HIROSHIMA UNIVERSITY

UP DA TE



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ABOUT US

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.







NTER CAMPUS PHOTOS













HIROSHIMA UNIVERSITY UPDATE

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Ms. Setsuko Thurlow

"Crawl towards the Light-Pursuing a World without Nuclear Weapons"

The 92nd Hiroshima University Lecture Meeting









Ms. Setsuko Thurlow receiving a letter of appreciation by President Mitsuo Ochi after the lecture

On November 18th, 2019, Ms. Setsuko Thurlow, a survivor of the atomic blasts in Hiroshima and the leading figure of ICAN, which won the Nobel Peace Prize in 2017, came to HU. She kindly accepted HU's invitation and delivered a lecture on peace based on her experiences at Higashi-Hiroshima Campus.

In the lecture, Ms. Thurlow told the audience how the words of a man shouting "Don't give up! See the light? Crawl towards it" saved her life when she found herself trapped in the smoldering rubble after the bombing.

As a living witness to the horrors of nuclear war, she fully understands the trauma of the atomic bomb survivors and it is hard to openly talk about such a painful event. However, during the lecture, she emphasized that the bomb survivors should be encouraged to share their experiences with the people in the world. This is because "People around the world should be given more opportunities to hear about the stories of the atomic bomb survivors and learn from their experiences."

During her lecture, she openly expressed her big disappointment at the Japanese government's decision of not ratifying the nuclear weapons treaty. This is because Ms. Thurlow has been working for decades to draw people's attention to the catastrophic consequences of nuclear weapons to humanity and campaigning for the total ban of nuclear weapons.

Ms. Thurlow concluded her lecture by asking the audience to reflect on the catastrophic damage nuclear weapons have caused in the past and to take actions for the total elimination of them from the world.



Meeting with the Vice President of Indonesia

Hiroshima University x Indonesia

On February 6th, 2019, Hiroshima University's President, Mitsuo Ochi, and Executive Vice President Toshiyuki Sato had a meeting with Indonesia's Vice President, Dr. Muhammad Jusuf Kalla, at his residence in Jakarta. In February 2018, Dr. Kalla paid a visit to HU, and this time President Ochi visited Indonesia's capital to meet the Vice President.



PARTICIPANTS

Cambodia

International University University of Health Sciences University of Puthisastra

Indonesia

University of Christian Maranatha Padjadjaran University University of Prof. Dr. Moestopo Indonesia University Airlangga University

Thailand

Mahidol University

Taiwan Taipei Medical University

Vietnam

University of Medicine and Pharmacy at Ho Chi Minh City Hong Bang International University

Malaysia University of Malaya During the meeting, President Ochi explained how successful higher education institutions in Indonesia and HU have been in building up good relationships in the past. He exemplified this by referring to the fact that HU and Indonesian universities have been actively engaged in the student/ academic exchanges for decades, and that ex-Indonesian students of HU are back to their home towns, playing active and important roles in their communities. Vice President Kalla expressed his hopes for HU to further expand academic exchanges between the two countries.

HU is determined to continue its efforts to further promote academic exchanges so as to strengthen its partnership with higher education institutions in Indonesia.

Currently, 151 Indonesian students are studying at HU. It is the secondlargest number of international students received at HU after China.



Vice President Kalla (left) and President Ochi (right) during the meeting



Students from Indonesia studying at Hiroshima University



School of Dentistry Receiving Asian Students for

The Short-term Stay Program 2019

International Students Activities

November 11th- 19th, 2019

This 10-day program serves as a dental exchange program, organized by the School of Dentistry at Hiroshima University where it receives students specialized in either dentistry, dental hygiene, or dental technique from our partner universities, mainly located in South East Asia.

By attending this program, students are expected to learn the importance of mutual understanding and multicultural communities, and harmonious coexistence for the countries in Asia, which will lead to building up a more solid relationship between the institutions in Asia and HU. The program organizer strongly believes that this program can be used to enhance its global network even further for the purpose of implementing dental research, education, and practices.

This year, 22 students of 13 partner universities from 6 countries have visited the School of Dentistry to attend the 10-Day Program, participating in some lectures which are available both in Japanese and English. They also had a guided tour of Hiroshima University Hospital.

Symposiums and Seminars at HU

Taoyaka Program Student Symposium

"Communityoriented tourism in Mitarai, Seto Inland Sea"

For a disadvantaged region such as small islands on the Seto Inland Sea, which are facing the problem of depopulation and aging, going for sustainable tourism development may be one of the possible solutions to revitalizing local communities. On August 25th, 2019, a student symposium was jointly held by "Taoyaka Program for creating a flexible, enduring, peaceful society---Organization of the Leading Graduate Education Program" at Hiroshima University and Kure city in Hiroshima Prefecture, attracting around 80 participants including the local people of Mitarai in Kure city. The first part of the symposium was a presentation session where the participating students report-

Triple-helix Seminar on "Food and Healthcare" in Singapore

On October 15th, 2019, Hiroshima University held a second triple-helix seminar on "Food and Healthcare" at Nanyang Technological University in Singapore.

In the seminar. Prof. Tadashi Shimamoto, Graduate School of Integrated Sciences for Life at Hiroshima University, first gave a brief overview of the Hiroshima University Research Center for Japanese Foods, and then presented his research on the inactivation of noroviruses with persimmon tannin and the development of antiviral disinfectants. Mr. Toru Tsuji at Altan Co. Ltd., a research collaborator of Prof. Shimamoto also delivered a

ed their research findings following their onsite training in Mitarai between August 17th and 25th. The second part of the symposium saw a panel discussion by a selected group of panelists from Japan and overseas.

During the onsite training, the student groups from Japan, India and the United States interviewed the local people to ascertain what kind of difficulties they were facing in Mitarai. The task involved with this interview was twofold: 1) To hear the voices of the local people and identify the issues involved, 2) To come up with practical suggestions/solutions for the identified issues. During the presentation session, the groups came up with a total of six suggestions/solutions, which were taken up for comments and discussions by the panelists and audience in the symposium.

Following the presentation by the students, a panel discussion entitled "Community Planning in Beautiful Harmony with Nature, Culture and History" was held with Professor Fujiwara from HU acting as the moderator. The Panelists shared with the audience examples of both successful and unsuccess-



ful community-based challenges made in the world. During the panel discussion, the panelists exchanged a wide range of opinions regarding the future development of Mitarai, while making sure to strike a balance between the economic activities and the environmental sustainability in Mitarai. In addition, the panelists exchanged opinions regarding what was expected of HU in terms of its contributions to science and technology and the local communities.

The symposium was concluded by the remarks of Mr. Shinhara, the mayor of Kure city, emphasizing that more future collaboration with the academia is necessary, but equally, maintaining regular dialogue with the local people of Mitarai through educational activities is important.



presentation on the anti-virus products developed through collaborative research with Hiroshima University. Mr. Tsuji handed out a variety of product samples to the participants, which led to a lively Q&A session.

After that, two researchers from Nanyang Technological University spoke about two interesting topics. Prof. James P. Tam, Synzymes and Natural Products Center, gave a lecture on "Traditional medicines and functional foods", in which he covered topics including drug development, synthesis, and research of orally active peptides using all the available medicinal herbs and a huge library of plants and herbs available in Singapore. Following that, Associate Prof. Sze Siu-Kwan Newman gave a talk entitled "The proteomics unraveling the health benefits of soy bioactive lunasin in fresh and processed foods". Dr. Newman's presentation was interesting as his research showed that the disappearance and reduction of soy protein effects are regulated by processing conditions such as temperature.

Following the seminar, the speakers and participants were still busy networking with each other, further discussing topics covered in the symposium.

HIROSHIMA UNIVERSITY UPDATE

NEW FACILITIES AT HU



One Cafe

This is a new cafe opened on Higashi-Hiroshima Campus where students, faculty and administrative members can relax and enjoy a good coffee.

The "Welcome Desk" is a space at One Cafe where international students, faculty and administrative members can discuss their daily life problems in English with university staff. This is also a place where home students who are interested in studying abroad can obtain information about international exchange programs.





Fukuyama-Tsuun-Komaru *Nigiwai** Pavilion

This is a new multi-purpose facility launched recently, which can be used as spaces for self-studying and entrepreneurship projects, as well as for consuming food and drinks. HU is keen to support voluntary activities of HU students and expects the pavilion to enhance HU students' learning environment.

With its construction undertaken by Yamane Holdings Co., Ltd., the Pavilion was donated by Fukuyama Transporting Co., Ltd. and The Shibuya Ikueikai Foundation.

*Nigiwai is a Japanese word, which literally means "bustle"



lt's *Matsuri* Time!

International Students Experience Matsuri

"Yoshiura Autumn Crab Festival"

On October 5th, 2019, a party of international exchange students from the "Hiroshima University Study Abroad Program" (HUSA 2019-2020) visited the Yoshiura Autumn Crab Festival held in Kure City, led by Associate Professor Tsunematsu from HU's Morito Institute of Global Higher Education.

This festival or *Matsuri* in Japanese is organized every year by the local community Yoshiura, in Kure-city as a dedication to Yoshiura Hachiman Shrine. The participating international students from various countries and with different backgrounds had an opportunity to experience one of Japan's many appealing cultural expressions: *Matsuri*. They tried some local food

On October 5th, 2019, a party of interna- and interacted with the locals while enjoytional exchange students from the ing the lively event.

The variety of colorful and interesting *Mikoshi*, or portable shrines, and the fishing boat which is built for praying for good harvest and fishing, were some of the most intriguing things for students. With the "Sô-rya sageta" call, a shout of encouragement to lift the dedication, people carried these very heavy *Mikoshi* and fishing boat on their backs. Seeing these people's energy and vigor deeply touched the heart of the international students.

The Yoshiura Autumn Crab festival was a one-of-a-kind experience for the international students to enjoy Japan, its culture and traditions!

HU Students Enjoying

"Sake Festival" at Saijo, "The Sake Town"

Higashi-Hiroshima City's Saijo district is famous throughout Japan as a leading sake brewing town. It is in this district that the annual "Sake Festival" was held on October 12th and 13th, 2019.

The "Sake Festival" or "Sake *Matsuri*" draws people from all over Japan and has also gained international popularity in recent years. During the festival, visitors walk around the neighborhood of JR Saijo Station as many sake breweries are within the walking distance from the station, and participate in brewery hopping. During the hopping, visitors can taste the different types of Japanese sake and enjoy delicious food.

Saijo district is not only the hometown for the leading sake breweries, but also it is





where Hiroshima University's main campus is located. So many international students at HU go to the festival. Mr. Gabriel Fonteles, a Ph.D. student from Brazil, and Ms. Chang Boya, an undergraduate exchange student from China, participated in the "Sake Festival" this year and shared some of their experiences with us. They both enjoyed the food and drinks at the event and were impressed with the mass of people that gathered around Saijo. "Sake Matsuri is not an event that you would find in our countries", they said. Ms. Chang liked how the Matsuri's stage and music reflected the Japanese culture, and Mr. Fonteles found it interesting that they had Brazilian food at the Matsuri, a way to connect Japanese people with other countries.







RECENT NEWS



Two HU researchers stand out in

Nature Biotechnology's

"15 Most Prolific Researchers Publishing on Gene Editing"

- Professor Takashi Yamamoto (2nd place)
- Associate Professor Tetsushi Sakuma (5th place)

On October 2nd, 2019, *Nature Biotechnology* published an article titled "Collaborative networks in gene editing." The article included a ranking list of the 15 most prolific researchers who have published on genome editing around the world. Two researchers from Hiroshima University were on the list: Professor Takashi Yamamoto in 2nd place and Associate Professor Tetsushi Sakuma in 5th place.

In the article, researchers from China, the United States, and Australia collected and analyzed over 15,000 articles and reviews published since 2000 related to genome editing. Professor Feng Zhang was ranked 1st place with 105 papers, followed by Professor Takashi Yamamoto in 2nd place with 91 papers, Professor Jennifer Doudna in 3rd place with 85, Professor Jin-Soo Kim in 4th place with 81, and Associate Professor Tetsushi Sakuma in 5th place with 78 papers.

Professor Feng Zhang and Professor Jennifer Doudna received the Canada Gairdner International Award in 2016, and Thomson Reuters predicts them to be Noble Prize winners in the near future. In the article, both professors of Hiroshima University were also highly regarded as world-class researchers.

ТАКАЗНІ УАМАМОТО

Professor

-Genome Editing Innovation Center -Graduate School of Integrated Sciences for Life

TETSUSHI SAKUMA

Associate Professor

-Graduate School of Integrated Sciences for Life

CHECK IT OUT

Find more information about Hiroshima University's doctoral programs in genome editing:

WISE Program (Doctoral Program for World-Leading Innovative & Smart Education

The Frontier Development Program for Genome Editing



https://genome.hiroshima-u.ac.jp/en/index.html



Graduate School of Integrated Sciences for Life

Associate Professor Noriyuki Yanaka Assistant Professor Thanutchaporn Kumrungsee

"Genetically modified mice can show which functional foods can heal kidney disease"

Scientists create a mouse model that can show kidney disease progression and treatment in live animals.

Researchers at Hiroshima University used genetically engineered mice to show the severity and progression of kidney disease and recovery during treatment in a new paper published in Scientific Reports in October.

Chronic kidney disease affects 750 million people each year. Aging populations and an increase in diseases such as diabetes will lead to a greater burden of kidney disease. In general, when doctors want to check if a patient has kidney disease, they must do so by a blood test or by biopsy. This is usually only feasible when the disease is in its later stages. By then it might be too late to treat, and the patients may have to undergo transplant or dialysis.

"So far, there is no method for imaging or visualizing of kidney disease in the early stage in both human and experimental animals. Our paper is the first to propose this solution. This method can let you see how severe the kidney disease is by observing the light emitted from the mice when they still alive,"

says Assistant Professor Thanutchaporn Kumrungsee, Graduate School of Integrated Life Sciences, Hiroshima University. In 2016, the team of Associate Professor Noriyuki Yanaka and Asst. Professor Kumrungsee developed a non-invasive method for monitoring obesity-caused inflammation to reduce the number of mice killed during experimentation.

The mice were engineered with a light-emitting gene that glowed when a protein was present at high levels. This protein (Saa3) is produced in high amounts during inflammation or injury so can be a useful biomarker of disease.

In the present study, to monitor disease progression and therapy Prof. Yanaka's team fed mice a highadenine diet to cause kidney disease. The high levels of adenine caused crystals (like kidney stones) to develop, leading to inflammation and increased levels of Saa3. The mice emitted light from their kidneys when under these injury conditions. The team have proposed this mouse model as a useful tool for monitoring kidney disease progression and therapeutic agent screening.

The researchers then screened possible treatment options and observed a promising chemical found in citrus

RESEARCH FOCUS



Visualization of kidney disease and therapy by the citrus fruit-derived compound treatment. The genetically engineered mice were anesthetized and put in a prone position under an imaging system machine that allowed us to visualize severity of kidney disease in live animals. Severe kidney disease was clearly seen as a strong light signal from the picture in the center. Treatment with G-Hes showed a decrease in kidney injury and thus a weaker light signal. **Credit:** Associate Professor Noriyuki Yanaka and Assistant Professor Thanutchaporn Kumrungsee

> fruit: glucosyl hesperidin (G-Hes). After treating mice with G-Hes for three days, then feeding them the adenine diet for 3 weeks the researchers observed a decrease in the amount of inflammation seen in the kidneys, also confirmed through a blood test. Using this engineered mouse, the team was able to observe the kidneys at 1, 2 and 3 weeks into the diet and treatment without terminating the mice, reducing the number of mice required for the experiments.

> In the future, the team would like to perform drug screening by using this model to prevent kidney disease in the early stages.

Original article: Kumrungsee, T., et al., The serum amyloid A3 promoterdriven luciferase reporter mice is a valuable tool to image early renal fibrosis development and shows the therapeutic effect of glucosylhesperidin treatment, Sci. Rep. 9, 14101 (2019).

Link: https://doi.org/10.1038/s41598-019-50685-0

Graduate School of Engineering

Carlos Maria

"How people trick themselves into thinking something is heavier than it really is"

Hiroshima University x Nagoya Institute of Technology

Holding a steering wheel at different arm positions can influence how much force we think we need to steer



Biological Systems Engineering Lab, Hiroshima University Official Website

http://www.bsys.hiroshima-u.ac.jp/en

In a recent study published in PLOS One researchers from Hiroshima University and Nagoya Institute of Technology found that if you hold your car steering wheel at certain angles (1, 4, or 5 on the clock) then it's likely you're over or underestimating how much force you need to use to steer the car.

There are many factors that go into how we perceive an object's weight. Gravity, fatigue and sensory information such as color and texture are relayed to our brains and form our ideas of how heavy or large something is. Using this information, we calculate how much effort we need to pick something up or move it around. This is called force perception. Professor Yuichi Kurita and Mr. Yusuke Kishishita from the Biological System Engineering Lab, Graduate School of Engineering, Hiroshima University and Associate Professor Yoshihiro Tanaka from Nagoya Institute of Technology were interested in how sense of effort influenced force perceptual bias.

"Force perceptual bias is the misprediction of actual events. Almost all of the illusion is based on the gap between the prediction and the reality. For example, an object's color can make it look bigger or smaller, so we predict that it is light or heavy before touching it," explains Yusuke Kishishita, lead author of the paper. "Black makes objects look smaller while light colors make them look bigger,". Darker colors make objects appear small, so they are heavier than expected and vice versa for light objects.

Most of our daily activities require us to have correct force perception including picking up a cup of tea, closing a door or driving. Incorrectly assuming how much force is needed to accelerate a little faster can lead to an accident. Force perception also affects how we steer the car. Arm position changes the way we use our muscles to perform tasks. An uncomfortable or strange position can make our sense of effort feel higher or lower, thus the object feels lighter or heavier than it actually is.

"When we drive, we don't see the steering angle but we have to make a decision on how much force to use... if the bias affects the force perception that could cause us to badly control the steering wheel," says Kishishita.

This study used a weighted steering wheel where participants performed actions with it using one hand. The position of the arm was changed to see if the subjects perceived the resistance as greater or lesser when compared to a neutral posture (0 o). The modified positions were at 30o, 60o, -60o and -30o (similar to hands pointing to 1, 2, 4 and 5 on the clock). The participants were asked to perform a task using the steering wheel and differing weights. The research team used 3D motion capture to look at the posture and used algorithms to model the data. Using this method, the researchers could look at the whole arm and torso posture. Participants were also asked about how heavy the steering wheel was when compared to the neutral position. They reported a large change in the amount of force used at 30o, -60o and -30o i.e. these angles were the most biased.

"If we consider this bias, we can make cars safer to drive also give us a good feeling while driving," says Kishishita.

Research in this area can also be useful for safety, like designing machines that account for this bias to reduce the number of human errors as well as for entertainment such as improving virtual reality environments.

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Link: https://doi.org/10.1371 journal.pone.0223930

Original article: Kishishita Y, Tanaka Y, Kurita Y (2019) Force perceptual bias caused by muscle activity in unimanual steering. PLoS ONE 14(10): e0223930.

The World of *Kakuhitsu*

Interview to Professor Emeritus Yoshinori Kobayashi

Prof. Kobayashi was the first person who has discovered an ancient document in which characters were written using a *Kakuhitsu* (a stylus that produces depressions to create letters and marks). Having steadily pursued his research on ancient documents regarding *Kakuhitsu* for more than 50 years, Prof. Kobayashi found out that the stylus-impressed literature existed not only in Japan but also in China, the Korean Peninsula, and Europe. Having lived past the age of 90, Prof. Kobayashi is still passionate about his research.

Encounter with the stylus - Kakuhitsu

As my research subject concerns history of *Kanbun Kundoku* (Japanese reading of Classical Chinese by literal translation), I used to visit ancient temples in Kyoto and Nara in search of my research materials. My first encounter with the *Kakuhitsu* was in 1961 when some Classical Chinese writing was discovered in a temple in Koyasan. The writing was put on display at the exhibition in the temple. When I saw it, I happened to notice that there were some symbols, looking like nail marks, next to some Chinese characters. Since these marks were colorless, i.e. no ink was used, they had been completely overlooked by other researchers until then.



Profile: Born in Yamanashi Prefecture in 1929. Worked at Hiroshima University for 72 years. Received the Japan Academy Prize and the Imperial Prize in 1991. Retired and became a Professor Emeritus of Hiroshima University in 1992. Awardee of a "Person of Cultural Merit" in 2019, an official Japanese honor and recognition awarded annually to select people who have made outstanding cultural contributions.



"I believe that approaching ancient documents from the viewpoint of Kakuhitsu will lead to the discovery of more unknown techniques and traditions of different cultures. I hope and expect Hiroshima University to lead the international research communities regarding Kakuhitsu on ancient documents"

What did these stylus-impressed marks mean?

The stylus-impressed documents were in use from the Nara to the Edo period, and most marks were there to show how to read Classical Chinese texts. I found letters, old documents and even *mokkan* (wooden tablets) that were stylus-impressed. I think that people from that time used to write and read with this stylus while using the candle light.

More or less, I have come to understand the possible reasons behind using the stylus. The beauty of *Kakuhitsu* is that the writing (characters and marks) did not stand out, which means that it was not used for formal documents or writings, but for personal use (e.g. when you leave comments or messages on a paper). I also came across the spoken Japanese and slang words in those periods on the stylusimpressed documents.

Is the culture of Kakuhitsu unique to East Asia?

My research at the British Museum proved that the stylus was also in use across Europe. On the hand-printed bibles assembled in the 11th and 12th century, I came across ancient letters, signs and pictures that seemed to have been written with a stylus. I also saw similar marks in The Koran. Therefore, it seems that the *Kakuhitsu* was in use not only in East Asia but also in Europe and the Middle East. However, this research has just begun.



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Graduate School of Education

Associate Professor Ko Tomikawa

"New species of shrimp-like creatures discovered in the mouth of a whale shark"

A new species of amphipods, Prodocerus jinbe, were found in the mouth of a whale shark, one of the largest species of fish in the ocean.

Associate Professor Ko Tomikawa of Hiroshima University's Graduate School of Education, found the new species of amphipods in the mouth of

a whale shark through the international collaboration with the Okinawa Churaumi Aquarium and the University of Tromsø in Norway. The new species was officially named *Prodocerus jinbe*, and it was the first record ever of an amphipod associated with the whale shark. Professor Tomikawa thinks that these amphipods reside in the mouth of the whale shark because it is a comfortable habitat to be in: fresh seawater and food flowing in regularly and providing a safe place against predators.

He thinks that he should be able to clarify some of the mysteries surrounding the evolution of the habitats of small invertebrates in the future by studying the ecology, distribution and genetic structure of the *Prodocerus jinbe*. This research paper was published on *Species Diversity* (25 October 2019), a journal of the Japanese Society of Systematic Zoology.

RESEARCH FOCUS



New species Prodocerus jinbe

Original article:

Tomikawa, K., Yanagisawa, M., Higashiji, T., Yano, N.& Vader, W. (2019) A New Species of Podocerus (Crustacea: Amphipoda: Podoceridae) Associated with the Whale Shark Rhincodon typus. *Species Diversity* 24(2), 209-216.

Link: https://doi.org/10.12782/ specdiv.24.209

Graduate School for International Development and Cooperation





On November 17th, 2019, Hiroshima University conducted a pilot test of a self-driving bus on the tramway operated by the Hiroshima Electric Railway in Hiroshima city. This is the first time that an automatically-operated bus has been tested on a tramway in the world.

The experiment was a part of the research entitled "Measuring value of mobility in the age of quality transport" led by the Committee on Advanced Road Technology (CART) of the Ministry of Land, Infrastructure, Transport and Tourism.

The self-driving bus is equipped with several sensors and cameras that are capable of measuring and monitoring the distance between the two vehicles. By collecting and analyzing the monitor survey data, the findings will be used to improve the level of convenience of the bus in question. During the test, the self-driving bus with a monitor ran on the tramway of "Eba Line" of the Hiroshima Electric Railway, going after a streetcar for 225 meters at a maximum speed of 15 km/h. The test runs were repeated 10 times between 0:10 and 4:20 including the pilot runs.

"This is a groundbreaking experiment of which findings can be fed back to the technology and implemented into society", said Akimasa Fujiwara, Professor at the Graduate School for International Development and Cooperation of HU, at the interview.



12

Graduate School of Integrated Sciences for Life

'here is a

Original texts and photos by Okinawa Institute of Science and Technology Graduate University (OIST) Edited by Hiroshima University

Researchers have identified a new species of bobtail squid inhabiting Okinawa's waters



Original article

Sanchez, G., Jolly, J., Reid, A., Sugimoto, C., Azama, C., Marlétaz, F., Simakov, O., Rokhsar, D., S. (2019) New bobtail squid (Sepiolidae : Sepiolinae) from the Ryukyu islands revealed by molecular and morphological analysis. Communications Biol-

Researchers in the Okinawa Institute of Science and Technology Graduate University's Molecular Genetics Unit, in collaboration with a researcher from Australia, have identified a new species of bobtail squid inhabiting Okinawa's waters - dubbed Euprymna brenneri in honor of the late Dr. Sydney Brenner, molecular geneticist and one of the founders of OIST, who passed away earlier this year. The scientists' findings, published in Communications Biology, highlight the rich biodiversity in the seas near Okinawa, and may shed light on the genes, behavior, and development of bobtail squid.

"Our research strives to understand how these animals' complicated brains work... We're also compelled to explore why there is such a wide variety of species off the coast of Okinawa."

said Gustavo Sanchez, currently an Assistant Professor at Hiroshima University, lead author of the study.

Finding and classification

Bobtails have unique features from true squid, including their rounded or "bobbed" posteriors, earning them the nickname "dumpling squid." In fact, they are actually more closely related to cuttlefish. Bobtails can be raised in the laboratory, making them useful as model for studying cephalopod development, genetics, and behavior. Scientists have also observed advanced behaviors like associative learning and inherited personality and fitness traits in bobtails.

For the present study, the researchers scoured the Ryukyan archipelago for bobtails, searching in shallow waters. They found three different types of egg masses and two distinct adult bobtails.

By studying the DNA and RNA expression, or transcriptomes, in 42 different individuals across 10 species, the researchers matched the adults with their corresponding egg types and identified one of them as Euprymna parva, which was previously miscategorized as a different genus. One egg mass lacked a corresponding adult; by DNA it appeared to be distantly related to a different species found in Australia and East Timor, Euprymna pardalota.

One Ryukyuan type of bobtail remained. In addition to sequencing its transcriptome, the scientists closely analyzed its morphology; Jeff Jolly observed distinctive patterns of suckers on its arms and tentacles. The researchers enlisted the help of systematist Dr. Amanda Reid, from the Australian Museum in Sydney, to carefully look over the species and formally describe them.

From their analyses, the scientists confirmed they had found a new species, which they named Euprymna brenneri. This species is the eleventh known in the Euprymna genus and will be useful in future phylogenetic and comparative studies, the researchers said.

In addition to phylogeny, the scientists are interested in the bobtail squid's symbiotic relationship with the Vibrio fischeri bacteria that populate a pouch -like organ on the squid's underside. Bobtails conceal themselves under the sand throughout the day, then emerge at night to hunt. They use the bacteria, which glow, to help them camouflage and achieve more successful predation in the dark.

Moving forward, the researchers hope to discover more about the rich diversity of cephalopods off the shores of Okinawa, and to further explore the relationships between different bobtail species.



A photo of Euprymna brenneri, taken by Jeff Jolly, a co-author of the study.

HIROSHIMA UNIVERSITY UPDATE

Hiroshima Synchrotron Radiation Center

"Coherent control of an atom by synchrotron radiation"

Coherent control is a method to manipulate the populations and pathways in matters by light and is currently one of the most attractive research areas in optical physics and photochemistry. Lasers have been considered as unique light source enabling one to perform coherent control. However, in recent studies pub-

Graduate School of Biomedical and Health Sciences

"Inhibiting mitochondrial protein TSPO for antidepressant effect"

Antidepressant effect of the TSPO antagonist modulating inflammatory response in the mouse brain

Recent studies suggested that chronic stress is a predisposing factor for depression and activates microglial cells in the brain with inflammatory response. Translocator protein 18 kDa (TSPO) is a mitochondrial protein expressed on microglia in the brain that has been proposed to be a useful biomarker for inflammation. A group of Dr. Aizawa in Hiroshima University in lished in Nature Communications and Physical Review Letters, the research group that Prof. Masahiro Katoh (Hiroshima Univ.) directs has demonstrated an unremarked capability of synchrotron radiation on the coherent control. They employed devices called undulators, which was capable of producing synchrotron light pulses with tailored waveform. They shone He atoms with those pulses and demonstrated that the populations of the individual excited states of He atoms can be controlled. Moreover, they also demonstrated that the shape and orientation of the electron cloud surrounding the atomic nuclei can be controlled. There is no technical restriction on the application of this method at shorter wavelengths to which lasers could hardly reach soon. This unexploited capability of synchrotron radiation will advance the frontier of coherent-control technology.

collaboration with Kyushu University and ONO Pharmaceutical Co. Ltd. hypothesized that a TSPO antagonist, ONO-2952, would inhibit the neuroinflammation induced by microglial hyperactivation and associated depressive-like behaviors. An in vitro analysis showed that ONO-2952 suppressed the release of pro-inflammatory cytokines and mitochondrial reactive oxygen species in cultured microglia stimulated by lipopolysaccharide. In mice submitted to chronic stress, microglia predominantly expressed TSPO in limbic areas implicated in depressivelike behaviors, including the amygdala, ventral hippocampus and nucleus accumbens, in which an increase in the production of pro-inflammatory cytokines in vivo were associated. Treating animals with ONO-2952 during chronic social defeat stress ameliorated impairments in social avoidance and anxiety-like behaviors and suppressed pro-inflammatory cytokine production, suggesting that ONO-2952 exerted an anti-stress effect in this animal model of depression. Thus, targeting TSPO as a candidate for the development of antidepressants that reduce suscepti-



The shape and orientation of an Helium atom was successfully controlled by irradiation of a synchrotron light pulse with a tailored waveform.

Original articles:

1. Y. Hikosaka, T. Kaneyasu, M. Fujimoto, H. Iwayama, M. Katoh, "Coherent control in the extreme ultraviolet and attosecond regime by synchrotron radiation", Nature Communications 10, 4988 (2019)

Link: https://doi.org/10.1038/s41467-019-12978-w

2. T. Kaneyasu, Y. Hikosaka, M. Fujimoto, H. Iwayama, and M. Katoh, "Controlling the orbital alignment in atoms using cross-circularly polarized extreme ultraviolet wave packets", Physical Review Letters (2019)

Link: https://doi.org/10.1103 PhysRevLett.123.233401

bility to chronic stress could pave the way toward therapeutic interventions for relapse prophylaxis in depression.



Original article

Nozaki, K., Ito, H., Ohgidani, M., Yamawaki, Y., Sahin, E. H., Kitajima, T., Katsumata, S., Yamawaki, S., Kato, T., Aizawa, H. (2020). Antidepressant effect of the translocator protein antagonist ONO-2952 on mouse behaviors under chronic social defeat stress. Neuropharmacology, 162, 107835.

Link: <u>https://doi.org/10.1016/</u> j.neuropharm.2019.107835

14

Graduate School of Science

Successful Development of "Single Molecule Electret"



Report on a unique material exhibiting single-molecule electric polarisation switching that can operate above room temperature

Continual progress has been achieved in information technology through unrelenting miniaturisation of the single memory bit in integrated ferromagnetic, ferroelectric, optical, and related circuits. However, as miniaturisation is approaching its theoretical limit, new memory materials are being sought as replacements.

Here, we report a unique material exhibiting single-molecule electric polarisation switching that can operate above room temperature, we call a single-molecule electret (SME), which exhibits all the characteristics of ferroelectricity but without long-range dipole ordering. The phenomenon occurs in a Preyssler-type polyoxometalate (POM) cluster which has the (a) Crystal structure and (b) potential-energy dispersion of dipole moment for Preyssler-type polyoxometalate cluster. Dependence of polarisation on (c) electric field and (c) temperature of the cluster.

internal space storing one terbium ion. The terbium ion moves randomly between the two sites in the space at high temperature, and it localises at either site without a structural phase transition as the temperature is decreased. From the temperature- and frequency-dependent dielectric properties, the wide frequency range of dielectric dispersions can be attributed to terbium-ion movement in the molecule. This compound exhibits ferroelectric-like behaviour but without longrange dipole ordering, as can be seen from the hysteretic electric-field dependence of polarisation (P-E) and temperature-dependent polarisation (P -T). These behaviours originate from a single POM molecule, as confirmed by the above electric measurements

for samples of POM molecules dispersed in a polymer.

Our findings suggest that SMEs can potentially be applied to ultrahighdensity memory and other molecularlevel electronic devices operating above room temperature.

Original articles

Kato, C., Machida, R., Maruyama, R., Tsunashima, R., Ren, X.-M., Kurmoo, M., Inoue, K., Nishihara, S. (2018). Giant Hysteretic Single-Molecule Electric Polarisation Switching above Room Temperature. Angewandte Chemie International Edition, 57(41), 13429–13432.

Link: <u>https://doi.org/10.1002</u> anie.201806803



As many researchers are familiar with, "QS WOW NEWS" issued by QS, a University Evaluation Institution in the United Kingdom, contains timely topics and world-class research breakthroughs.

Between the first issue in 2011 and the latest issue of No.35 in 2019, ten articles concerning HU have been published. As far as the number of times that HU has been featured in this newsletter, it is the highest among the universities in Japan.

HU is keen to continue disseminating interesting news to the world through the media like QS WOW NEWS.

Hiroshima University: Most frequently-featured university in Japan in the articles of



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.

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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



HIROSHIMA UNIVERSITY UPDATE



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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 PROMOTIONAL VIDEO

Check out HU's video featuring the University's leading researches as well as everyday campus scenes.



Visit the following webpage to watch this video.

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HIROSHIMA UNIVERSITY UPDATE

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

Hiroshima University RESEARCH UPDATES FROM OUR LABORATORIES

SCIENCE COMMUNICATION

Meet Ms. Rachel Webber Our Sci-Com Fellow! (Jan 2020)



The Office of Academic Research and Industry-Government Collaboration at Hiroshima University hires professional science writers through the Science Communication Fellowship.

Fellows represent the interface be-

tween the campus research community and the nonacademic world. They publish science news in English on the Research Updates website and social media. Other works include Q&A interviews with researchers, photo essays, and short videos.

Contact information: pr-research@office.hiroshima-u.ac.jp



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HIROSHIMA UNIVERSITY

UNIVERSITY OF WORLD-WIDE REPUTE AND SPLENDOR FOR YEARS INTO THE FUTURE



