



# ***HIROSHIMA UNIVERSITY***

# ***UPDATE***

February 2018

## Recent Topics

### HU concludes Memorandum of Agreement on student exchange and research collaboration with leading Indian research institutes

On January 17 2018, Hiroshima University signed an MOU with six institutions/agency from India including the Indian Institute of Technology Delhi (IIT-D) and the Indian Institute of Technology Bombay (IIT-B) concerning about “JAPAN-INDIA International Linkage Degree Program for Developing Innovators Transforming Advanced Technology to Social Goals”.



*Commemorative Photo of the Participating Institutions*



*Opening Remarks by President Ochi*

The signing ceremony was held at the International Conference Center Hiroshima with approximately 70 people including Professor. Ajoy Kumar Ray, Director of Indian Institute of Engineering Science and Technology, Shibpur (IEST-S) and other institution representatives in attendance. In his opening remarks, HU president Mitsuo Ochi said that he hopes that HU and partner institutions from India will share and develop new knowledge and technologies together, thus making our growing partnership an engine for sustainable growth in this globalized world. Following the opening remarks, Mr. Hidehiko Yuzaki, Governor

of Hiroshima Prefecture, and other special guests delivered an address.

After all the representatives from each of the participating institutions joined together in a signing ceremony, the kick-off symposium entitled “Globalization of Education, Science and Research: The University Experience” was held, where they enthusiastically discussed their future education and research exchanges, based on the common issues faced by both countries, as well as the contents of their MOU.

The degree program above was adopted by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) for the 2017 Inter-University Exchange Project (Re-Inventing Japan Project). Over the next 5 years, to develop innovators who will form a bridge between Japan and India, all the parties concerned will be offering three new interdisciplinary fields: “Smart Infrastructure Development”, “New Energy”, and “Environmental Sustainability”, all of which will encompass the common issues faced by Japan and India, while simultaneously implementing the mutual educational and academic exchanges by mutually dispatching a number of undergraduate and graduate students between the two countries.

Original Article :

<https://www.hiroshima-u.ac.jp/en/news/43629>



*Kick-Off Symposium*

# Peace through decentralization of the nation state – Asia leads the way

An international seminar held at Hiroshima University, 13th and 14th November 2017, discussed how decentralization of the nation state could breed peace in an increasingly unstable world.

With xenophobia developing in many regions of the world, including Europe – where migrants continue to flow in from West Asia and North Africa, and in East Asia – where nuclear and territorial disputes are heightening tensions between nations, some might wonder if democratic peace is on the brink.

At the same time, politics with decisions made at a level closer to the people and to their daily lives is increasingly seen as an important development for the democratization of societies, and the realizing of stable and accountable government.

Greatly concerned with this backdrop, researchers and practitioners from different countries in East, Southeast, and South Asia met at Hiroshima University to discuss how decentralization can enable stability and end regional conflicts in Asia.

Focusing on case studies from India, Mindano in the Philippines, and Aceh and Ambon in Indonesia – all of which have been in the past, or are now, focusing on the subnational unit as a route to peace – this forum was one of the first to discuss such issue, and compare the participating Asian countries on the extent of this political phenomenon in Asia.



*Opening Session*

Over the two-day event, researchers from the Indian academic institute reported that their experiences in decentralization echo current attempts in Indonesia and the Philippines, while practitioners from Southeast Asia said that they found Indian lessons significant for their own political evolution.

Keynote speaker, Mr. Noriaki Nishimiya, Former Executive Director of the JICA Chugoku Center, warned participants against adopting decentralization that could lead to elites capturing power, and emphasized the significance of a ‘learning by doing’ approach in order to give such approach more chance for success.

Professor Osamu Yoshida, who organized the seminar, emphasized its significance by saying, “this academic discussion has shown the diverse paths countries are taking to reach peace through autonomy. Representatives leave here with a greater understanding of how others achieve this and can now adapt these lessons

for their own unique local circumstances.

We will further explore the potential to host such initiatives in order to contribute to peacebuilding and development in conflict areas, and to the theoretical development of peace and political science.”

The seminar was hosted by HU’s Hiroshima Active Peacebuilding Research Initiative, the Graduate School of Social Sciences, and the School of Law. Hiroshima University is financially supported by MEXT’s “Program for Promoting the Enhancement of Research Universities.”

The original article:

<https://www.hiroshima-u.ac.jp/en/news/42862>

Official Website of Hiroshima Active Peacebuilding Research Initiative:

<http://hipec.hiroshima-u.ac.jp/>

Details about the seminar:

<https://www.hiroshima-u.ac.jp/en/news/42476>

# Permanent Secretary, Ministry of General Education, Zambia, Visits HU



On November 29th, 2017, Mr. Henry C. Tukombe, Permanent Secretary, Ministry of General Education, Republic of Zambia visited the Higashi-Hiroshima Campus of Hiroshima University (HU) and met HU President Mitsuo Ochi.

Mr. Tukombe expressed his gratitude to HU for its long-term contributions for education in Zambia such as through the STEPS (Strengthening Teachers' Performance and Skills through School-based Continuing Professional Development) Project starting from 2005, School curriculum revision in Mathematics and Science held in 2013,

and the ongoing IPECK (Improvement of Pedagogical Content Knowledge: Linking Pre-Service and In-Service Education) Project supported by JICA.

President Ochi mentioned that 30 HU students have been sent to Zambia so far through the Zambia Education Program\* at the Graduate School for International Development and Cooperation (IDEC). He also expressed his wish to maintain and develop the strong relationship between Zambia and Hiroshima University in the fields of education, research, and social contribution.

Mr. Benson Banda, Director of the National Science Center, Ministry of General Education, Zambia, accompanied Mr. Tukombe to this visit. He has completed his studies at IDEC in 2011. President Ochi shared his expectations with Mr. Banda to have further success in his future as a HU alumnus.

\*The aim of this program is to fuse practice with research - participants teach mathematics or science in Zambian schools at either junior or senior secondary level as JOCV, and at the same time conduct research as graduate students of IDEC.



The original article:

<https://www.hiroshima-u.ac.jp/en/news/42911>

Please visit the following website for more details about the Zambia Education Program:

[https://www.hiroshima-u.ac.jp/en/idec/education/special\\_education/zamproba](https://www.hiroshima-u.ac.jp/en/idec/education/special_education/zamproba)

# Three Minute Thesis Competition (HIRAKU 3MT 2017)

Hiroshima University organized the Three Minute Thesis Competition (HIRAKU 3MT 2017) on November 25, 2017 in Higashi-Hiroshima. A total of 36 doctorate students from 10 universities showcased their research in front of 260 people as public audience, using a single slide to complete a presentation within the time limit of three minutes. The Winner, Novi Syaftika from Graduate School of Engineering at Hiroshima University also received the Sponsor Award from Springer Nature, which was publicized in multiple media channels. ([www.springer.com/jp/news-from-tokyo/15315564](http://www.springer.com/jp/news-from-tokyo/15315564))



Winner: NOVI SYAFTIKA (Hiroshima University)  
"Fueling your car with garbage and wastewater: possible?"

Chieri Fujino from Graduate School of Biomedical & Health Science won the Global Challenge Award, which entitled her to represent our consortium to compete in the Asia-Pacific 3MT Competition 2018. The Global Challenge Award Winner in 2016, Tunchai Mattana from Graduate School for International Development and Cooperation, competed in the Asia-

Pacific 3MT 2017 and won the science magazine's Editor's Choice.

## References :

HIRAKU 3MT 2017 Report :

[http://home.hiroshima-u.ac.jp/hiraku/en/event/competition\\_2017/report/](http://home.hiroshima-u.ac.jp/hiraku/en/event/competition_2017/report/)

Asia-Pacific 3MT:

<https://threeminutethesis.uq.edu.au/>



# HU International Students' Group Project on "Mitigating a Feeling of Homesickness"

On January 24, International exchange students participating in the Hiroshima University Study Abroad Program (HUSA) made presentations about their Practical Research Group Project entitled the "Glocal Leadership Project : Cooperation of University & Local Society ~ Self-Support System: Homesickness Mitigation~". It was the 1st Midyear presentation seminar for the Projects.

Seven groups of international exchange students in the HUSA Program 2017-2018 (39 students from 33 universities in 13 countries from North America, Europe, Oceania, and Asia) reported the progress of their practical group projects in English in the seminar chaired by the Associate Professor Naomi Tsunematsu of International Center. The students have been undertaking self-support projects to mitigate homesickness by collaborating with the local people since last October.

The seminar was held as an open seminar, and students received valuable feedback from people including the local industry, professors, graduate students, and international students of Hiroshima University. The students gained insights into how they could cooperate with the local people.



*HUSA Program Students Making a Presentation*

Currently, the students are working on many projects such as "30 Days Survival Guide," "Hiroshima University Preparation Guidebook for New International Students," "An Introductory Video about Higashi-Hiroshima," "Hirodai Circles & Clubs," and "Creation of an Interactive Map of International Cuisine in Saijo." The students are going through the process of trial and error. We are look-

ing forward to seeing how the projects will progress.

Official Website of Hiroshima University Study Abroad Program (HUSA):

<https://www.hiroshima-u.ac.jp/en/husa>

# HU Concluded an Agreement on Internship Program with UNESCO



*Commemorative photo of Director Hong Kwon (left) and President Mitsuo Ochi (right)*

On December 14th, 2017, Hiroshima University (HU) concluded an agreement on Internship Program with the United Nations Educational, Scientific and Cultural Organization (UNESCO). This agreement was set off by the suggestion from Assistant Professor Yui Arimatsu, who is now a dispatched staff from HU to the UNESCO Headquarters. And recently, HU President Mitsuo Ochi visited the UNESCO Headquarters in Paris, France and signed the agreement with Mr. Hong Kwon, the Director of UNESCO Bureau of Human Resources Management.

With this agreement, HU graduate students will have long-term internship opportunities at the UNESCO Headquarters or related institutions between six months and one year. It is

an attractive program for those students who wish to work in international organizations in the future.

As Hiroshima University aims to cultivate “peace-pursuing, cultured individuals with international mindset and a

challenging spirit,” providing internship opportunities abroad like this program is just one of those efforts that HU has to make for nurturing more global human resources.



*Commemorative photo at UNESCO*

*(Assistant Professor Yui Arimatsu is 2nd from the right)*



# The 3rd Japan-Mexico Rectors Summit

From November 30th to December 1st, 2017 Hiroshima University and AMEXCID held the 3rd Japan-Mexico Rectors Summit in Hiroshima city. A total of about 150 delegates from 30 Japanese universities/institution and 37 Mexican universities/institutions gathered in Hiroshima for the summit.

The summit was held under the theme “Collaboration for Innovation: Academy, Industry and Government working together” to discuss industry-academia-government collaboration, research collaboration, and student exchange, as well as to promote exchange between universities in Japan and Mexico.

At the summit, President Mitsuo Ochi, Hiroshima University, pointed out the growing significance of international industry-academia-government collaboration between Japan and Mexico as many companies started to expand their business markets to overseas countries. He also referred to the importance of this summit by saying, “Universities are increasingly expected to play a wide range of roles, such as promoting exchange of students and researchers, deepening knowledge through joint research, creating innovation, and nurturing individuals with knowledge and skills sought by companies in both Japan and Mexico.”

After President Ochi’s remarks, more speeches followed including those by Ambassador Agustín García-López Laeza, Executive Director of AMEXCID, who is the co-organizer of the summit; Mr. Hidehiko Yuzaki, Governor of Hiroshima Prefecture; Ambassador Carlos Almada Lopez, Embassy of Mexico in Japan; Mr. Tadayuki Fujino, Deputy Director-General for Policy Evaluation, MEXT; Dr.

Jaime Valls Esponda, Executive Secretary General, ANUIES; and Mr. Daisuke Nakano, Director of Mexico, Central America and Caribbean Division, MOFA.

On the first day of the summit, Mr. Seita Kanai, Representative Director and Chairman of the Board, Mazda Motor Corporation, and Dr. Enrique Luis Graue Wiechers, Rector, UNAM, respectively delivered the keynote speech, which were followed by three sessions.

The second day of the summit saw keynote talks delivered by Dr. Kouichiro Yaginuma, Vice President, Kanda University of International Studies, and Dr. Juan José Serrato Velasco, Secretariat of Public Education (SEP), respectively. These were followed by a session entitled “Future-Oriented for Japan-Mexico Universities Collaboration.”

Finally, President Mitsuo Ochi of Hiroshima University and Dr. Jaime Valls Esponda, Executive Secretary General, National Association of Universities and Higher Education Institutions (ANUIES) read out the following joint statement: “We will continue to hold the Japan-Mexico Rectors Summit

*President Ochi from Hiroshima University delivering a speech*







A total of about 150 delegates gathered for the summit.

to promote more industry-academia-government collaborations between Japan and Mexico.” The statement was unanimously adopted and summit ended with applause from the summit participants.

The next rectors’ summit is scheduled to be held at the Universidad Nacional de Mexico (UNAM) in 2019.

The original article:

<https://www.hiroshima-u.ac.jp/en/news/42911>

## HU Enters into Inter-university Partnership with University of California, Berkeley

In a signing ceremony on November 17, Hiroshima University (HU) and the University of California (UC), Berkeley, commemorated their formal agreement to collaborate and promote exchange between their two institutions. HU president Mitsuo Ochi together with Vice Presidents Professor Kenji Kamiya and Professor Satoshi P. Watanabe visited the UC Berkeley campus to sign the agreement.

Founded in 1868, UC Berkeley has the oldest history among the universities of the UC system, and is well-known as a world-class research university, with an impressive roster of highly accomplished alumni and faculty, including Nobel laureates, entrepreneurs and public figures.

Faculty and graduate students in Hiroshima Univer-

sity’s Leading Graduate Program, the “Phoenix Leader Education Program (Hiroshima Initiative) for Renaissance from Radiation Disaster” have been actively engaged with UC Berkeley in collaborative research activities and joint efforts to aid the recovery from the Fukushima nuclear accident in 2011. This

new partnership brings further opportunity for exchange and collaboration in a wider range of fields between the two universities.

The original article:

<https://www.hiroshima-u.ac.jp/en/news/42767>



UC Berkeley Chancellor Carol Christ (left) and HU President Mitsuo Ochi (right)

# HU on Exchange Program with Changchun University, China



From 4th to 11th October 2017, the International Center of HU accepted 8 hearing-impaired students from the Special Education College of Changchun University for the Japanese Language and Culture Special Program.

Since its launch in 2010, the Japanese Language and Culture Special Program has been held annually for the overseas youngsters who are interested in Japanese Language and culture. The program aims to help the participants deepen their understanding of Japan and to encourage them to come back to study at Hiroshima University in future. It was the first time for the HU International Center to accept hearing-impaired students for this program.

While attending the program, the students from Changchun University experienced the Japanese sign language, interacted with HU students, and had a chance to visit many historical sites such as the Atomic Bomb Dome, Hiroshima Peace Memorial Museum,

and Itsukushima Shrine in Miyajima. In addition, they paid a visit to the local special support school and had a guided tour of Mazda Motor Corporation.

After attending the program, the participants expressed that they are very keen to come back to Japan to study in future. We do hope that many of them will decide to come back to Hiroshima University to pursue their studies.

On December 18th 2017, Dr. Li Zhiyao, President of Changchun University, visited the Higashi-Hiroshima Campus of HU and had a meeting with HU President Mitsuo Ochi. During the meeting, both sides agreed to start the negotiation towards facilitating the implementation of their joint education programs. It is hoped that exchanges between the two universities will be further enhanced and flourish.



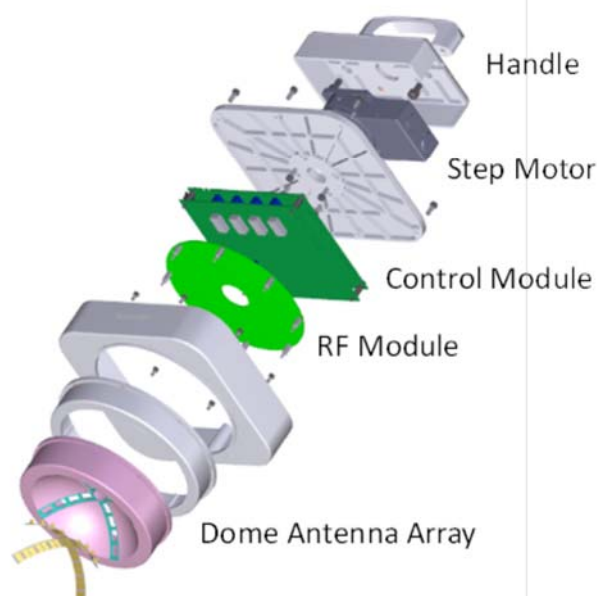
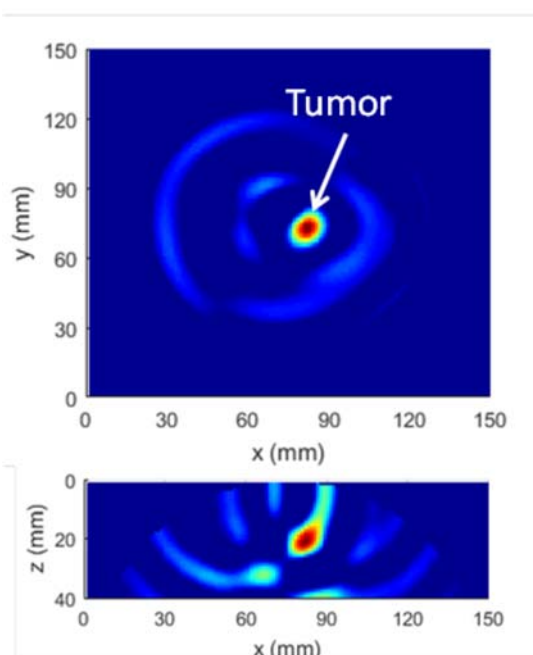
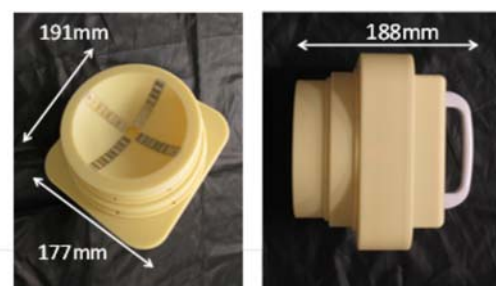
## The World's First Hand-held Impulse-Radar Detector for Breast Cancer

A hand-held impulse-radar breast cancer detector is developed by a research group led by Professor Takamaro Kikkawa, Research Institute for Nanodevice and Bio Systems, Hiroshima University. The detectability of malignant breast tumors and the safety are demonstrated in the pilot clinical test. The detector is composed of originally-

designed integrated circuits for radar and transceiver, resulting in miniaturization and low power consumption.

The impulse-radar detector can establish a new modali-

ty for image diagnosis by solving the drawbacks of conventional X-ray mammography such as ionizing radiation and pain from breast compression. (Scientific Reports 2017)



### Reference

Hang Song, Shinsuke Sasada, Takayuki Kadoya, Morihito Okada, Koji Arihiro, Xia Xiao & Takamaro Kikkawa, Detectability of Breast Tumor by a Hand-held Impulse-Radar Detector: Performance Evaluation and Pilot Clinical Study, *Scientific Reports* 7, Article number: 16353 (2017)

doi:10.1038/s41598-017-16617-6

### Profile of Professor Takamaro Kikkawa:

<http://seeds.office.hiroshima-u.ac.jp/profile/en.d40789ff90916698520e17560c007669.html>

### Official website of

Research Institute for Nanodevice and Bio Systems:

<http://www.rnbs.hiroshima-u.ac.jp/index-e.html>

# Educational Vision Research Institute (EVRI)

Educational Vision Research Institute (EVRI), Hiroshima University, has been selected as one of the institutions designated under MEXT's "FY2013 Program for Promoting the Enhancement of Research Universities." The goal of EVRI is to become one of the university's "Centers of Excellence," which aims to lead the world in their own research. Under the slogan of "By EVRI, For Everyone; Innovative Educational Design," EVRI intends to seek the paradigm-shift in the theory & practice of education.

In order to achieve the goal above, EVRI has set up three research units that consist of six clusters in total : (a) Learning Space Design Unit



*New national curriculum jointly designed with Cambodian policy makers*

with "Knowledge Construction" and "Inclusive Education cluster" respectively , (B) Curriculum Design Unit with "IB education" and "Teacher Education cluster" respectively, and (c) Profession Design Unit with "Researcher" and "Teacher educator cluster"

respectively. These units have been putting a lot of efforts into promoting outreach activities that are meant to encourage a great variety of collaborative educational reforms tailored appropriately for local, national and international settings .

<https://www.facebook.com/pg/byevriforeveryone/about/?ref=page>



*Monthly seminar where the special interest from each research Unit are covered*



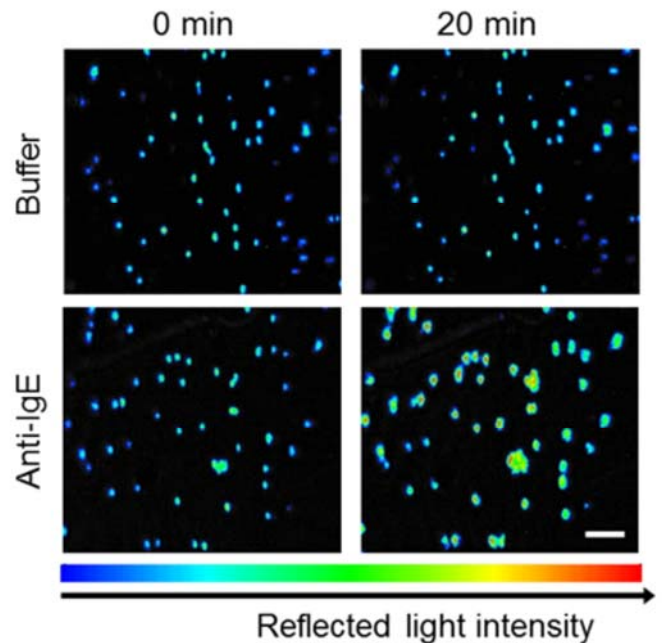
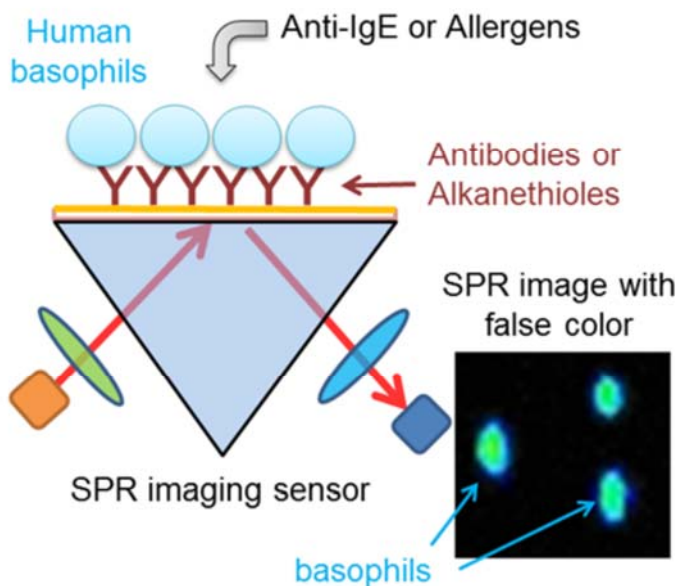
*Problem-based learning: Designing and implementation on PEACE education with international high school students*

# Development of SPR imaging sensor for single cell analysis and clinical diagnosis of allergy

A real-time and label-free technique to visualize living cell activation is required in the fields of life sciences and medicine. Surface plasmon resonance (SPR) sensors detect the refractive index (RI) changes on the surface of sensor chip coated with gold thin

film without any labeling in a real time manner. In order to visualize RI distribution on the surface of sensor chip, a research group of the Department of Dermatology at Graduate School of Biomedical and Health Science, Hiroshima University, developed an SPR imaging sen-

sor and succeeded in monitoring individual cells reactions in response to stimuli (1). Moreover, they applied the technique for clinical diagnosis of type I allergy by monitoring peripheral blood basophils activation in response to allergens (2, 3).



[From Yanase et al., *Opt Mater Express*. 6(4) 1339-1348 (2016)]

## References

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doi: 10.1016/j.bios.2010.06.065
2. Yanase Y, Hiragun T, Yanase T, Kawaguchi T, Ishii K, Hide M. (2012) Evaluation of peripheral blood basophil activation by means of surface plasmon resonance imaging. *Biosens Bioelectron*. 32(1):62-8  
doi: 10.1016/j.bios.2011.11.023
3. Yanase Y, Sakamoto K, Kobayashi K, Hide M. (2016) Diagnosis of immediate-type allergy using surface plasmon resonance. *Opt Mater Express*. 6(4), 1339-1348  
doi: 10.1364/OME.6.001339

## Official Website

Department of Dermatology, Graduate School of Biomedical and Health: Science,

Hiroshima University

<http://dermatology.hiroshima-u.ac.jp/>

# First Astronomical Observation for Lights from Gravitational Wave Events

## –Japanese Telescopes Saw the Birth Place of Heavy Metal Elements

Japanese team for follow-up observation of gravitational wave events, J-GEM (PI: Prof. Michitoshi Yoshida, Director of Subaru Telescope, National Astronomical Observatory of Japan=NAOJ), consisting of members from Hiroshima University, NAOJ, Konan University, Kagoshima University, University of Tokyo, and so on, performed astronomical observations for GW170817, which was detected by the gravitational wave (GW) telescopes, Advanced LIGO (USA) and Advanced Virgo (Europe), and successfully detected the optical counterpart of it and followed the daily variation of optical and near-infrared (NIR) lights from it.

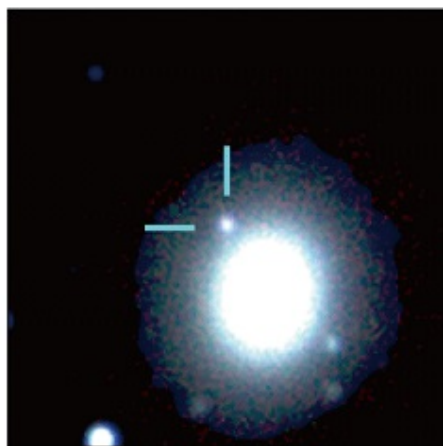
After the first successful direct observation of GW in 2015, five (to six) GW events have been detected in total. They are all consistent with the theoretical predictions for collisions of black hole binaries, and no electromagnetic waves including optical light has ever been detected with them. GW170817 is expected to be optically bright because the properties of the detected gravitational wave are consistent with the collision of neutron stars. Unfortunately the GW170817 is in the southern celestial hemisphere and near the sun (thus, it sank below the horizon during the evening twilight), it was severe to observe it from main land of Japan. But, we success-

fully observed it (Fig. 1) with Japanese telescopes at South Africa, New Zealand and Hawaii, USA.

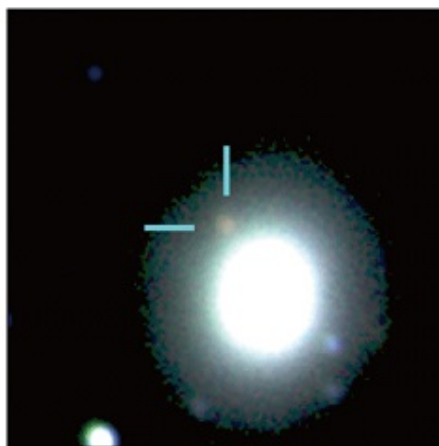
The observed properties of optical and NIR emissions are consistent with the theoretical predictions for electromagnetic wave emission from 'Kilonova' in which two neutron stars collide after close binary phase. From this study, a considerable amount of precious metal elements like gold and platinum are likely to have originated from past collisions of neutron stars in the universe.

Besides, the gamma-ray observation with the Fermi satellite (the members in Hiroshima University hold the representative position of Japanese Fermi team) also made a substantial contribution to the GW study, and detailed data analysis of follow-up observation with Fermi LAT is still ongoing. These observational facts ensure that a direct detection of GW is a decisive probe for the 'unseen universe' and that the age of GW astronomy has really begun.

**2017.08.18-19**



**2017.08.24-25**



*Pseudo-color images of GW170817 obtained by J-GEM observations. Each of the two images consists of an optical image in z band (center wavelength is 0.9 micron) obtained with Subaru/HSC and those in J- (1.2 micron) and Ks- (2.2 micron) obtained with IRSF at South Africa. The star indicated by two cyan lines is GW170817. The nearby large elliptical object is its host galaxy NGC 4993. GW170817 rapidly becomes fainter and redder. (Credit: NAOJ/Nagoya Univ.)*

## References

Utsumi, Tanaka, Tominaga, Yoshida, Barway, Nagayama, Zenko, Aoki, Fujiyoshi, Furusawa, Kawabata, Koshida, Lee, et al., Publications of the Astronomical Society of Japan (PASJ), VOL 69, 101 DOI 10.1093/pasj/psx118 (2017)

Tanaka, Utsumi, Mazzali, Tominaga, Yoshida, Sekiguchi, Morokuma, Motohara, Ohta, Kawabata, Abe, Aoki, Asakura, et al., Publications of the Astronomical Society of Japan (PASJ), VOL 69, 102 DOI 10.1093/pasj/psx121 (2017)

Tominaga, Tanaka, Morokuma, Utsumi, Yamaguchi, Yasuda, Tanaka, Yoshida, Fujiyoshi, Furusawa, Kawabata, Lee, Motohara, Ohsawa, Ohta, et al., Publications of the Astronomical Society of Japan (PASJ), Accepted for publication for PASJ, <https://arxiv.org/abs/1710.05865>

The original article:

<https://www.hiroshima-u.ac.jp/en/news/42234>

Profile of researchers:

Professor Koji Kawabata:

<http://seeds.office.hiroshima-u.ac.jp/profile/en.ba061ee9e37fba83520e17560c007669.html>

Assistant Professor Masanori Ohno:

<http://seeds.office.hiroshima-u.ac.jp/profile/en.c79942c5b620996a520e17560c007669.html>

Official Website

Hiroshima Astrophysical Science Center (Japanese Page):

<https://www.hiroshima-u.ac.jp/hasc/>

National Astronomical Observatory of Japan:

<https://www.nao.ac.jp/en/>

# Quantitative analysis of society using personal data of ants

Ants have evolved to the present forms from the same ancestor with bees, through which evolution process they have simplified their own structure and the behavior of each, whereas cooperative behavior as a mass of them has got more and more complex and sophisticated. Hence, they have obtained various kinds of “social functions” and are now enjoying the highest level of prosperity among various animals on the earth.

Mr. Osamu Yamanaka and Mr. Masahiro Nakao, students of the Department of

Mathematical and Life Sciences at the Graduate School of Science, along with Professor Hiraku Nishimori, Professor Akinori Awazu and Dr. Masashi Shiraishi have attempted to characterize the long-term foraging behavior of a large number of ants in several colonies using a newly introduced measuring system (Fig.1) recognizing the ID of each ant. Such observation in this study became possible by using very tiny RFID chips (smaller than 0.5mm<sup>2</sup>, supplied by SK-Electronics CO., LTD. Kyo-



Fig.1 Snapshot from the movie introducing our measuring system.

<https://www.youtube.com/watch?v=GClhuJo153c>

to) attached to the bodies of individual ants.

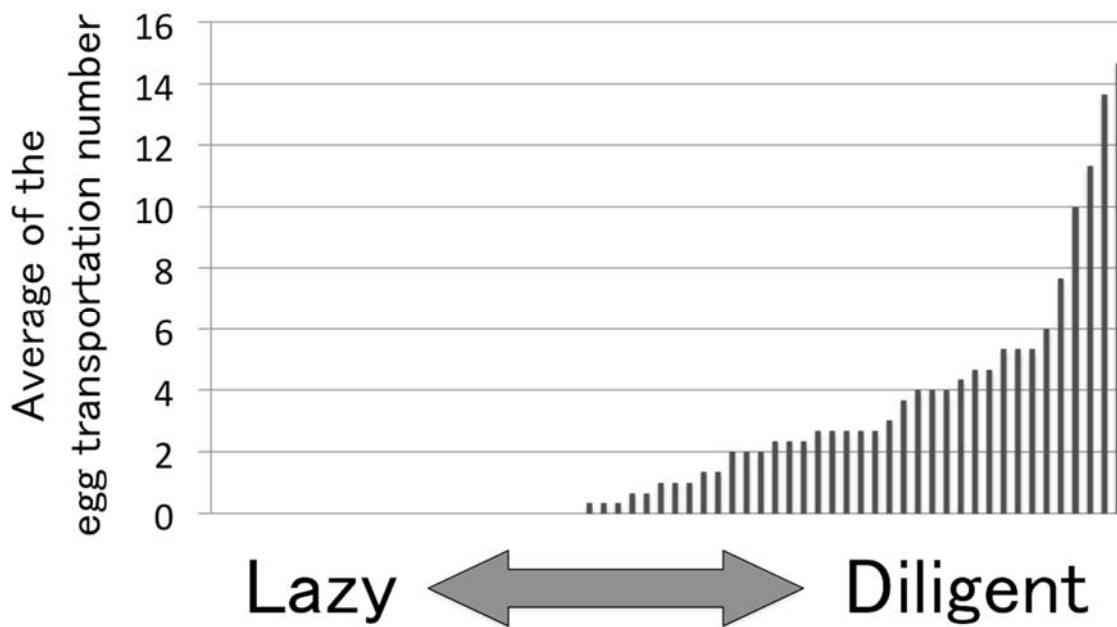


Fig.2 The rank graph of the foraging activity of *A species Camponotus japonicus* of ants.[1]

The obtained data indicates;

The existence of the non-uniform distribution of foraging activity among ants in each colony during certain period (Fig.2).

The shape of the distribution is almost similar in each independent of colony, indicating the existence of a certain fraction of “diligent ants” and “lazy ants” in each colony, at least in terms of foraging task.

In addition, they have recently found that the diligence/laziness of each ant in each colony varies, depending on the temporal crisis of the colony (like removing diligent ants in the colony) to compensate the activity of the colony and may go back to the original state after the crisis.

We expect that, the “big-data analysis” of the ants’ society with the use of the “personal data free-of-ethics committee” may give some suggestions for the stably sustained mechanism of a

wide range of social organizations apart from colonies of ants.

#### Related articles:

[1]. Masahiro Nakao, Osamu Yamanaka, Masashi Shiraishi, Akinori Awazu, and Hiraku Nishimori:

‘Situation-Dependent Task Allocation in *Camponotus japonicus*’, Proc. of SWARM 2017: The 2nd International Symposium on Swarm Behavior and Bio-Inspired Robotics , 313(2017)

#### Official Website:

Department of Mathematical and Life Sciences,  
Graduate School of Science, Hiroshima University  
<http://www.mls.sci.hiroshima-u.ac.jp/index2.html>

#### Profile of researchers:

Professor Hiraku Nishimori

<http://seeds.office.hiroshima-u.ac.jp/profile/en.cddc4666bfa0e983520e17560c007669.html>

Associate Professor Akinori Awazu

<http://seeds.office.hiroshima-u.ac.jp/profile/en.e9426d2a56a9f334520e17560c007669.html>

Assistant Professor (Special Appointment) Masashi Shiraishi

<http://seeds.office.hiroshima-u.ac.jp/profile/en.41f73402d6386fe2520e17560c007669.html>



# Group determines spin characteristics of superconductor

A superconductor is a material that can transport an electrical current without losing energy. Usually, this phenomenon happens at very low temperatures. The magnetic fields that superconductors expose are useful for such machines as maglev trains, proton accelerators, and MRI machines.

A study led by Professor Taichi Okuda's group, Hiroshima Synchrotron Center, revealed band and spin characteristics of new superconductor  $\text{LaO}_{0.55}\text{F}_{0.45}\text{BiS}_2$ . Wu and coworkers used spin-resolved photoemission spectroscopy to investigate physical properties of  $\text{LaO}_{0.55}\text{F}_{0.45}\text{BiS}_2$ , including its electronic band structure and spin texture. Of particular interest to the researchers was the obser-

vation of the coexistence of the Rashba-like and Dresselhaus-like spin textures in the conduction band. These results contribute further understanding of the physics of superconductors as well as the applying new spin related materials toward the field of spintronics, which has implications for developing more efficient electronic devices using spin properties of electrons.

## Reference :

Shilong Wu, K. Sumida, K. Miyamoto, K. Taguchi, T. Yoshikawa, A. Kimura, Y. Ueda, M. Arita, M. Nagao, S. Watauchi, I. Tanaka and T. Okuda, Direct evidence of hidden local spin polarization in a centrosymmetric superconductor  $\text{LaO}_{0.55}\text{F}_{0.45}\text{BiS}_2$ , Nature Communications

doi: 10.1038/s41467-017-02058-2

Profiles of researchers

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Assistant Professor

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Professor Akio Kimura:

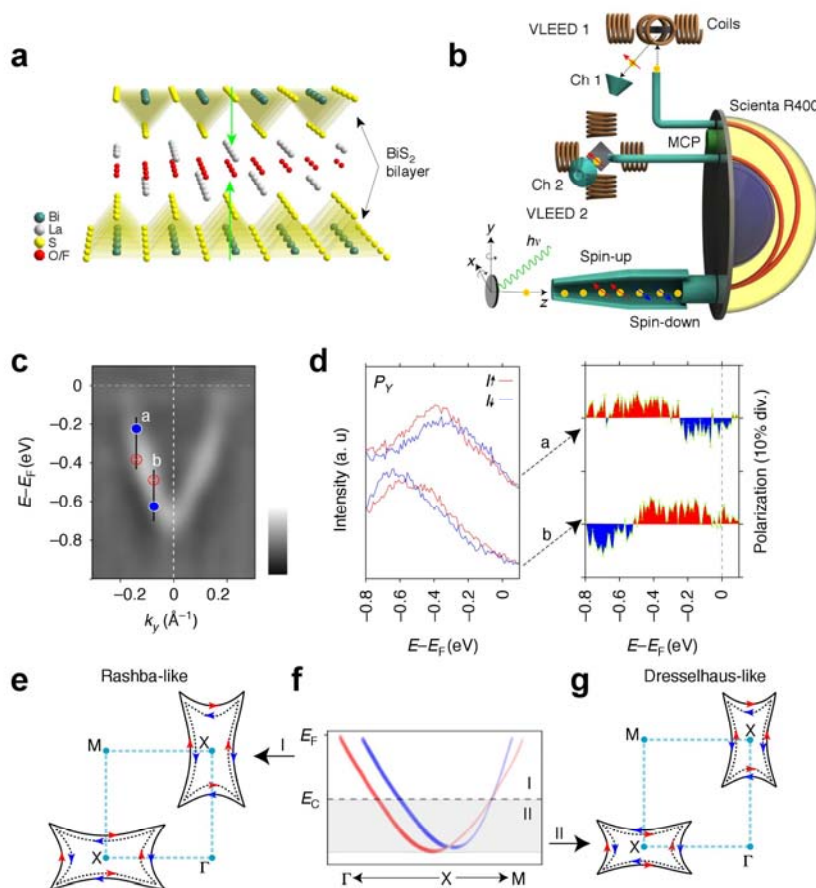
<http://seeds.office.hiroshima-u.ac.jp/profile/en.62057a04354038f6520e17560c007669.html>

Official website of Hiroshima Synchrotron Radiation Center:

<http://www.hsrc.hiroshima-u.ac.jp/english/index.html>

Official website of Department of Physical Science, Graduate School of Science (Japanese page):

<http://home.hiroshima-u.ac.jp/srphys/index.html>



**a** Crystal structure of  $\text{La}(\text{O},\text{F})\text{BiS}_2$ , **b** Illustration of spin- and angle-resolved photoemission spectrometer (spin-ARPES) named Efficient SPin Resolved SpectroScOpy (ESPRESSO) machine at HiSOR and the experimental geometries for the photoemission measurements. **c** Band dispersion measured by ARPES (photon energy at 18 eV) along the X-M line. **d** Spin-ARPES spectra of at a and b points in **c**, right panel shows the corresponding spin polarizations. The reversal of spin polarizations at a and b points leading to a different spin textures (Rashba-like and Dresselhaus-like). **f** Schematic band structure of the system. **e** The Rashba-like spin texture at region I in **f** and **g** the Dresselhaus-like spin texture at region II in **f** that were derived from the crossing of spin-texture obtained in **d**, The red and blue colors for arrows and energy bands represent spin-up and spin-down states, respectively

# Biological removal of minor metals using manganese-oxidizing bacteria in the novel bioreactor

Minor metals are essential to the metal industry and are used in modern products such as rechargeable batteries, photovoltaic cells, and structural materials. Products containing minor metals eventually become waste, and such waste is produced in large amounts in urban areas. Industrial wastewater is usually discharged without minor metals being recovered from it. It is necessary to recycle them to move toward a sustainable society.

Biotechnology using microorganisms has been used to recover metals from wastewater. Biomineralization (the production of minerals by organisms) is one such technique. Manganese-oxidizing bacteria (MnOB) can produce manganese oxide. Biogenic manganese oxide (BioMnOx) can efficiently adsorb various minor metals. The production of

BioMnOx in reactors to remove metals during wastewater treatment processes is a promising biotechnological method.

However, it was difficult to preferentially enrich MnOB to produce BioMnOx during wastewater treatment processes. The research group of Professor Akiyoshi Ohashi has proposed some unique methods of cultivating MnOB. The research group has succeeded in enriching MnOB and demonstrated that minor metals were efficiently removed and recovered from wastewater by a cost-effective DHS (Down-flow Hanging Sponge) reactor at a high rate (Fig. 1). Through this research, surprisingly, they found MnOB can be also applied to persistent dye wastewater treatment.

In biological wastewater treatment, high biomass retaining reactor is very im-

portant. The research group has been developing DHS as a novel, cost effective and low energy consumption biological sewage treatment reactor for developing countries. A pilot plant of DHS reactor had run in India to investigate the reactor performance for more than 10 years (Fig. 2). Now, DHS reactor is established, and the world's first full-scale DHS reactor was installed in Agra, India, in 2014. The group focuses on the application of DHS reactor because it is very attractive for not only sewage treatment but also recovery of resources from wastewaters.



Fig. 1 Produced biogenic manganese oxide for adsorbing minor metals

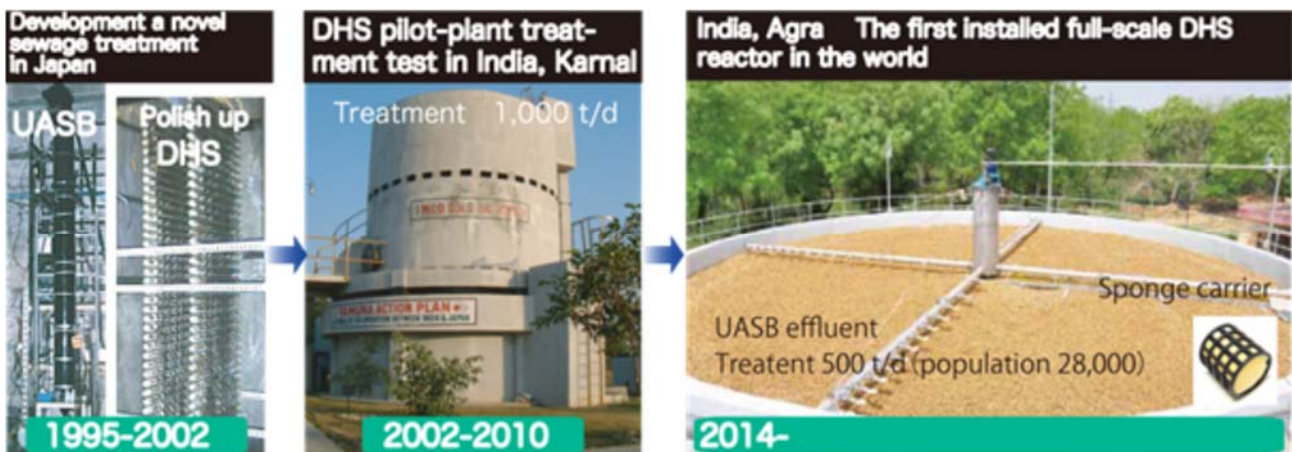


Fig. 2 History of DHS reactor development

## References

1. Shuji Matsushita, Daisuke Komizo, Linh Thi Thuy Cao, Yoshiteru Aoi, Tomonori Kindaichi, Noriatsu Ozaki, Hiroyuki Imachi, Akiyoshi Ohashi. Production of biogenic manganese oxides coupled with methane oxidation in a bioreactor for removing metals from wastewater, *Water Res.* 130: 224-233. 2018.

doi: 10.1016/j.watres.2017.11.063

2. Cao T. T. L., H. Kodera, K. Abe, H. Imachi, Y. Aoi, T. Kindaichi, N. Ozaki and A. Ohashi. Biological oxidation of Mn(II) coupled with nitrification for removal and recovery of minor metals by downflow hanging sponge reactor. *Water Res.* 68: 545-553. 2015.

doi: 10.1016/j.watres.2014.10.002

## Profile of

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# A ubiquitous experimental platform for measuring motor learning ability

Motor learning ability is the basis of regaining motor function through rehabilitation. The research group, led by Associate Professor Masahiro Shinya, Graduate School of Integrated Arts and Sciences at Hiroshima University, developed a portable and easy-to-use application called Portable Motor Learning Laboratory (PoMLab), which can measure human motor learning ability anytime and anywhere. The PoMLab works by asking the subjects to control the position of a cursor displayed on the screen by tilting the device and the results are analyzed by a mathematical model which calculates the learning rate and retention rate respectively. The research group measured the data obtained from each group of patients with Parkinson's disease and stroke as well as young and elderly control participants. The group found that the basic motor learning ability is not affected by

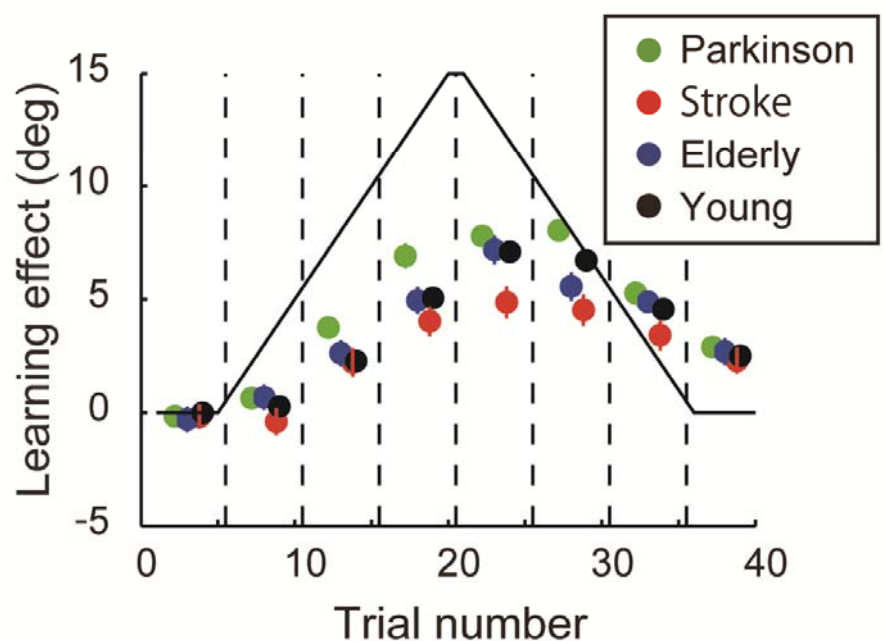
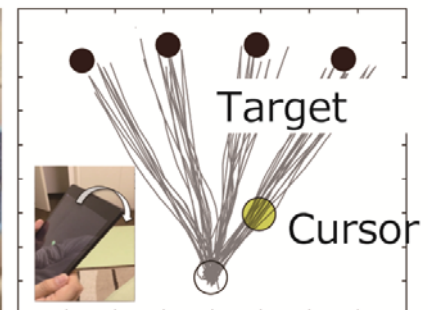
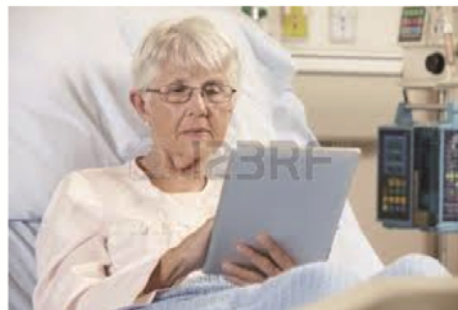
aging, cognitive impairments or Parkinson's disease.

This research was supported by the grant: JSPS KAKENHI Grant Number 16K12988

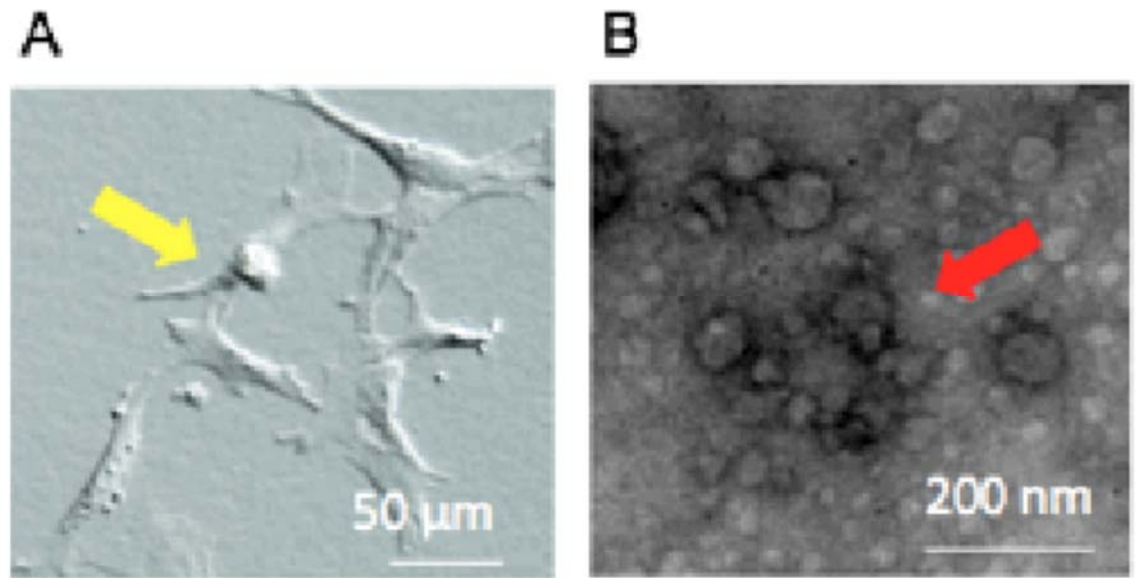
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# Amelioration of graft-versus-host disease after hematopoietic cell transplantation by mesenchymal stromal/stem cell-derived extracellular nanoparticles



A) Bone marrow-derived MSCs and B) nanosized MSC-derived extracellular vesicles

Allogeneic hematopoietic cell transplantation (HCT) is an important medical remedy for acute radiation syndrome as well as widely accepted treatment for intractable hematologic diseases. However, development of graft-versus-host disease (GVHD) is a serious complication after HCT and frequently associated with high morbidity. To develop a novel preventive/therapeutic strategy for post-transplant GVHD, the Department of Hematology and Oncology at the Research Institute for Radiation Biology and Medicine recently discovered that nanosized extracellular vesicles (EVs) derived from human bone marrow mesenchymal stromal/stem cells

(BM-MSCs) have unique functions to ameliorate GVHD-associated organ damages in a collaborative research with Kyoto University. Systemic infusion of EVs suppressed the functional differentiation of naïve T cells to an effector phenotype and prolonged the survival of mice with GVHD. These results pave the way for the novel therapy for HCT-associated GVHD and systemic T-cell activated diseases by use of BM-MSC-derived EVs. (A part of this work was presented at the 2017 Annual Meeting of the American Society of Hematology.)

#### References :

Fujii S, et al. *Stem Cells*. 2017 Dec 14 [EPub ahead of print]  
doi: 10.1002/stem.2759.

#### Official Website :

the Department of Hematology and Oncology, Research Institute for Radiation Biology and Medicine, Hiroshima University:

[https://www.hiroshima-u.ac.jp/en/rbm/research/lab/Hematology\\_and\\_Oncology](https://www.hiroshima-u.ac.jp/en/rbm/research/lab/Hematology_and_Oncology)

# Schools and Graduate Schools

## Schools

For undergraduate level, Hiroshima University consists of 11 schools which provide undergraduate courses including majors in the natural sciences, humanities, the social sciences, and many others.

School of Integrated Arts and Sciences  
School of Letters  
School of Education  
School of Law  
School of Economics  
School of Science  
School of Medicine  
School of Dentistry  
School of Pharmaceutical Sciences  
School of Engineering  
School of Applied Biological Science  
School of Informatics and Data Science  
(To Be Opened in 2018 April)

## Graduate Schools

Graduate level studies at Hiroshima University consist of 11 graduate schools including Education, Biomedical & Health Sciences, Engineering, and many other majors. In addition, two unique program offerings: "The Phoenix Leader Education Program for Renaissance from Radiation Disaster" and "The Taoyaka Program for Creating a Flexible, Enduring, and Peaceful Society", combine graduate level academic coursework with integrative research components.

Graduate School of Integrated Arts and Sciences  
Graduate School of Letters  
Graduate School of Education  
Graduate School of Social Sciences  
Graduate School of Science  
Graduate School of Advanced Sciences of Matter  
Graduate School of Biomedical & Health Sciences  
Graduate School of Engineering  
Graduate School of Biosphere Science  
Graduate School for International Development and Cooperation  
Hiroshima University Law School

## Advanced Course

Special Education Major Program

## Interdisciplinary Graduate Educational

Phoenix Leader Education Program (Hiroshima Initiative) for Renaissance from Radiation Disaster (adopted by MEXT), TAOYAKA PROGRAM for creating a flexible, enduring, peaceful society (adopted by MEXT) and Education Program for Global Environmental Leaders.



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About Researcher Interviews etc. <https://www.hiroshima-u.ac.jp/en/research>

# Education

## Student and Faculty Numbers

Undergraduate Students 10,887 (As of May 1, 2017)  
Graduate Students 4,520 (As of May 1, 2017)  
Academic Faculty Members 1,726 (As of May 1, 2017)

## Networks and Overseas Bases

### Overseas Bases

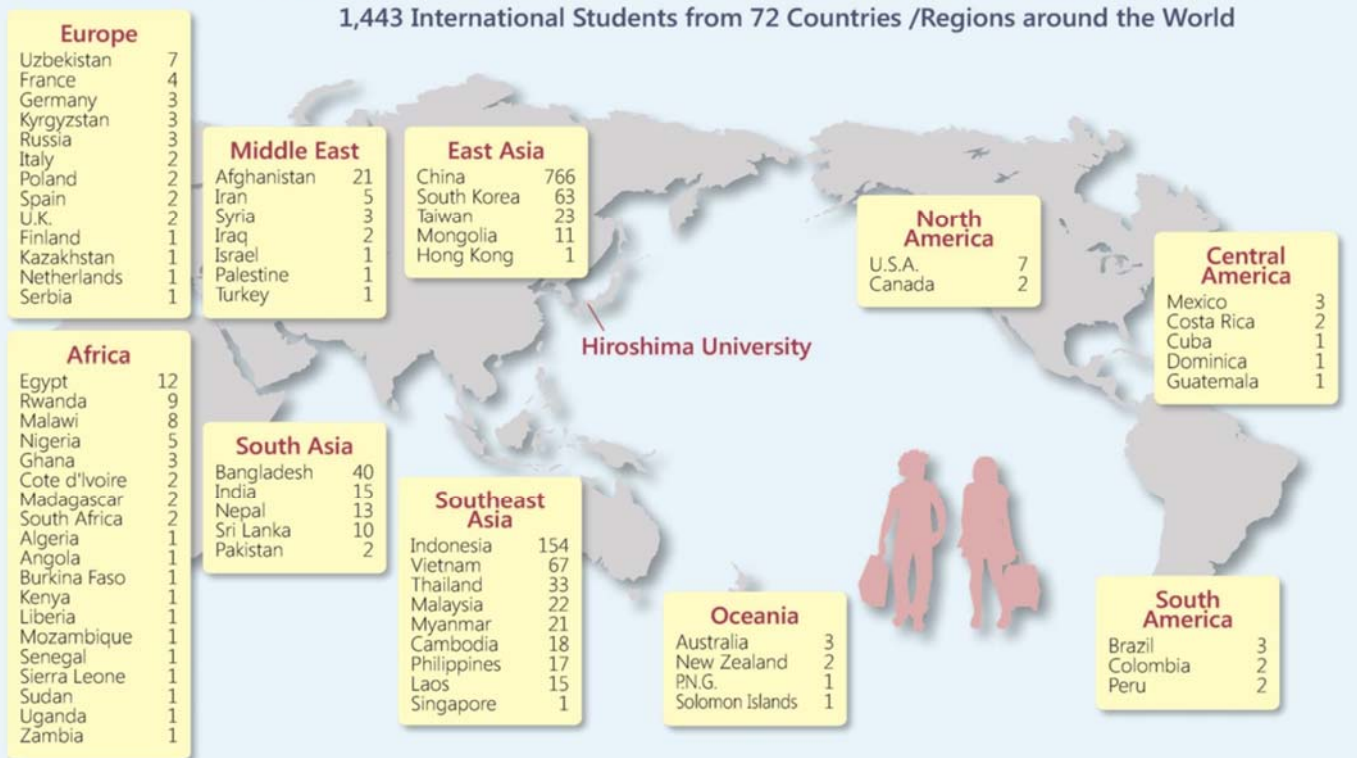
HU has established overseas bases in 14 countries/regions (As of May, 2017)  
Number of Overseas Bases 16 (As of May, 2017)

### International Exchange Agreements (As of October 26, 2017)

University-level: 274 Agreements with 251 Organizations in 47 Countries/Regions  
Faculty / Department-level: 342 Agreements with 312 Organizations in 50 Countries/Regions  
Undergraduate Students 10,887 (As of May 1, 2017)  
Graduate Students 4,520 (As of May 1, 2017)

### 留学生数 (2017年5月1日現在) Number of International Students (As of May 1, 2017)

1,443 International Students from 72 Countries /Regions around the World



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