuromuscular diagnosis. Of these, 71 had evidence of intramuscular nerve bundles and 43 did not. Among the 71 patients, axonal TDP-43 accumulations in their nerve bundles were confirmed in 33. These 33 patients with axonal TDP-43 accumulations were all later diagnosed with ALS. Among the 43 patients without nerve bundles, three were later diagnosed with ALS.

"Results of this dual case-control and cohort study suggest that axonal TDP-43 accumulations may be characteristic for patients with ALS, and consequently may be a novel diagnostic biomarker for ALS," said Maruyama.

> **Early diagnosis enables patients to initiate prompt treatment. We aim to prevent the progression of ALS and will continue research into developing new medication.**

HIROFUMI MARUYAMA
Professor
Graduate School of
Biomedical and Health Sciences

About the study

Kurashige, T., Morino, H., Murao, et al. (2022). TDP-43 Accumulation Within Intramuscular Nerve Bundles of Patients With Amyotrophic Lateral Sclerosis. In JAMA Neurology. American Medical Association (AMA). https://doi.org/10.1001/jamaneurol.2022.1113

Researchers develop procedure to interpret x-ray emission spectra of liquid water

© Osamu Takahashi, Hiroshima University

Water molecule in liquid phase accelerating dynamics by X-ray radiation

Water is an abundant and essential compound, found everywhere on earth. Yet despite its familiarity and simple structure, water displays many unusual physical properties. For more than a century, scientists have turned their attention to the study of water, attempting to better interpret its structure. An international team of researchers, led by a scholar from Hiroshima University, has developed a procedure allowing them to reproduce the double peak feature of x-ray emission spectroscopy (XES) spectra in liquid water.

The study helping to advance the understanding of the structure of water, led by Osamu Takahashi, an associate professor at Hiroshima University's Graduate School of Advanced Science and Engineering, is published in *Physical Review Letters*.

Through the years, as scientists have worked to better understand the structure of liquid water, some have studied water using a two-structure model. Other scientists, in a wide range of fields, have used a uniform, continuous liquid model. XES has proven to be a useful tool for researchers studying substances whose features are not homogeneous.

For over a decade, scientists have debated how to interpret XES spectra of liquid water. To solve this problem the research team performed molecular dynamics calculations to create the model structures of liquid water. Their next step was to estimate XES spectra for the liquid water, using first principles of quantum mechanical calculations.

The team was able to theoretically reproduce the double $1b_1$ feature, present in liquid water's x-ray emission spectroscopy. They explored different effects, such as geometry and dynamics, to determine the shape of the XES spectra.

Adopting classical molecular dynamics simulations, the team was able to construct the water's structure in the liquid phase. In these simulations, the researchers worked at various temperature points with the bond length and water molecule angles fixed. In the spectra they calculated, the researchers were able to reproduce the features, such as the double peaks of the $1b_1$ state, that had been previously observed by other scientists in experimental XES spectra.

To better understand the features they were seeing, the research team classified the XES spectra they calculated based on the different types of hydrogen bonds. They observed the double peak feature in the XES spectra in all the different types of hydrogen bonds they studied.

After examining the spectra related to the hydrogen bonds, the team studied the effect of thermally excited vibrational modes on the XES spectra. They obtained nine independent vibrational modes and studied their effects on the spectra.

The researchers were able to successfully reproduce the XES spectra of liquid water by examining the effect of full vibrational modes, O-H stretching, bending, and rotational modes. They explained both the temperature and isotope dependence by examining the hydrogen-bond configuration around the excited water molecule and core-hole induced dynamics. "Our procedure is general and can be applicable for various systems related to the phenomena including liquid water," Takahashi said.

The team is hopeful that their research may help to resolve some of the long-standing debates surrounding the interpretation of liquid water's structure. Looking to the future, the researchers see various potential applications for their procedure.

> "
> **Development of new materials such as electrodes used in batteries, biomaterials such as artificial blood vessels, and functional polymers such as water treatment membranes may be fascinating projects, which are related to the structure of liquid water.**

OSAMU TAKAHASHI
Associate Professor
Graduate School of Advanced
Science and Engineering

About the study

Takahashi, O., Yamamura, R., Tokushima, T., & Harada, Y. (2022). Interpretation of the X-Ray Emission Spectra of Liquid Water through Temperature and Isotope Dependence. In Physical Review Letters (Vol. 128, Issue 8). American Physical Society (APS). https://doi.org/10.1103/physrevlett.128.086002
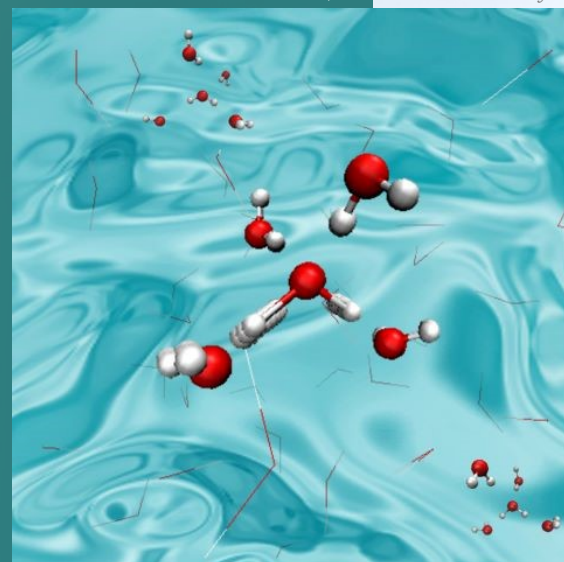
Scientists identify chemical markers that may unlock future therapeutic uses of mRNA

In recent years, messenger RNA, DNA's close cousin in life's complex process of going from a string of genetic blueprints to fully functioning organism, has received intense scrutiny in the scientific and medical community for the role it can play in creating next-generation vaccines, cancer treatments, and stem cell therapies addressing a myriad of previously incurable diseases. The previously obscure topic of mRNA became a nearly universal household utterance following the rush to discover a type of vaccine that could prevent COVID-19 related fatalities. The scientific community's herculean effort did result in Pfizer's mRNA COVID-19 vaccine, and products with similar mechanisms of action closely follow from other U.S. and global pharmaceutical companies.

An international research team led by Professor Katsura Asano of Hiroshima University's Graduate School of Integrated Sciences for Life in Japan, and also of Kansas State University in the U.S., set out to find new ways to artificially induce mRNA to respond in ways that could eventually lead to therapeutic outcomes, expanding on the success of the mRNA-based COVID-19 vaccines and opening up new possibilities across a host of possible genetic therapies.

Asano and his research team paid attention to a biochemical process termed chemical modification that adds a chemical mark to RNA bases, corresponding to a genetic letter of life's blueprint, and identified such chemical marks that both speed up and slow down action in the beginnings of the chemical zippers involved in generating gene-specified proteins. They published their findings in *Science Advances*.

In animals, including humans, mRNA is called to action in the protein production process with a signal called the AUG Start Codon, a universal code for the genetic "zipper" of RNA. The compound that AUG makes up is an amino acid called methionine, one of the twenty building blocks of protein molecules. Other RNA codons such as GUG (amino acid Valine), UUG (amino acid Leucine), and CUG (also Leucine) are generally considered "non-start" codons, meaning they're less likely to represent the beginning of a gene translation. Instead, they appear in the middle of protein coding region that is meant to unzip the genetic blueprint and produce a given protein.

Few other codons than AUG are known to be able to activate mRNA in the way AUG does. But in setting out to change that, Asano and his team set out to test common RNA chemical modifications, evaluating their effects on different types of rare start codons initiating the translation process. To do so, they used their previous discovery that GUG, UUG, and CUG codons that are different by one letter from AUG, are converted to a reasonably strong start codon specifying methionine through attaching the optimum RNA sequence for initiating their translation event in animals. Their study design pitted a dozen RNA sequences, derived from these sequences, for expressing green fluorescent proteins through various non-AUG start codons at various efficiencies. To accurately evaluate GFP expression, they used a technique called flow cytometry to measure fluorescence from ~10,000 cells per attached RNA sequence and start codon. In this way, they compared translation efficiencies between natural RNA and chemically modified RNA.

They found common trends in altering translation efficiencies when a certain non-AUG start codon received a certain chemical mark. A remarkable discovery, they reported, was the ability of U-to-Psi (pseudouridine) conversion to dramatically increase initiation potentials of CUG, GUG and UUG start codons (and more satisfyingly no affect on AUG).

Asano hopes the medical industry will take note of this new body of data and continue to conduct further research into how to use chemical modified RNA for generating synthetic expression switches—in such a way to stimulate translation activity in a highly targeted way in humans and animals.
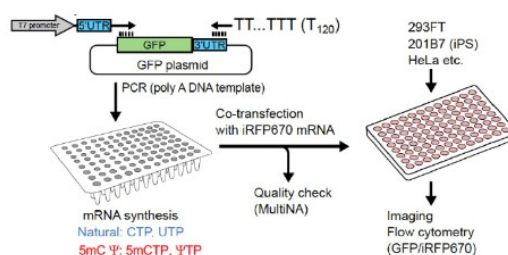
Experimental scheme
© Katsura Asano, Hiroshima University & Kansas State University

> mRNA translation from non-AUG start codons is an old but new concept. These start codons were used in prokaryotes but our research takes the concept a big step further by highlighting the possibilities of doing so in eukaryotes, including humans.

KATSURA ASANO

Professor
Graduate School of Integrated Sciences for Life

About the study

COVID long-haulers: Study shows who is most at risk, impact on local communities

More here

Long COVID risk factor and community impact

A Japanese research team looking at COVID-19's lingering impacts on survivors and local communities found that having a mild case of COVID-19, smoking status, comorbidities, or your sex aren't significant predictors to tell if you are less likely to develop long-term symptoms but age is. The findings were published in *Scientific Reports*.

The cross-sectional study explored four areas to investigate what recovery and community life are like for COVID-19 survivors. These areas are the persistence of symptoms, psychological distress, impairments in work performance, and experiences of stigma and discrimination. Some 127 patients who recovered from COVID-19 at two hospitals in Hiroshima Prefecture, Japan participated in the study between August 2020 to March 2021.

COVID-19 severity is not a risk factor

Persistent symptoms of COVID-19 were identified in over half of the participants at a median of 29 days after onset. Meanwhile, half of those with mild cases experienced lingering symptoms.

Their findings are consistent with previous studies reporting that 53% to 55% of non-hospitalized COVID-19 patients get lingering symptoms.

But older age is

The prevalence of lingering symptoms varied by age group in the study, but the researchers found that older patients are significantly more likely to become long-haulers compared to those aged 40 and below. Patients aged 60 and above were more likely than other age groups to report fatigue, palpitations, dry eyes or mouth, dyspnea, and sputum production.

However, this result is before the emergence of mutant strains such as alpha, beta, and omicron. The characteristics of lingering symptoms have changed depending on the mutant strain, so further investigation is required.

About the study

Sugiyama, A., Miwata, K., Kitahara, Y. et al. Long COVID occurrence in COVID-19 survivors. Sci Rep 12, 6039 (2022). https://doi.org/10.1038/s41598-022-10051-z

Search for best strategy to control COVID-19 outbreaks without hurting tourism leads to one key policy

The quest for the ideal COVID-19 policies to contain outbreaks without border closures that harm the travel industry led researchers to one protocol.

What policies should be the ideal COVID-19 strategy to control outbreaks without closing borders and compromising the tourism economy? The search for answers led researchers to one crucial protocol.

To contain the pandemic, various policies restricting travel have been put in place. These policies, however, harmed many economic sectors, especially tourism. Simulations ran by a team of Hiroshima University researchers found that imposing quarantine protocols proved to be the most effective measure when it comes to avoiding outbreaks and disruptions on tourism services. The study was published in *Tourism Economics*.

The research team developed a system dynamics (SD) model to explore effective COVID-19 measures that can be used by developing nations dependent

on tourism, such as Thailand, Laos, and Vietnam. But added that it can also be applied to developed countries. They used the early stages of the pandemic in Cambodia as a case study.

The quarantine policy used in the study assumes all cross-border travelers and returnees are required to isolate at designated facilities for at least 14 days after entry into Cambodia and to undergo regular RT-PCR testing during the stay period.

Using the model, they examined the policies of international transportation bans, domestic transportation bans, quarantine protocols, tourist-centered protection, and enterprise-led protection. The researchers then compared policies individually and in combinations with roles of key stakeholders — government, businesses, tourists — incorporated.

Research findings also showed that a COVID-19 strategy combining quarantine protocols, tourist-centered protection, and enterprise-led safeguards outperforms other groupings of tourism-oriented policies when it comes to virus spread prevention and rescuing the travel economy.

More here

About the study

Li, S., Ma, S., & Zhang, J. (2022). Building a system dynamics model to analyze scenarios of COVID-19 policymaking in tourism-dependent developing countries: A case study of Cambodia. In Tourism Economics. SAGE Publications. https://doi.org/10.1177/13548166211059080
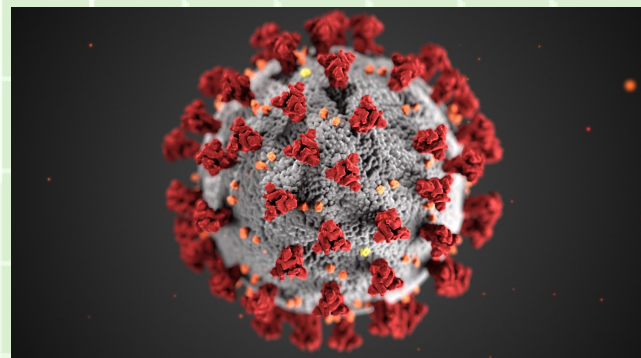
Recruiters may be causing the candidates they found for your business to quit

New research reveals what kind of employees headhunters contact, how they find them, and why relying on them to fill vacancies can drive up resignations

More here

Relying on headhunters to fill job vacancies can drive up voluntary turnover as new research found that they typically recruit the employees they successfully placed before to their next job.

Using Japan — where foreign subsidiaries extensively use headhunters to recruit host country nationals (HCNs) — as a case study, Hiroshima University Professor Vesa Peltokorpi applied an exploratory sequential mixed-method design to examine how contacts with recruiters are related to turnover.

His study published in the *British Journal of Management* revealed what kind of candidates recruiters contact, the manner they find them, and how they may be causing the employees they placed in your company to leave.

"Organizations in domestic and international settings are increasingly relying on headhunters to recruit employees. However, very little focused research on headhunters has been conducted. Furthermore, research to date has focused primarily on the positive effects accompanied by recruiting through headhunters," Peltokorpi, who handles courses on human resource management and organizational behavior at HU's Graduate School of Humanities and Social Sciences, said.

Why employees leave

While headhunters reached out to candidates who fit the search criteria of foreign subsidiary clients, they also targeted easy-to-contact and easy-to-move HCNs to maximize the likelihood of receiving placement fees. Easy-to-move HCNs were those interested in job alternatives and are weakly embedded in their organizations.

Peltokorpi explained how this study demonstrated the active role recruiters play in shaping the labor market and called attention to the less examined negative effects of headhunter-assisted recruitment.

> "
>
> **This paper demonstrates that recruiting through headhunters can increase voluntary turnover in organizations partly because headhunters contact employees that they have previously placed in organizations.**
>
> **VESA PELTOKORPI**
> **Professor**
> Graduate School of Humanities and Social Sciences

About the study

Peltokorpi, V. (2022). Here Today, Gone Tomorrow: A Mixed-method Study on Headhunter-intermediated Recruitment Practices. In British Journal of Management. https://doi.org/10.1111/1467-8551.12607

Bears got hibernation power in their blood but identity of 'superhero' components still a mystery

Japanese scientists observed "muscle gain" in cultured human skeletal muscle cells infused with serum from hibernating black bears, confirming that unique factors activated in these creatures' blood during winter trigger their remarkable ability to prevent muscular atrophy despite months of inactivity. But these key blood components remain unknown.

Hibernating bears can lie still for 5-7 months a year inside their dens without eating or drinking and survive with limited muscle loss, minimal metabolic dysfunction, and unharmed physical functions.

The study jointly conducted with researchers from Hokkaido University found that the serum drawn from the blood of hibernating Japanese black bears weakened the "destruction mechanism" controlling muscular degradation.

Their findings were published in the journal *PLOS ONE*.

Muscle mass is generally determined by the dynamic balance between the "synthesis" and "degradation" of proteins. But since this balance is altered by the hibernating bears' serum, the cultured muscle cells showed significant protein content growth following 24 hours of treatment. This notable increase in protein was not seen in cultured muscle cells infused with serum collected during the bears' active summer season.

About the study

Miyazaki, M., Shimozuru, M., & Tsubota, T. (2022). Supplementing cultured human myotubes with hibernating bear serum results in increased protein content by modulating Akt/FOXO3a signaling. In A. Asakura (Ed.), PLOS ONE (Vol. 17, Issue 1). https://doi.org/10.1371/journal.pone.0263085

More here

*Pictures are for reference only

Neural network model helps predict site-specific impacts of earthquakes

More [here]

In disaster mitigation planning for future large earthquakes, seismic ground motion predictions are a crucial part of early warning systems and seismic hazard mapping. The way the ground moves depends on how the soil layers amplify the seismic waves (described in a mathematical site "amplification factor"). However, geophysical explorations to understand soil conditions are costly, limiting characterization of site amplification factors to date.

A new study published by Hiroshima University researchers in the *Bulletin of the Seismological Society of America* introduced a novel AI-based technique for estimating site amplification factors (AF) from data on micro-tremors of the ground.

Subsurface soil conditions, which determine how earthquakes affect a site, vary substantially. Softer soils, for example, tend to amplify ground motion from an earthquake, while hard substrates may dampen it. Ambient vibrations of the ground or microtremors can be used to investigate soil conditions.

Measuring microtremors provides valuable information about the AF of a site, thus its vulnerability to earthquake damage.

The study used 2012-2020 microtremor data from 105 sites in western Japan's Chugoku district. The model performed well on the test data, demonstrating its potential as a predictive tool for characterizing site AF from microtremor data.

About the study

Pan, D., Miura, H., Kanno, T. et al. (2022). Deep-Neural-Network-Based Estimation of Site Amplification Factor from Microtremor H/V Spectral Ratio. In Bulletin of the Seismological Society of America (Vol. 112, Issue 3). Seismological Society of America (SSA). https://doi.org/10.1785/0120210300

> **"** The proposed method would contribute to more accurate and more detailed seismic ground motion predictions for future earthquakes.

Hiroyuki Miura

Associate Professor
Graduate School
Advanced Science and
Engineering

Researchers study society's readiness for AI ethical decision making

More [here]

With the accelerating evolution of technology, artificial intelligence (AI) plays a growing role in decision-making processes. Humans are becoming increasingly dependent on algorithms to process information, recommend certain behaviors, and even take actions on their behalf. A research team has studied how humans react to the introduction of AI decision making. Specifically, they explored the question, "is society ready for AI ethical decision making?" by studying human interaction with autonomous cars.

The team led by Johann Caro-Burnett, an assistant professor in the Graduate School of Humanities and Social Sciences, published their findings in the *Journal of Behavioral and Experimental Economics.*

Two experiments were designed to measure the bias people might have against AI ethical decision making and to test the effect of alternative ways of introducing AI into society.

The researchers observed that when the subjects were asked to evaluate the ethical decisions of either a human or AI driver, they did not have a definitive preference for either. However, when the subjects were asked their explicit opinion on whether a driver should be allowed to make ethical decisions on the road, the subjects had a stronger opinion against AI-operated cars. The researchers believe that the discrepancy is caused by a combination of two elements.

The first element is that individuals believe society as a whole does not want AI ethical decision making, and so they assign a positive weight to their beliefs when asked for their opinion on the matter.

The second element is that allowing discussion of the topic does not necessarily improve people's opinion. Indeed, this depends on country characteristics identified in the study.

The researchers conjecture this rejection of a new technology, that is mostly due to incorporating individuals' beliefs about society's opinion, may play a role in policy-making in the near future.

About the study

Caro-Burnett, J., & Kaneko, S. (2022). Is Society Ready for AI Ethical Decision Making? Lessons from a Study on Autonomous Cars. In Journal of Behavioral and Experimental Economics (Vol. 98, p. 101881). Elsevier BV. https://doi.org/10.1016/j.socec.2022.101881

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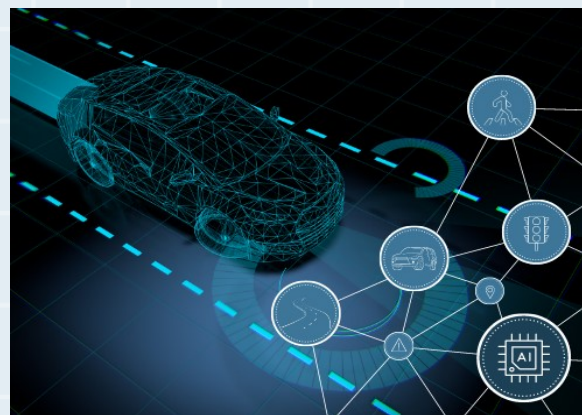
Feature

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.

Toru Yamamoto

Distinguished Professor

Graduate School of Advanced Science and Engineering
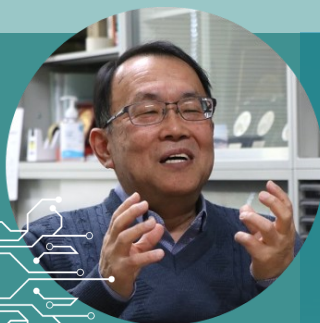
As a researcher in control engineering, Professor Toru Yamamoto's field overlaps with other specialized disciplines in engineering. He studies and develops technology that allows the efficient control of various systems to realize a society that saves energy, reduces costs, and achieves the SDGs.

Q: What got you into this field?

I majored in information engineering at university, but rather than information technology itself, I was extremely interested in areas where information technology is integrated with electrical engineering and mechanical engineering. I chose a laboratory that was proceeding with such research and got interested in control engineering in this laboratory.

Q: What scientific problem are you trying to answer?

The rapid development of information technology has made it possible to accumulate and process a variety of data. Therefore, if controllers can be designed directly from data accumulated in databases without using models, it will be possible to construct more practical control systems without the need to model the system. My goal is to establish "database-driven control," in which control systems are designed directly from data, and to construct cyber-physical systems that encompass such control systems.

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

It was to come up with a methodology to store various information about the system to be controlled in a database and to enable new adaptive and learning control through this database. This idea is my original and the first attempt in the world.

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

Control technology is inherent in everything that moves around us. Efficient control leads to economic benefits via cost and labor savings and solutions to environmental issues such as greenhouse gas reduction and energy conservation.

Masayuki Shimada

Distinguished Professor

Graduate School of Integrated Sciences for Life

Reproductive biologist Masayuki Shimada examines the mechanism behind fertilization. His research has led to developments in assisted reproductive technologies such as in vitro fertilization, embryo transfer, and sperm cryopreservation for infertility care and for livestock production.

Q: What scientific problem are you trying to answer?

One of my projects now is understanding the mechanisms behind reduced fertility with increasing age. Many organs lose their function at the time of death, but the testis and ovaries lose their function before the end of their lifetime. By clarifying the mechanism of this early loss of function, I think we can understand why the aging of the body occurs and how it can be delayed.

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

Currently, we reported in *Science Advances* that the reduction of ovarian functions is induced by decreasing metabolic activity in ovarian interstitial cells. It was clarified that improving the metabolism of the cells recovers ovarian function. Furthermore, we found that there is a potential functional difference between X sperm that becomes female and Y sperm that becomes male, which have been thought to have the same fertility. And by the appearance of this functional difference, we can change the male-female ratio.

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

Our research has contributed to human infertility care and livestock production.

Q: How important for you is pursuing science that aligns with SDGs?

Contributing to the achievement of SDGs is our major goal. Currently, we are researching a sex separation method for use in the artificial insemination of cows. This study aims to generate milk as a high-quality animal protein by producing a large number of dairy cows. The project aims to help poor populations in developing countries. It is supported by the Bill & Melinda Gates Foundation.

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 <u>here</u>!

Answers in the questions were edited for clarity and brevity.

Tomonori Kindaichi

Distinguished Researcher

Graduate School of Advanced Science and Engineering

As a water and wastewater treatment engineer, Associate Professor Tomonori Kindaichi explores cost-effective wastewater treatment, such as biological nitrogen removal using anaerobic ammonium oxidation (anammox) and the ecology and physiology of microorganisms related to the nitrogen cycle, among others.

Q: What got you into this field?

When I was an undergraduate student, I became interested in a class related to Water and Wastewater Treatment Engineering. This class partially addressed chemistry and microbiology. Most of the classes in Civil and Environmental Engineering are based on physics. I found that I prefer chemistry and microbiology to physics when I took the class.

Q: What scientific problem are you trying to answer?

The main scientific problem is nobody knows what kind of microorganisms are surely responsible for the wastewater treatment in the activated sludge process, although the activated sludge process was developed more than 100 years ago and is widely used in the world. In addition, most of the microorganisms are difficult to cultivate (so-called microbial dark matter) in the laboratory. We are trying to investigate the *in situ* physiology of microbial dark matter microorganisms.

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

I found anammox bacteria from activated sludge in the wastewater treatment plant located in Higashihiroshima City and from sediment in Hiroshima Bay. Now I have two enrichment cultures of freshwater anammox bacteria and marine anammox bacteria in the laboratory.

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

If anammox process is installed in the wastewater treatment plant, we can save on energy and cost. If the characteristics of microbial dark matter microorganisms are fully understood, the efficiency of wastewater treatment will increase.

Yasuhiro Ishihara

Distinguished Researcher

Graduate School of Integrated Sciences for Life

Environmental toxicologist Yasuhiro Ishihara explores how exposure to certain commonly used drugs and chemicals affects human health.

Q: How did you get interested in this field, especially given that your major in high school was history?

It is quite an interesting story, as like you said, I majored in history during high school! However, I got interested in the field of chemistry while attending university for my undergraduate education. I remember that one of my professors sparked my interest in electron mobility and flow by explaining how electron flow within human cells results in the formation of ATP (adenosine triphosphate), which is essential for generating energy, that we need for sustenance. I found this synergy between biology and chemistry within human cells highly intriguing, which led me to the field of biological chemistry.

Q: What are some of the major projects that you are working on right now?

One of the key projects my team and I are working on is to understand how PM2.5 – a type of fine particle suspended in the air, affects brain development and diseases.

There is evidence suggesting that people who live in polluted areas are prone to more serious neurodegenerative disorders. We hypothesize that upon inhalation, the pollutant PM2.5 might get transferred from the nasal tract to the brain via connecting neurons, and negatively affects the nervous system. We want to elucidate the true nature of the weakening of the nervous system and its immune system, via exposure to such fine atmospheric air pollutants.

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

My advice for young researchers is to be consistent with their experiments and to get involved in scientific discussions and collaborations with their peers. I also recommend practicing presentation skills to communicate important research information with utmost clarity.

WOMEN IN ACADEMIA
Meet our researchers

Meet Dr. Yoko Iwamoto

Answers in the questions were edited for clarity and brevity.

As a marine chemist, Associate Professor Yoko Iwamoto from the Graduate School of Integrated Sciences for Life studies the interaction between the ocean and the atmosphere — and what it means for climate change. We chatted with her to get to know more about her and her work.

Q: Good day, sensei! In a previous HU write-up, it was written that your whole life you've been linked with water and upon checking the Kanji for your name, turns out it's the character for the ocean.

A: Yeah. My name Yoko, my Kanji for "Yo" is ocean.

Q: There seem to be lots of coincidences that link you to your current research. So can you please describe what field you're working on?

A: Yes. Okay, so my field is chemical oceanography or atmospheric chemistry. And I'm especially focusing on the very tiny particles in the air, in the atmosphere. We call that aerosol particles. So maybe you may hear the word PM2.5.

Q: Yes, it's linked to pollution, right? Is it always linked to pollution? PM2.5.

A: Yeah, the image of the ordinary people is like that. But PM2.5 is just a part of aerosols. They are particles smaller than 2.5 micrometers. Of course, air pollution contains PM 2.5 particles, but natural phenomena also produce the kind of particles.

Q: So it's just not pollution. There are also things that small in nature. It's just the size?

A: Exactly.

Q: By the way, why are you studying aerosols? What got you into this field?

©Yoko Iwamoto, Hiroshima University

A: It's not a long story, but when I was a high school student, I wanted to study earth science in the university. But I failed the entrance exam so I shifted to studying Physics.

Physics is the most basic of science so I think that it would be useful. In our department, there was one professor focusing on atmospheric physics. I was involved in that laboratory and eventually, I chose atmospheric particles over the ocean as the topic for my graduate thesis.

Associate Professor Yoko Iwamoto onboard an Indian Ocean cruise in 2018

Q: You had this study where you check nutrients and how phytoplankton use it, too, right?

A: Yeah, sometimes aerosols contain nutrients. And if they pour onto the ocean, that particle can be used by the phytoplankton as nutrients because the open ocean is very far from the continent. For example, the Seto Inland Sea, very close to Hiroshima Prefecture, is surrounded by land and there are so many rivers that transport nutrients from the land to the ocean. But the open ocean it's very far from the land area. So it's difficult to get the nutrients phytoplankton need. Phytoplankton can absorb carbon dioxide from the atmosphere for photosynthesis. When they die, they carry the carbon with them as they sink to the deep ocean.

Q: Are you trying to find out how chemical compositions affect people's health?

A: I'm not working on the health impact of aerosol particles but rather on the climate impact. Aerosols can be nuclei of cloud droplets. If there are no aerosols, we cannot have clouds. Clouds consist of water droplets but they need a nuclei to condense the water vapor. So it's very important for reflecting sunlight because clouds are very white, so they can reflect the sunlight into space. Clouds cool the earth.

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

A: Not very recently, but in 2018, I joined a cruise in the Indian Ocean, Phuket to Jakarta, in the early winter season, and at that time the air pollutants from the Indian subcontinent are transported to the ocean. So, the atmosphere over the Bay of Bengal is very, very polluted. Worse than Tokyo. I was really surprised. We also collected atmospheric samples and measured the chemical composition and found high concentration of nitrate. Nitrate is a very important nutrient for phytoplankton. We found that the nutrients from the aerosol may be important for the phytoplankton in the Indian Ocean, so I saw how anthropogenic or human activity changed the ecosystem.

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

A: That's an important question because climate change is a social and economic issue. But if we are just focusing on development, then it may negatively impact the environment. We have to approach it with balance. If we think about the future of the Earth, we have to be more careful about the climate or environmental issue. Not just focusing on the development.

Toyoshio-Maru, the research ship of Hiroshima University

Hiroshima University in Figures (as of May 1, 2021)

Undergraduate students
10,605 students

Postgraduate students
4,435 students

Staff members
3,651 members

1 for every **4.1** students

Doctorates conferred in AY 2020
364 students

THE University Impact Rankings 2021
Top spot among Japanese universities and first in Japan for five SDG categories

SDG4 (Quality Education)
SDG5 (Gender Equality)
SDG6 (Clean Water and Sanitation)
SDG8 (Decent Work and Economic Growth)
SDG11 (Sustainable Cities and Communities)

1st in Japan

Undergraduate graduates
Cumulative # 144,231 students

Annual visitors to the libraries
Approx. # 0.41 million visitors

1,711 visitors per open day

Volumes in collections at the libraries
Approx. # 3.46 million volumes

Approx. 230 volumes per student

Total site area of Higashi-Hiroshima Campus
Approx. # 2.49 million m²

Equivalent to 49 Hiroshima Municipal Baseball Stadiums (Mazda Stadium)

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

Higashi-Senda Campus

Kasumi Campus

Higashi-Hiroshima Campus

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

● : Shinkansen
✈ : Airport

CAMPUS LIFE

Live music, food, and HU students dressed in colorful summer kimonos!
Photos of the Yukata Festival 2022, one of HU's biggest summer events held for the first time after 3 years.
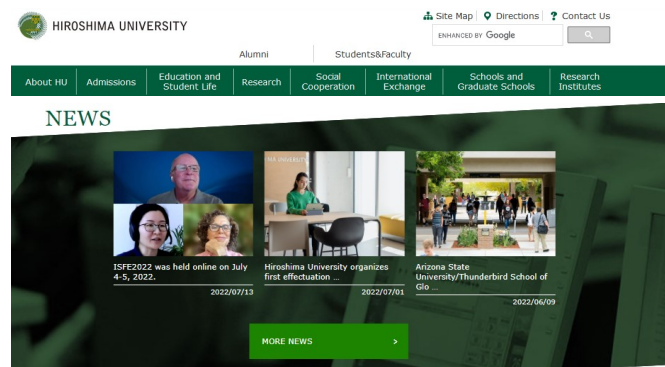

*Masks were removed briefly for photos.

Yukata Festival 2022
@Higashi-Hiroshima Campus

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

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

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

NEW RESEARCHER DIRECTORY

Finding researchers at Hiroshima University is now easier than ever! Introducing the Researcher Directory — HU's new 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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UNIVERSITY OF
WORLD-WIDE REPUTE AND
SPLENDOR FOR YEARS INTO
THE FUTURE

HIROSHIMA UNIVERSITY