HIROSHIMA UNIVERSITY UPDATE

HIROSHIMA UNIVERSITY

VOLUME 23 • SUMMER 2024

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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MEET OUR RESEARCHERS

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

We asked scientists, recognized as among the best in Japan by Research.com, questions about their fields and exciting developments in their work.

Nakanishi is among those believed to have coined the current era name "Reiwa."

HU's 75+75th Anniversary Project

Explore some of the commemorative events leading up to HU's 75+75th anniversary this year.

Hiroshima University in Kansai

Introducing academic programs and research opportunities at HU

Hiroshima University marked its 75+75th anniversary by hosting the "Hiroshima University in Kansai" event on June 22, highlighting its academic programs and research excellence.

A keynote speech by Susumu Nakanishi, a renowned Japanese literature expert and Order of Culture recipient, titled "The Conscience of Earth," emphasized the importance of a mutually supportive relationship between humans and the Earth.

The event also highlighted HU's peace education, showcased innovative research, and provided insights into admissions and career opportunities, offering attendees a comprehensive overview of the university.

The event attracted about 350 attendees, including students, parents, career guidance teachers, and company representatives.

Nakanishi was presented a certificate of appreciation after the event. (From left: Nakanishi and President Ochi)

Members of the Kasumi Orchestra

HU participates for the first time in the

2024 Hiroshima Flower Festival's 'Flower Parade'

Hiroshima University made its debut in the 2024 Hiroshima Flower Festival on May 3 with the “Hiroshima University 75+75th Anniversary Parade” as part of the main “Flower Parade.”

During the parade, President Ochi and Ms. Ayako Kimura (former Japanese representative in the 100-meter hurdles and currently a master's student in the Graduate School of Humanities and Social Sciences at our university) rode together in a convertible. The university’s mascot, "Hiroty," appeared on a truck, and a bus wrapped in HU’s original design also joined the procession. A special marching band, led by the Hiroshima University Kasumi Orchestra, provided musical accompaniment as approximately 300 students, faculty, staff, and alumni, all donning matching original green T-shirts and holding 75+75th anniversary towels, marched along Peace Boulevard.

The parade was organized as part of the 75+75th anniversary project, aiming to showcase HU’s rich history and ongoing commitment to future challenges and strengthen community bonds.

The participation of vehicles in the parade was made possible through the support of Mazda Motor Corporation and Hiroshima Electric Railway Co., Ltd.

HU’s mascot, Hiroty, also made an appearance at the parade!

Ceremonial first pitch

In the photo: HU **Assistant Professor Haruna Katayama** throws out the ceremonial first pitch. Katayama was **named one of the "Top 100 Asian Scientists" in 2023** by Asian Scientist Magazine. Every year since 2016, the magazine compiles a list of Asia's most outstanding researchers, highlighting recipients of national or international awards as well or those who have made a significant scientific discovery or provided leadership in academia or industry. She proposed a method to observe Hawking radiation — which has peculiar quantum correlations emitted from an analogue black hole created in an electric circuit. When applied to quantum computers, her work is expected to contribute to the realization of next-generation information processing and communications. Last year, Katayama was **one of the recipients of the 2022 L'Oréal-UNESCO For Women in Science, Japan Fellowship Award**.

Hiroshima University hosts sponsored baseball game, Carp triumph 2-0!

Hiroshima University sponsored the prefecture's baseball team, Hiroshima Toyo Carp, in a game against the Tokyo Yomiuri Giants on May 17. The event was titled "Hiroshima University 75+75th Anniversary: Together with Hiroshima! Phoenix Night."

Around 250 HU students, faculty and staff, who won tickets from a highly competitive draw, attended the game wearing matching HU original T-shirts. Among them were 20 pediatric patients from the University Hospital accompanied by their families and doctors.

Before the match, about 20 students participated in a pre-game tour. Various events were held at the stadium, including a promotional booth, a presentation ceremony, the first pitch ceremony, the national anthem, and a CC Dance (Carp Cheer Dance) performance. Assistant Professor Haruna Katayama from the Graduate School of Advanced Science and Engineering, who was named one of the "Top 100 Asian Scientists" in 2023, threw out the ceremonial first pitch.

The game saw the Carp triumph with a 2-0 victory. HU and the beloved Hiroshima Toyo Carp continue to invigorate the community as the university celebrates its 75+75th anniversary.

Players receiving commemorative gifts before the game

HU's 75+75th anniversary commemorative commercial

Introducing HU's 75+75th anniversary commemorative commercial

HU created a special TV commercial to celebrate its 75+75th anniversary! You can watch it on our official YouTube channel.

Discover our latest and upcoming events on our special website (in Japanese):

HU ranks 3rd among Japanese universities in THE's Impact Rankings 2024

Times Higher Education (THE) released its 2024 Impact Rankings on June 12, placing Hiroshima University in the global top 100 in seven SDG categories, more than any other university in Japan.

Read more about the Impact Rankings

HU secured 101-200th place among 1,963 universities worldwide in the overall ranking and tied for third place in Japan for the third consecutive year. This consistent ranking reflects the university's dedication to education, research, and social contributions, aligning with the SDGs.

Among the three items that ranked in the global top 100 and first place in Japan, SDG 17 (Partnerships for the Goals) is mandatory. HU ranked 45th out of 2,031 universities worldwide and first out of 77 universities in Japan for SDG 17. This was due to HU's strong relationships with the government and NGOs, and the university's proactive dissemination of information to achieve the SDGs.

The university's international efforts to achieve the SDGs have also been recognized in the THE Awards Asia, where HU has been a finalist in the International Strategy of the Year category for three consecutive years and was nominated for the Outstanding Contribution to Regional Development category for the first time.

HU completes support for former Afghan students

Immediately after the political upheaval in Afghanistan in August 2021, Hiroshima University announced its intention to support former Afghan students who had returned to their country. As the first Japanese university to establish a Special Afghanistan Support Office, HU has now completed all support activities as of January 2024.

HU assisted 11 former students, along with their families, totaling 51 individuals. This made it one of the largest support efforts of its kind in Japan. The university employed these former students as academic researchers for six months and provided them with Japanese language education, job placement assistance, and housing support. As a result, six of the former students found jobs in Japan and abroad, two continued their education in graduate programs, two returned to Afghanistan due to personal reasons, and one is still looking for employment.

HU received significant support for this initiative, including donations through crowdfunding, and essential living supplies. Over 300 individuals contributed a total of 4,635,000 yen to support this cause.

April 2024
Naming rights partnership with Webasto (Webasto ROOM 113 in the School of Engineering)

Global brands secure naming rights at HU

Introducing new naming rights deals with international companies

Hiroshima University has established new collaborations with leading international companies, granting them naming rights to various campus spaces. These include the e-mobility solutions manufacturer Webasto, and the farm machinery and equipment company DeLaval. Additionally, the semiconductor company Micron has been a naming rights holder since 2021.

Introduced in April 2020, the naming rights system at HU aims to enhance the university's value through the development, effective use of facilities, and improved educational and research environments. Naming rights holders can designate their business name, trademark, logo, or nickname to university facilities. They may also install signs and billboards on campus.

HU produced 2nd most number of female CEOs among Japan's national and public universities for sixth consecutive year

Hiroshima University produced the second most number of women CEOs among Japan's national and public universities, according to a 2023 survey.

1st in the Chugoku region

HU has also claimed the top spot among universities contributing to companies headquartered in the Chugoku region.

Hiroshima University has produced the second most number of women CEOs among Japan's national and public universities, according to the 12th National Female President Survey of Tokyo Shoko Research, Ltd.

This is the sixth time in a row that the university ranked second. The survey results showed that there are 131 female company presidents who graduated from HU, compared to 130 in the previous survey.

HU ranks 14th place overall on the list including private universities in Japan — climbing up two positions from 16th place in the previous survey.

The survey revealed that the number of female presidents in Japan is expected to reach 612,224 in 2023, almost triple from the 212,153 recorded 12 years ago when the survey started.

*This survey is based on the analysis of approximately four million business owner profiles (including individual enterprises) held by Tokyo Shoko Research, extracting and analyzing female presidents (including directors of hospitals, cooperatives, etc.).

HU's scholarship system for female graduate students in science and engineering

Hiroshima University Fellowship for Female Graduate Students in Science and Technology

Female doctoral students who are motivated to play an active role in science and technology are selected as STEM Female Research fellows, receiving stipends (equivalent to living expenses) and research funding.

With this fellowship, HU provides an environment where students can focus on their research. Furthermore, the university also provides support to master's degree students who wish to advance to the doctoral program. If these students continue to the doctoral program at HU, they are guaranteed STEM Female Research Fellow positions. More here.

Women scientists: Focus on research

Introducing exciting studies led by female scientists at HU, pushing the boundaries of knowledge within and beyond Japan.

By the numbers: Research at Hiroshima University

3,086
Academic Papers in 2023

1,713
Faculty Members

1,8
Papers per Faculty

(As of May 2024)

An inside look into Hiroshima University's research numbers

Hiroshima University is one of the largest comprehensive research universities in Japan, consistently producing numerous academic papers. Our increasing output highlights HU's significant research activities in recent years.

Trends in SCI papers and papers per faculty (including A&HCI and ESCI)

HU ranks 10th in clinical medicine paper count among 82 Japanese universities with medical schools

HU ranked 10th among 82 Japanese universities with medical schools and 1st in the Chugoku-Shikoku region for the most number of clinical medicine papers published in Q1 journals in 2021. This ranking was announced by the editorial team of "Doctors LIFE-STYLE" on the "m3.com" site, based on data compiled by analytics company Clarivate (published in 2021).

Q1 journals refer to high-profile journals that rank in the top 25% based on the Journal Impact Factor.

Clinical Medicine
Number of papers published in Q1 journals

Ranking	University	Number of Q1 journal articles
1	The University of Tokyo	1,518
2	Kyoto University	1,430
3	Osaka University	1,174
4	Keio University	1,109
5	Nagoya University	921
6	Kyushu University	826
7	Tohoku University	824
8	Hokkaido University	792
9	Juntendo University	721
10	**Hiroshima University**	**700**

Ranking	University	Number of Q1 journal articles
11	Tokyo Medical and Dental University	667
12	Yokohama City University	617
13	Chiba University	561
14	Kobe University	531
15	Okayama University	515
16	University of Tsukuba	510
17	Kumamoto University	488
18	Kindai University	458
19	The Jikei University School of Medicine	441
20	Kanazawa University	420

1st in the Chugoku-Shikoku region

HU also leads the Chugoku-Shikoku region in the number of medical papers and studies published in the top 10% of journals.

Find more about HU in our Integrated Report

NATURE

NATURE COMMUNICATIONS

A cool survival strategy

Researchers found these worms enter a previously unknown hibernation-like state, slowing development and potentially extending their lifespan.

C. elegans undergoes diapause at low temperatures, namely cold-inducible diapause (CID). Courtesy of Dr. Masamitsu Fukuyama/University of Tokyo

Temperature plays a key role in shaping many species' development, reproduction, behavior, and lifespan. In ectotherms, organisms that rely on external heat sources to regulate body temperature, like the *C. elegans* worm, warmer environments usually mean shorter lifespans but accelerated growth.

A study led by Masaki Mizunuma, professor at Hiroshima University's Graduate School of Integrated Sciences for Life, found these worms enter a previously unknown hibernation-like state called cold-inducible diapause (CID), slowing development and potentially extending their lifespan.

Their findings published in ***Nature Communications*** showed that a nonsense mutation in the heat shock factor 1 (*hsf-1*) gene — responsible for regulating stress responses within cells — triggers entry into CID at 9 °C for mutant *C. elegans*, and at 4 °C for wild-type variety.

The team also found that by overexpressing anti-aging genes like *hsf*-1, XBP1/*xbp*-1, FOXO/*daf*-16, Nrf2/*skn*-1, and TFEB/*hlh*-30, CID can be prevented in the mutant worms, indicating their potential role in aging processes. A nonsense mutation of the MED23/*sur*-2 gene also stops CID from occurring and makes the worms live longer. The researchers argued that examining CID can be a powerful model for understanding aging processes and the neural networks involving cold acclimation.

NATURE COMMUNICATIONS

Knitting meets engineering

WPI-SKCM2'S RESEARCH

By looking at the properties of knit patterns, a team led by Elisabetta Matsumoto, principal investigator at Hiroshima University's International Institute for Sustainability with Knotted Chiral Meta Matter (WPI-SKCM2) and associate professor at the Georgia Institute of Technology, developed a mathematical model that can be used to design composite fabrics with customized mechanical features, and unrestricted by yarn type.

"Here we untangle the relationship between changes in stitch topology and emergent elasticity in several types of knitted fabrics. We combine experiment and simulation to construct a constitutive model for the nonlinear bulk response of these fabrics," the authors said in their paper published in ***Nature Communications.***

Their findings can allow designers and engineers to tailor mechanical properties such as the elasticity of knitted textiles stitch by stitch, opening up a wide range of applications such as wearable electronics, tissue engineering, and architected materials, among others.

Here we untangle the relationship between changes in stitch topology and emergent elasticity in several types of knitted fabrics.

Many types of yarn are not very stretchy, yet once knit into a fabric, the fabric exhibits emergent elastic behavior. Courtesy of Georgia Institute of Technology

RESEARCH NEWS | Hiroshima University's high-impact research in top-tier journals

NATURE COMMUNICATIONS

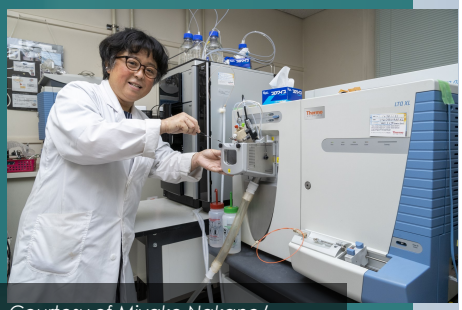
Locating the cell's sweet zones

Using advanced techniques like CRISPR/Cas9 genome editing technique and super-resolution microscopy, researchers found that the Golgi apparatus — a cell structure responsible for processing and packaging proteins, adding glycans (also known as sugar chains) to them, and transporting molecules within the cell — is made up of small "Golgi units," within which smaller clusters of glycosyltransferases (referred to as "zones") move around.

The research team includes Miyako Nakano, associate professor at Hiroshima University's Graduate School of Integrated Sciences for Life.

The specific location of glycosyltransferases, enzymes involved in adding sugar molecules to proteins (glycosylation), in the Golgi apparatus had been previously unknown. However, by introducing fluorescent molecules in the genes encoding glycosyltransferases and observing them via a powerful microscope, the researchers could see how these enzymes are distributed and move within cells. Their discovery, published in ***Nature Communications***, could have potential applications in diagnosing and treating human diseases resulting from abnormal sugar chain synthesis in proteins.

Researchers found that the Golgi apparatus is made up of small "Golgi units," within which smaller clusters of glycosyltransferases move around.



Courtesy of Miyako Nakano/ Hiroshima University

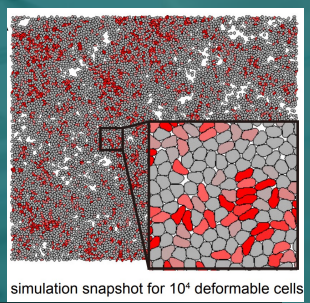
SCIENCE

SCIENCE ADVANCES

New way to uncover cells' shape-shifting secrets

Cell deformability, the ability to change shape in response to external forces, influences the behavior, like flexibility, strength, and movement, of the tissues they form into. This deformability is crucial in understanding various biological processes, including wound healing, organ development, and disease progression. However, many existing simulation methods to study deformability are designed for cells with regular geometries. These methods don't accurately capture the complex deformations exhibited by nonpolygonally deformable cells like mesenchymal and amoeboid cells that can change shape more freely.

A research team led by Nen Saito, an associate professor at Hiroshima University's Graduate School of Integrated Sciences for Life, introduced a new approach for simulating large populations of nonpolygonally deformable cells that has a higher computational efficiency than current methods. Their study is published in ***Science Advances***. Using their simulation method, the researchers observed a unique phenomenon called "fluid-to-fluid transition" within a densely packed group of active cells, indicating a shift from one type of fluid-like behavior to another. They suggested measuring this transition via an index based on topological defects.



Red cells indicate highly deformed cells. Courtesy of Nen Saito/Hiroshima University

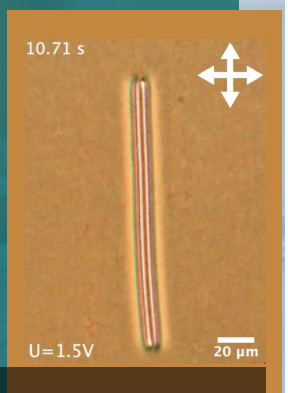
Their proposed method offers a new way to study cell populations at tissue-scale and gain insights into biological fluid phases.

SCIENCE ADVANCES

WPI-SKCM2'S RESEARCH

Quest for particle physics' holy grail sparks discovery

The search for magnetic monopoles, the holy grail of particle physics, has led scientists to discover monopole-like behavior in condensed matter systems, particularly chiral materials. Now, by using optical imaging methods and computer simulations, a research team headed by Ivan Smalyukh, director of Hiroshima University's International Institute for Sustainability with Knotted Chiral Meta Matter (WPI-SKCM2), found they could arrange tiny structures called skyrmions in liquid crystals and colloidal liquid crystal ferromagnets so they come together or terminate at specific points called monopoles within the material. Being able to harness these unique topological configurations could drive innovations in data storage and processing technologies and the creation of new electronic and electro-optic devices.



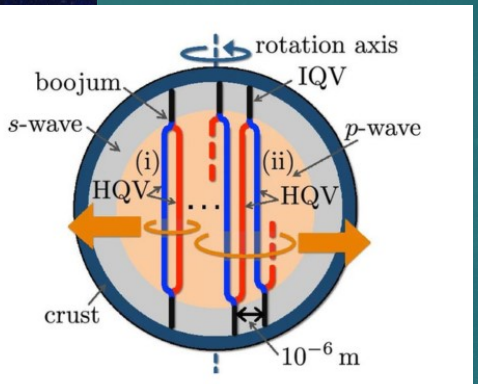
Spatial separation between monopoles connected by a skyrmion tube in a colloidal magnetic dispersion can be controlled by applying voltage across the sample normally to the image plane. The elapsed time, crossed polarizers of a microscope, applied voltage and the scale bar are marked on the image. Courtesy of Ivan Smalyukh and Benny Tai

A magnetic monopole is a hypothetical elementary particle carrying a single pole (either north or south). It differs from the familiar dipole magnets which always have both north and south poles together. Despite the extensive search over the years, the experimental discovery of magnetic monopoles remains elusive. However, now having topological analogs of such objects in condensed matter systems like colloidal and solid-state magnets could enable new scientific discoveries and technological utility. Their paper was published in ***Science Advances***.

WPI-SKCM2'S RESEARCH

Study reveals twisted origin of dead stars' mysterious 'heartbeats'

Stars blinking code in Netflix's "3 Body Problem" may be sci-fi, but by deciphering neutron stars' erratic flickers, a new study has revealed the twisted origin of their mysterious "heartbeats."



© Muneto Nitta and Shigehiro Yasui

When neutron stars—ultra-dense remnants of massive stars that exploded in supernovae—were first discovered in 1967, astronomers thought their strange periodic pulses could be signals from an alien civilization. Although we now know these "heartbeats" originate from radiation beams of stellar corpses, not extraterrestrial life, their precision makes them excellent cosmic clocks for studying astrophysical phenomena, such as the rotation speeds and internal dynamics of celestial bodies.

At times, however, their clockwork accuracy is disrupted by pulses inexplicably arriving earlier, signaling a glitch or a sudden speed-up in the neutron stars' spins. While their exact causes remain unclear, glitch energies have been observed to follow the power law (also known as scaling law)—a mathematical relationship reflected in many complex systems from wealth inequality to frequency-magnitude patterns in earthquakes. Just as smaller earthquakes occur more frequently than larger ones, low-energy glitches are more common than high-energy ones in neutron stars.

Re-analyzing 533 up-to-date data sets from observations of rapidly spinning neutron stars, called pulsars, a team of physicists found that their proposed quantum vortex network naturally aligns with calculations on the power law behavior of glitch energies without needing extra tuning, unlike past models. Their findings are published in ***Scientific Reports***.

"More than half a century has passed since the discovery of neutron stars, but the mechanism of why glitches happen is not yet understood. So we proposed a model to explain this phenomenon," said study corresponding author Muneto Nitta, a specially appointed professor and co-principal investigator at Hiroshima University's International Institute for Sustainability with Knotted Chiral Meta Matter (WPI-SKCM2).

Superfluid vortices get a new twist

Previous studies have proposed two main theories to explain these glitches: starquakes and superfluid vortex avalanches. While starquakes, which behave like earthquakes, might explain the observed power law pattern, they could not account for all types of glitches. Superfluid vortices are the widely invoked explanation.

"In the standard scenario, researchers consider that avalanche of unpinned vortices could explain the origin of glitches," Nitta said.

However, there has been no consensus on what might trigger vortices to avalanche catastrophically.

"If there would be no pinning, it means the superfluid releases vortices one by one, allowing for a smooth adjustment in rotation speed. There would be no avalanches and no glitches," Nitta said.

"But in our case, we didn't need any mechanism of pinning or additional parameters. We only needed to consider the structure of p-wave and s-wave superfluids. In this structure, all vortices are connected to each other in each cluster, so they cannot be released one by one. Instead, the neutron star has to release a large number of vortices simultaneously. That is the key point of our model."

While a neutron star's superfluid core spins at a constant pace, its ordinary component lowers its rotation speed by releasing gravitational waves and electromagnetic pulses. Over time, their speed discrepancy grows so the star expels superfluid vortices, which carry a fraction of angular momentum, to regain balance. However, as superfluid vortices are entangled they drag others with them, explaining the glitches.

To explain how vortices form twisted clusters, researchers proposed the existence of two types of superfluids in neutron stars. S-wave superfluidity, which dominates the outer core's relatively tamer environment, supports the formation of integer-quantized vortices (IQVs). In contrast, p-wave superfluidity prevailing in the inner core's extreme conditions favors half-quantized vortices (HQVs). As a result, each IQV in the s-wave outer core splits into two HQVs upon entering the p-wave inner core, forming a cactus-like superfluid structure known as a boojum. As more HQVs split from IQVs and connect through boojums, the dynamics of vortex clusters become increasingly complex, much like cacti arms sprouting and intertwining with neighboring branches, creating intricate patterns.

The researchers ran simulations and found that the exponent for the power-law behavior of glitch energies in their model (0.8±0.2) closely matched the observed data (0.88±0.03). This indicates that their proposed framework accurately reflects real-world neutron star glitches.

"Our argument, while simple, is very powerful. Even though we cannot directly observe the p-wave superfluid inside, the logical consequence of its existence is the power-law behavior of the cluster sizes obtained from simulations. Translating this into a corresponding power-law distribution for glitch energies showed it matches the observations," said co-author Shigehiro Yasui, a postdoctoral researcher at WPI-SKCM2 and associate professor at Nishogakusha University.

What lessons can be learned from Japan's rural movement initiative, 15 years on?

Fifteen years after Japan initiated efforts to attract younger people to rural areas, researchers assess its impact and the lessons it offers for global rural revitalization policies.

In-migrants and local people's cooperation
© Simona Zollet

Over half of the world's population now lives in cities, a trend on the rise. In Japan, only 8% of the population live in rural areas, with rapidly aging residents. To address this issue, the country launched the Local Revitalization Cooperator (LRC) initiative, known as chiiki okoshi kyouryoukutai, offering three years of housing and salary to entice younger people to not only move to the countryside, but also contribute to local revitalization using their specific skills and interests. A recent study in ***Habitat International*** assessed the initiative's impact.

Launched in 2009, the LRC initiative initially involved 89 participants across 31 municipalities. By March 2022, it included 6,447 participants in 1,118 municipalities, aiming for 10,000 by 2026. About 65% of participants remained in the rural area once their LRC commitment concluded. Many started their own businesses, as intended by the LRC initiative, but several noted the communities' lack of facilities and services, had left them uncertain if they planned to remain in the long term.

"Although the reach of the LRC program is responsible for a small fraction of the people relocating from urban to rural areas in Japan, the policy implications of the initiative are noteworthy, as it is one of the only examples in the world of a longstanding national-level policy promoting rural revitalization by supporting the settlement of people interested in living and working in rural areas," said Simona Zollet assistant professor in the Graduate School of Humanities and Social Sciences.

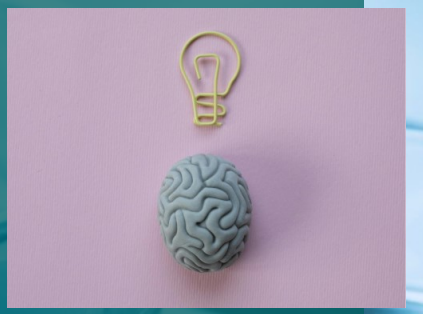
However, current national policies also promote decentralization and budget cuts to peripheral rural areas — which means these areas are left unable to address structural problems related to basic services and infrastructure.

"Therefore, attracting new population should be seen only as one aspect of more holistic regional revitalization policies," Zollet said.

SIMONA ZOLLET
Assistant Professor
Graduate School of Humanities and Social Sciences

Are lab-grown brain tissues ethical? There is no no-brainer answer

Insights into ethical and legal ramifications of growing brain organoids from human fetal brain tissue



© Katrin Bolovtsova via Pexels

Brain organoids, though often referred to as "mini brains," are not truly human brains. However, the concerns regarding these lab-grown brain tissues, especially when developed from human fetal tissues, are very significant.

In a paper published in ***EMBO Reports***, researchers offer valuable insights into the complexities inherent in brain organoid research, making significant contributions to the ongoing discourse surrounding this innovative biotechnology and paving the way for informed decision-making and legal and ethical stewardship in the pursuit of scientific advancement.

Traditionally, brain organoids are grown from pluripotent stem cells, an especially potent sub-type that is typical of early embryonic development, but new technologies now make it possible to generate these organoids from human fetal brain cells. This method comes, however, with even more heated legal and ethical debates about brain organoids — debates that are already intense in conventional organoid research.

"Our research seeks to illuminate previously often-overlooked ethical dilemmas and legal complexities that arise at the intersection of advanced organoid research and the use of fetal tissue, which is predominantly obtained through elective abortions," said Tsutomu Sawai, a professor (special recognition) at the Graduate School of Humanities and Social Sciences.

The study highlights the urgent need for a sophisticated and globally harmonized regulatory framework tailored to navigate the complex ethical and legal landscape of fetal brain organoid (FeBO) research. The paper emphasizes the importance of informed consent protocols, ethical considerations surrounding organoid consciousness, transplantation of organoids into animals, integration with computational systems, and broader debates related to embryo research and the ethics of abortion.

Issue 4 | Since 2023

Feature

SCIENTISTS RECOGNIZED AS AMONG THE WORLD'S BEST

Meet some of our researchers named to be among the best scholars in their fields by Research.com.

We asked three scientists, recognized as among the best in the world by Research.com, questions about their fields and exciting developments in their work.

These researchers are some of the leading scholars in their disciplines, demonstrated by their impressive rankings on Research.com's best scientists list. The rankings are based on the Discipline H-index (D-index), calculated by considering only the publications and citation values belonging to a given field. Top researchers from over 3000 universities and research institutes are featured on the list.

About Research.com

Research.com is a research portal dedicated to promoting high-quality research and inspiring young scholars to contribute to the advancement of science.

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

Check out the rankings here.

Chisa Shukunami

Professor

Graduate School of Biomedical and Health Sciences

As a dental researcher, Chisa Shukunami's focus is the musculoskeletal field. Her research examines the cartilage, tendons, and ligaments that integrate the musculoskeletal components.

Q: What got you into this field?

A: When I was a Ph.D. student, I established a culture system that reproduces the multi-stage chondrogenic differentiation. After earning my doctorate, I conducted research on chondromodulin, an angiogenesis inhibitor present in avascular cartilage. I then discovered a related gene, which I named tenomodulin because it is expressed in tenocytes (tendon fibroblasts). Tendons and ligaments, in which tenomodulin is specifically expressed, are essential for supporting the musculoskeletal system. Fascinated by this unexplored field, I engaged in research to clarify the mechanisms of tendon/ligament formation and regeneration.

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

A: In my laboratory, we aim to elucidate the mechanisms underlying the formation of cartilage, tendons, and ligaments, which are difficult to regenerate due to the lack of vascular networks. In Japan, a super-aging society, our research is expected to become the basis for establishing the treatments necessary to maintain locomotive function.

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

A: Of the 17 SDGs, we are conducting research toward goal 3, which

Prof. Chisa Shukunami

Best Scientists - **Biology and Biochemistry**

To learn more about Professor Shukunami's research, visit her profile here.

is to ensure good health and well-being for all. I believe that pursuing science aligned with the SDGs is necessary to solve the health problems facing humanity and to conduct interdisciplinary research.

Q: What achievement are you most proud of so far?

A: I am proud of having discovered a molecule that is specifically expressed in tendons and ligaments, which I named Tenomodulin, and of having elucidated the characteristics of the cell population that contributes to musculoskeletal integration.

Q: Is there anything exciting coming up in your research that you want to share?

A: The molecule I identified and named tenomodulin was cloned in the early 2000s not only in Japan but also at the Max Planck Institute in Munich, where it was named tendin, but the molecular name tenomodulin was officially adopted. At that time, a graduate student who generated tenomodulin-deficient mice for her doctor's degree has become a professor at Würzburg University and we are now conducting collaborative research with the support of the Fund for the Promotion of Joint International Research by JSPS. I think it's wonderful that researchers who have been working on the same molecule can now work together toward a new goal.

Akiyoshi Ohashi

Professor (Special Appointment)

Graduate School of Advanced Science and Engineering

To conserve water environments, it is important to treat wastewater before discharging it into water bodies. Generally, wastewater is biologically treated as it is more cost-effective than physio-chemical processes. Environmental engineer Akiyoshi Ohashi examines microorganisms that can degrade pollutants and develops suitable bioreactors for their optimal living conditions.

Q: What do you find most exciting in your field of research?

A: The diversity of microorganisms in nature is fascinating, allowing for the degradation of various pollutants. In wastewater treatment engineering, the key challenge is to determine how specific bacteria can be enriched and activated in bioreactors to effectively treat targeted pollutants.

Q: What got you into this field?

A: As an undergraduate, I became aware of environmental issues as significant social problems. This motivated me to study environmental science in graduate school, and I chose an environmental lab within the civil and environmental engineering course. Although I initially considered a different career path, I discovered a passion for research and was fortunate to secure a position as a researcher.

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

A: A bioreactor can be thought of as a "house" for bacteria. If the house is uncomfortable, bacteria will not thrive or may escape. I developed a novel bioreactor containing sponge material that continuously supplies substrates as food and efficiently removes bacterial waste products. This bioreactor is highly suitable even for my target new bacteria. It can be applied to wastewater treatment processes, contributing to the conservation of water environments as an eco-friendly technology.

Prof. Akiyoshi Ohashi

Best Scientists - **Biology and Biochemistry**

To learn more about Professor Ohashi's research, visit his profile here.

Q: What are the UN SDG goals your research is trying to help achieve?

My research directly supports UN SDG Goal 6: Clean Water and Sanitation. However, I do not specifically focus on SDGs. I believe the key is to pursue excellent science as a researcher, as any significant scientific achievement will ultimately benefit society.

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

A: In my current research, I have successfully enriched manganese-oxidizing bacteria. The bio-manganese oxides they produce have a high potential to adsorb minor metals. Using this phenomenon, I am developing a new technology for the treatment of metal-containing wastewater and the recovery of metals as resources.

Hiroshima University Researcher Directory

Find out more about the researchers that make the science happen at HU:

Inside Hiroshima University's RISE: Engineering the future via semiconductor innovations

Semiconductor chips, often dubbed the "brains" of electronics, are crucial to the modern devices we rely on daily. In Japan, Hiroshima University has a rich history in its research. Now, with its Research Institute for Semiconductor Engineering (RISE), HU is poised to be a game-changer in the world of technology.

Formerly known as the Research Institute for Nanodevice and Bio Systems (RNBS), its renaming to RISE in April 2024 reflects its expanded focus, encompassing cutting-edge materials, semiconductor manufacturing methods, and applications like AI and communication systems. This institute isn't just about tech—it's about breakthrough materials like silicon carbide (SiC) and gallium nitride (GaN) that can handle extreme conditions. SiC is commonly used in high-temperature devices such as power conversion systems, automotive components, and optoelectronics due to its exceptional thermal stability, higher breakdown voltages, and lower leakage currents. On the other hand, GaN is preferred for high-frequency and high-performance applications like radio frequency amplifiers, LED lighting, and power electronics as it allows electrons to easily move through it and travel at fast speeds without losing much energy.

RISE's research is powered by state-of-the-art, 800-square-meter cleanroom facilities, ensuring precision in developing next-gen microchips. Collaboration is central to its mission. The institute partners with industry giants like Micron and collaborates with a consortium of companies, governments, and academic institutions worldwide.

Today, the institute aims to be a global leader in semiconductor education and research.

Hiroshima University joins landmark Japan-U.S. semiconductor partnership

HU has joined a landmark U.S.-Japan collaborative partnership launched by **Micron** and its industry partners to enhance semiconductor research and establish a talent development hub.

UPWARDS for the Future brings together eleven universities from across Japan and the U.S.: Hiroshima University, Tohoku University, Tokyo Institute of Technology, Nagoya University, and Kyushu University from Japan; Purdue University, Boise State University, University of Washington, Rochester Institute of Technology, Rensselaer Polytechnic Institute, and Virginia Tech from the United States.

© Photo by the White House

Q&A

We spoke with RISE director Professor **Akinobu Teramoto** to explore the institute's pioneering work and vision for the future.

Q: What prompted the renaming of the institute to the Research Institute for Semiconductor Engineering?

A: The name change reflects our broader work scope which includes semiconductor devices, materials, and manufacturing equipment and applications, like AI or communication systems.

Q: Can you highlight the importance of your research on materials like silicon carbide (SiC) and gallium nitride (GaN)?

A: Silicon carbide and gallium nitride are crucial for high-power applications. Their superior performance in extreme conditions make them ideal for aerospace and advanced communication systems. Our research aims to explore and expand the potential of these materials.

Q: What opportunities does RISE provide for students and researchers?

A: We offer access to our state-of-the-art facilities, such as our cleanroom, for both Hiroshima University students and external researchers. Cleanrooms are essential for semiconductor manufacturing and research. They ensure minimal contamination, which is vital for the precision and reliability of our experiments and developments. Also, our programs combine rigorous academic training with hands-on experience, preparing graduates to excel in the semiconductor industry. These opportunities help foster the next generation of innovators.

Q: What collaborative opportunities does RISE offer to industry partners?

A: We have partnerships with companies like Micron and we are part of a consortium of 23 companies and two universities. These collaborations are crucial because they allow us to translate academic research into practical, scalable solutions.

Q: What is the future direction for RISE in terms of research and development?

A: Our future direction involves pushing the boundaries of semiconductor technology. We aim to delve deeper into advanced materials, improve manufacturing techniques, and expand our applications in AI and communication systems. By fostering strong industry partnerships and providing top-tier education and research opportunities, we aspire to be at the forefront of technological innovation.

Join us at RISE!
We invite students and researchers to join us in advancing the future of semiconductor engineering.

Hiroshima University at a Glance

(as of May 1, 2024)

12 SCHOOLS (UNDEGRADUATE)

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

4 GRADUATE SCHOOLS

- Integrated Sciences for Life
- Biomedical and Health Sciences
- Humanities and Social Sciences
- Advanced Science and Engineering

1 RESEARCH INSTITUTE

- Graduate School of Innovation and Practice for Smart Society

STUDENTS

15,000+

UNDERGRADUATE AND GRADUATE

INTERNATIONAL STUDENTS

1,900+

FROM 90+ COUNTRIES & REGIONS

(as of November 1, 2023)

Hiroshima University hosts students worldwide, with the highest number coming from CHINA, INDONESIA and VIETNAM.

INTERNATIONAL EXCHANGE AGREEMENTS

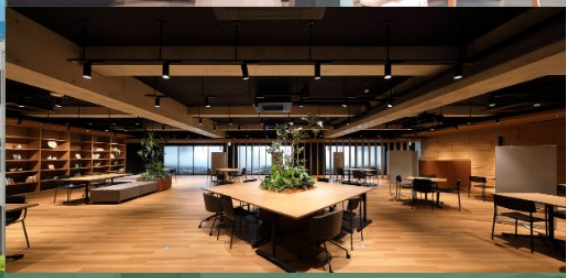
369 AGREEMENTS WITH 413 INSTITUTIONS IN

56 COUNTRIES & REGIONS

OVERSEAS BASES

22

IN 14 COUNTRIES & REGIONS



THE UNIVERSITY IMPACT RANKINGS 2024

3rd IN JAPAN FOR THE OVERALL SCORE

TOP **100** IN THE WORLD FOR 7 SDG CATEGORIES

ADMISSIONS

For admissions inquiries or to learn more about the graduate degrees offered at HU, please click or scan the QR codes below.

Admissions

Graduate Degrees at HU

Campus location & access

Hiroshima University

WHAT'S NEW ON CAMPUS

23 MAR 2024

HU celebrates 2023 Commencement Ceremony

This year's graduates included 2,343 undergraduate students, 13 advanced course students, and 1,345 graduate students, a total of 3,701 individuals (including 283 international students).

3 APR 2024

HU welcomes new students at 2024 Entrance Ceremony

This year, among the newcomers, there are 2,517 undergraduate and advanced course students and 1,550 graduate students, all embarking on their new journeys.

HU Original Goods

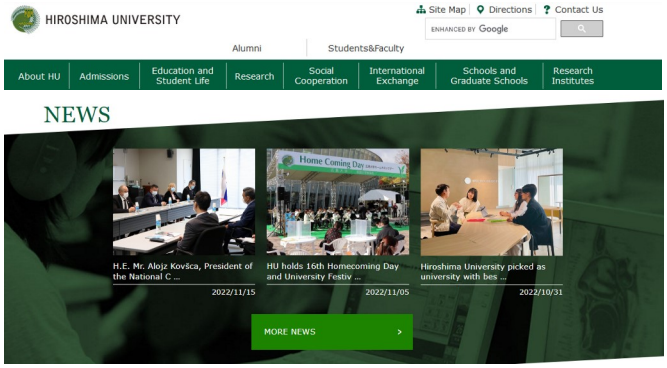
HU has launched a new line of original merchandise, including a green hoodie and dry t-shirt. Both items incorporate the university's emblem and its signature green color, blending tradition with a timeless design aesthetic.

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

SOCIAL MEDIA ACCOUNTS

HU Facebook
@HiroshimaUniv.en

HU Research Facebook
@HiroshimaUniversityResearch

HU Instagram
@hiroshima_univ

HU LinkedIn
HiroshimaUniv.en

HU X (formerly Twitter)
@HiroshimaUnivEn

HU Research Twitter
@Hiroshima_Univ

HU YouTube
HiroshimaUniv

Connect with us!

75+75th Anniversary Project Commemorative Goods

Available now are a 315-piece jigsaw puzzle and a scarf, both featuring the most iconic sites of HU. These items, created by Hiroshima-based illustrator Hirofumi Kamigaki, were specially designed to commemorate HU's 75+75th anniversary.

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
E-mail: koho@office.hiroshima-u.ac.jp