



Vol.21, March 2018



岡山大学
OKAYAMA UNIVERSITY



“Okayama University supports the Sustainable Development Goals”

■ Contents

Feature

Okayama University Hosts World's First International Conference on Attainment of Sustainable Development Goals (SDGs)

News

- Okayama University honored with special prize in the first Japan SDGs Awards!!
- President Makino Speaks at 1st Japan SDGs Award Briefing Session
- President Makino and others visit the UNESCO headquarters to present Okayama University's efforts for SDGs and ESD

Research Highlights

- Plant science: New insights into infection strategy of *Rhizoctonia solani*, a causal agent for rice sheath blight, highlighted by the plant defense mechanism
- Comparative genomics of epidemic strains from cholera patients reveals evolution of *Vibrio cholerae* O1
- High temperature superconductors: Discovery of a new form of electronic wave
- Identification of illegal users from pirated copies of multimedia contents

Topics

Radio Message from International Students (World Heartful Message)

Further information

About Okayama University

■ Feature

Okayama University Hosts World's First International Conference on Attainment of Sustainable Development Goals (SDGs)

From 5-7 December 2017, Okayama University, the United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS) and Regional Centers of Expertise on Education for Sustainable Development (RCE) Okayama co-hosted the first world RCE conference on the theme of the United Nations [Sustainable Development Goals \(SDGs\)](#) of the 2030 Agenda for Sustainable Development entitled, “First RCE Thematic Conference: Towards Achieving the SDGs”, at the Okayama Convention Center in Okayama City.



First RCE Thematic Conference: Towards Achieving the SDGs

Approximately 200 representatives of international organizations, governments, academia, industry, communities, NGOs and NPOs from 26 countries attended the conference. One of the main goals of the participants was to share their ideas and best practices related to Education for Sustainable Development (ESD) and to discuss ways of finding solutions to global issues such as climate change, biodiversity, and sustainable consumption and production (of food) through plenary sessions, training capacity building workshops and field trips.

At the opening ceremony on the first day, greetings were given by Chairperson Hirofumi Abe of the Okayama ESD Promotion Commission (professor of Okayama University); President Hirofumi Makino of Okayama University; UNU-IAS Director Kazuhiko Takemoto; Mayor Masao Omori of Okayama City and Masaaki Kobayashi, Ministry of the Environment Senior Advisor (former Administrative Vice Minister for the Environment). UNU-IAS Project Director Naoya Tsukamoto also gave a talk on the current activities of the RCE Network.

Furthermore, on December 5, a plenary session entitled “Further Development of ESD towards the achievement of SDGs” was held to discuss ways how ESD practices and resources of Okayama could contribute to achieving the SDGs at local, national, regional and global levels. The panel discussion commenced with an overview on the Okayama ESD Project by Chairperson Abe, followed by case presentations by panelists from RCE Okayama, RCE Saskatchewan (Canada), RCE Denmark (Denmark) and RCE Cairo (Egypt) with focus on biodiversity, climate change and sustainable consumption and production (of food). At the conclusion of the session, Moderator Professor Kiichi Oyasu of the Center for Global Partnerships and Education provided a summary of the key discussion points and recommendations from the session that focused on opportunities for revisiting Okayama University’s ongoing ESD practices and activities in view of the 17 goals under the SDGs, for future planning.

At the second plenary session, entitled “Considering SDGs from Okayama – Towards further multi-stakeholder partnerships between industry and academia for the SDGs ” to seek to promote and support the Goal 17, the main discussion was on challenges and opportunities for higher education institutions to make much wider ranging contributions to the SDGs through excellence in research and education with multi-stakeholder partnerships and other voluntary initiatives. President Makino took the podium, saying, “Resonating with the SDGs, we will create new value with the whole university progressing forward with education, research and social contributions,” followed by guest speakers from industry, Chair Masao Seki of the revision drafting group at Keidanren Charter of Corporate Behavior (Senior Adviser on CSR, Sompo Japan Nipponkoa Insurance Inc.) and Chairperson Hisashi Matsuda of Okayama Association of Corporate Executives (President and CEO of Ryobi Holdings). As an example of Okayama University’s industry-academia cooperation, Dean of the Faculty of Engineering, Eiji Tomita, introduced the light environmental load engine being pursued as an industrial cooperation project. Additionally, Dean Yasutomo Nasu of the Graduate School of Medicine, Dentistry and Pharmaceutical Science described the development of medicines for use in gene therapy, and Associate Professor Yuta Nishina of the Research Core for Interdisciplinary Science gave an overview of his research into materials development including as ‘graphene oxide’ . The session was concluded with closing remarks from Executive Vice President Hiroshi Kanzaki of Okayama University, saying, “Research and education could contribute to achieving the SDGs through collaboration and greater engagement with government, industry, let alone, civil society. Working across disciplines and sectors is also a key.”



President Makino gave a talk

Further plenary sessions and capacity building workshops were held on December 6. On December 7, participants visited to companies in Okayama City and Maniwa City. Okayama University students also participated in the conference and field trips as support staff. The conference was a great success.



The Field trips in Maniwa

Soon after this event, Okayama University received the special prize, the “SDGs Partnership Award” in the first Japan SDGs Awards from the Government of Japan. The recipients, companies or organizations that have made exceptional efforts contributing to the attainment of SDGs, were selected and presented with the award by the SDGs Promotion Headquarters (headed by the Prime Minister) in order to promote all-Japan action on SDGs.

With Okayama University’s collective action and response to the SDGs and solid foundation and reputation of ESD, the university actively seeks opportunities to advance the SDGs beyond academic disciplines and institutional boundaries; namely connecting research and education to society, and engaging stakeholders beyond the university. In other words, the SDGs will be a major influencer and driver for mobilizing the university’s knowledge and solutions for sustainable development while transforming its organizational behavior and culture, which makes it more distinct and attractive than ever before for a higher education destination for sustainable development.

Regional Centers of Expertise on Education for Sustainable Development (RCEs)

In 2002, the UN General Assembly adopted a resolution announcing the Decade of Education for Sustainable Development (UNDESD 2005-2014), based on the Johannesburg Plan of Implementation. The United Nations Scientific and Cultural Organization (UNESCO), the lead agency for the UNDESD, stressed the need to reorient existing education towards sustainability.

In 2003, in response to the UN resolution on the UNDESD, the United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS) launched the ESD project, with funding support from the Ministry of the Environment, Japan. The ESD project designs and implements research and development activities through two flagship initiatives: a global multi-stakeholder global network of Regional Centers of Expertise on ESD (RCEs) and a network of higher education institutions called the Promotion of Sustainability in Postgraduate Education and Research Network (ProSPER.Net).

As of September 2017, 158 RCEs have officially been acknowledged by the United Nations University worldwide. The Global RCE Service Centre is headquartered at UNU-IAS, where it provides assistance to individual RCEs and facilitates their communication and networking.

RCE Okayama

RCE Okayama is a multi-stakeholder platform composed of more than 250 members of organizations, collaborating to empower people to change the way they think and work towards a sustainable future in Okayama City. Acknowledged first in the world as one of the ‘Initial Seven’ RCE’s, by the United Nations University (UNU) in 2005, RCE Okayama has been part of a coalition of 158 RCEs around the world for more than a decade.

In 2014, RCE Okayama hosted the 9th Global RCE Conference, co-organized by UNU-IAS. Input and recommendations were thereafter shared at the UNESCO World Conference on ESD in Aichi, Nagoya, partnering with UNESCO and the Government of Japan on the occasion of the end of the UN Decade of ESD (2005-2014). After 2015, RCE Okayama and Okayama City committed to further accelerating and mainstreaming ESD, by implementing the Global Action Programme (GAP), the follow-up programme to the UN Decade of ESD. In response to its vision and mission, RCE Okayama also launched the ESD Okayama Award in 2015, and offered a variety of programmes for youth and multi-stakeholders across the city and beyond.

Recently, RCE Okayama and Okayama City received prestigious global awards and recognition from UNESCO, including the UNESCO-Japan Prize on ESD 2016 and the UNESCO Learning City Award 2017. These are also significant steps in RCE Okayama’s global outreach efforts to contribute to the UN-Sustainable Development Goals (SDGS) towards a better and sustainable future for all.

Further information

About SDGs (the United Nations)
<http://www.un.org/sustainabledevelopment/>



About an approach to SDGs of Okayama University (Japanese page)
<http://www.okayama-u.ac.jp/tp/profile/okayama-sdgs.html>



Okayama University (English page)
http://www.okayama-u.ac.jp/eng/news/index_id7333.html



Okayama University (Japanese page)
http://www.okayama-u.ac.jp/tp/news/news_id7269.html



Reference (Okayama University e-Bulletin)

e-Bulletin vol.20 : Getting ready for the SDGs
http://www.okayama-u.ac.jp/user/kouhou/ebulletin/feature/vol20/feature_001.html



■ News

Okayama University honored with special prize in the first Japan SDGs Awards!!

On 26 December 2017, Okayama University was presented with the “SDGs Partnership Award” in the first Japan SDGs Awards.

The Japan SDGs Award encourages efforts by companies and organizations for realization of the United Nations Sustainable Development Goals (SDGs). The recipients, companies or organizations that have made exceptional efforts contributing to the attainment of SDGs, are selected and presented with the award by the SDGs Promotion Headquarters (headed by the Prime Minister) in order to promote all-Japan action on SDGs. Okayama University was honored with the special prize, the SDGs Partnership Award, presented to companies and organizations recognized as having performed meritorious service deserving special mention. Okayama University was the sole national or public university to receive an award.

President Hirofumi Makino attended the award ceremony at the Office of the Prime Minister on behalf of Okayama University, where he received the award certificate.

At a press conference held at the Tsushima Campus on the same day, President Makino said, “It is a great honor to have Okayama University’s efforts recognized in this way. I believe this award is due to the activities of the local community, including the Education for Sustainable Development (ESD) activities conducted thus far in the Okayama City area. In the future, we intend to make further contributions to the attainment of the SDGs through collaboration with the local community and international society.” In the activities toward attainment of the SDGs, Okayama University will promote the transparency and coordination of its various kinds of intramural endeavors as well as enhancing cooperation with a wide range of organizations and people, such as the local community, private companies and NPOs.

Further information

Okayama University (English page)
http://www.okayama-u.ac.jp/eng/news/index_id7332.html

Okayama University (Japanese page)
http://www.okayama-u.ac.jp/tp/news/news_id7256.html



Address by Prime Minister Abe(from HP of the prime minister's official residence)



Commemorative photo during an interview



■ News

President Makino Speaks at 1st Japan SDGs Award Briefing Session

A briefing session was held on January 20 at the Fukoku Seimei Bldg. in Tokyo on the 1st Japan SDGs Award. The Japan SDGs Award was created to recognize enterprises or organizations selected by the SDGs Promotion Headquarters (headed by the Prime Minister) for making exceptional efforts that contribute to achievement of the SDGs. Okayama University won a special prize, the “SDGs Partnership Award,” for achievements worthy of special mention. The briefing session brought the twelve winning organizations together, including Okayama University, allowing each organization to report on its efforts. There were about 250 people in attendance, with Kotaro Katsuki, Director of the Global Issues Cooperation Division of the International Cooperation Bureau at Japan’s Foreign Ministry taking the platform as a commentator, along with Kaoru Nemoto, Director of the United Nations Information Center (UNIC) in Tokyo, and Miyuki Hokugo, News Bureau Copy Editor at Asahi Shimbun Co.



Group photo of speakers



President Makino gave a talk

President Hirofumi Makino of Okayama University gave a speech on “Partnerships Resonating with Each Other—Okayama University’s Initiatives for Contributing to the SDGs.” He reported about “social problem-solving genes” inherited in the area of Okayama and the results of Education for Sustainable Development (ESD) in Okayama. In addition, he described how the university’s efforts toward the SDGs had accelerated since he became president in April 2017. Before concluding his speech, he proposed having the award-winning organizations team up to create an “SDGs Award Ecosystem” for informing the world of Japan’s SDGs model. Director Katsuki highly appraised Okayama University’s efforts, the president’s leadership and his proposal for informing the world of the SDGs model, commenting, “It is important that the generations that will bear responsibility for our future society have the SDGs spirit.” Editor Hokugo commented, “What the SDGs constitute needs to be reexamined in an educational setting. It is there that solutions can be found, and they must be brought forth.”

At the conclusion of the briefing session, Director Nemoto commented, “I would like every one of you to participate with the SDGs as your own ideals,” and Director Katsuki said, “The awards will be held next year, too, so I hope we will have many entries.”

Okayama University's Action Guidelines and Achievements in the SDGs

Okayama University is undertaking activities that will contribute to achievement of the SDGs (Sustainable Development Goals), and in accordance with their principles and aims, exerts leadership toward realization of a sustainable society.

Significance of Okayama University's Action Guidelines regarding the SDGs

1. Contribution toward the SDGs, which consist of present-day challenges shared by all of humanity, means to help work toward Okayama University's purpose of "Building up a new paradigm for a sustainable world," on the basis of our mission, "Creating and fostering higher knowledge and wisdom."
2. Okayama University, which has a UNESCO Chair and has promoted Education for Sustainable Development (ESD), has the groundwork and responsibility to promote the SDGs, joining together with the Okayama region and international society.
3. We will engage in educational research together with activities to contribute to society, with the SDGs as a language in common with society.
4. By contributing to achievement of the SDGs, we will foster human resources with outstanding capability in problem-solving.

Further information

Okayama University (English page)
http://www.okayama-u.ac.jp/eng/news/index_id7337.html



Okayama University (Japanese page)
http://www.okayama-u.ac.jp/tp/news/news_id7280.html



■ News

President Makino and others visit the UNESCO headquarters to present Okayama University’s efforts for SDGs and ESD

During 2-3 November 2017, President Makino and his group visited the UNESCO headquarters in Paris, France, to present Okayama University’s efforts for Education for Sustainable Development (ESD), which UNESCO is leading, and also the Sustainable Development Goals (SDGs), which the UN is trying to achieve with the global community. Information was also gathered on implementation of SDGs and ESD.

UNESCO is an agency within the UN that led the 2005-2014 “UN Decade of ESD” and leads the 2015-2019 “Global Action Programme (GAP) on ESD.” In 2005, the Okayama region became a Regional Centre of Expertise on ESD (RCE) and in 2007 Okayama University was approved as UNESCO Chair. In 2014, the UNESCO World Conference on ESD was held in Okayama city, which shows how the Okayama region and Okayama University have been leaders for ESD and have developed a close relationship with UNESCO.

During the visit, President Makino and his group of three joined gatherings for organizations that won awards related to the 3rd UNESCO-JAPAN Prize on ESD, which are given in conjunction with the UNESCO General Conference. They also attended publication parties related to SDGs and ESD. Opinions were exchanged in a meeting with: MEXT Minister Yoshimasa Hayashi, who attended as a representative of the Japanese government which sponsored the UNESCO-JAPAN Prize on ESD; UNESCO Assistant Director-General for Education Qian Tang; UNESCO Education Sector EDS Section Chief Alexander Leicht and Miriam Tereick. The Makino Vision along with SDGs and ESD programs that are unique to Okayama University, were also presented with passion during the exchange.



Headquarters in Paris, France



MEXT Minister Yoshimasa Hayashi and President Makino (left)

Further information

Okayama University (English page)
http://www.okayama-u.ac.jp/eng/news/index_id7223.html

Okayama University (Japanese page)
http://www.okayama-u.ac.jp/tp/news/news_id7151.html

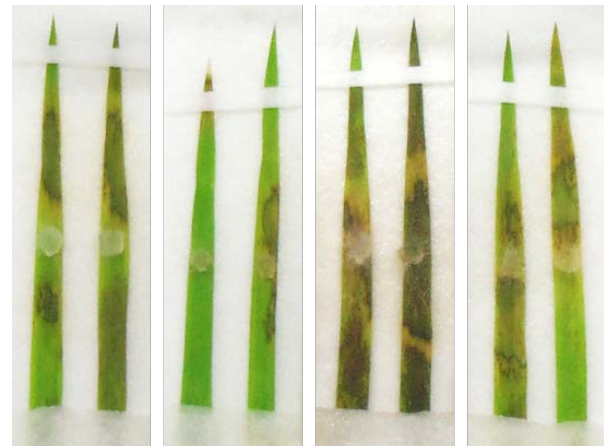


■ Research Highlights

Plant science: New insights into infection strategy of *Rhizoctonia solani*, a causal agent for rice sheath blight, highlighted by the plant defense mechanism

Rhizoctonia solani is a soil-borne phytopathological fungi causing sheath blight, a major disease in cultivated rice. It gives rise to serious damage in agriculture and economies in USA and East Asia including Japan.

Phytopathogens are classified in terms of their lifestyle and *R. solani* is regarded as a necrotrophic pathogen which kills its host to obtain nutrients. In contrast, biotrophic pathogens parasitize their hosts to deprive nutrients from living cells. Since all rice cultivars are not fully resistant to *R. solani*, fungicides are the only current means to deal with this pest.



Control Salicylic acid Jasmonic acid Ethylene
Fig.1. Effects of pretreatment of phytohormones on *R. solani* infection in *B. distachyon*

Yusuke Kouzai, Yoshiteru Noutoshi, and colleagues at Okayama University have developed a pathosystem using *R. solani* and *Brachypodium distachyon*, an emerging monocotyledonous model plant, and found that pretreatment of a phytohormone salicylic acid (SA) can induce disease resistance in both *B. distachyon* and rice against *R. solani*. Consistently, the SA-deficient transgenic rice is more susceptible to *R. solani* compared with wild-type.

Furthermore, two accessions of *B. distachyon* were found to be resistant against *R. solani*, that activate SA-dependent immunity after inoculation.

These results update the pathogenic program of *R. solani* as a hemi-biotroph which uses biotrophic phase at the initial invading step where SA-dependent plant immunity can effectively block. In addition, *B. distachyon* should deploy disease resistance proteins which work as a sensor detecting *R. solani* to activate defense response.

The researchers proposed two options to counteract this intractable disease: 1. development of *R. solani*-resistance cultivars using genetic resources of *B. distachyon*; and 2. development of plant immune-activating chemicals termed plant defense activator with SA-based functionality.

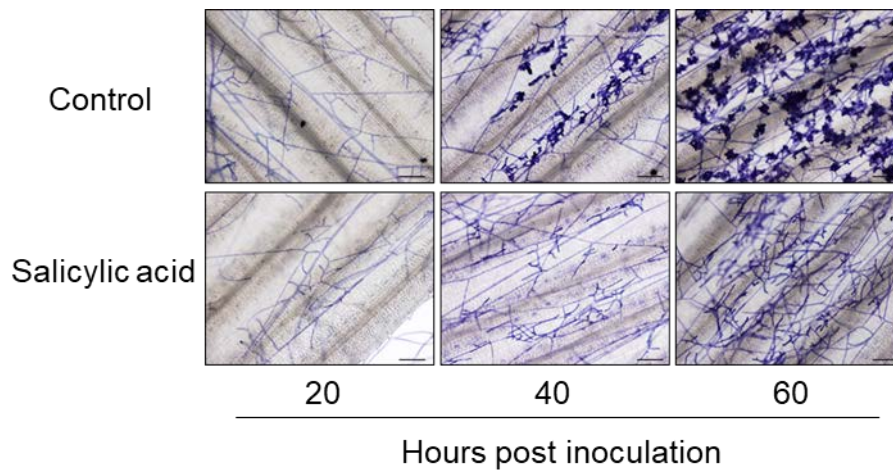


Fig.2. Effect of salicylic acid pretreatment on *R. solani* hyphal growth (purple filaments) on *B. distachyon* leaf surface. SA treatment prevents formation of structure called infection cushion (dense clots) required for the progression to its necrotrophic stage.

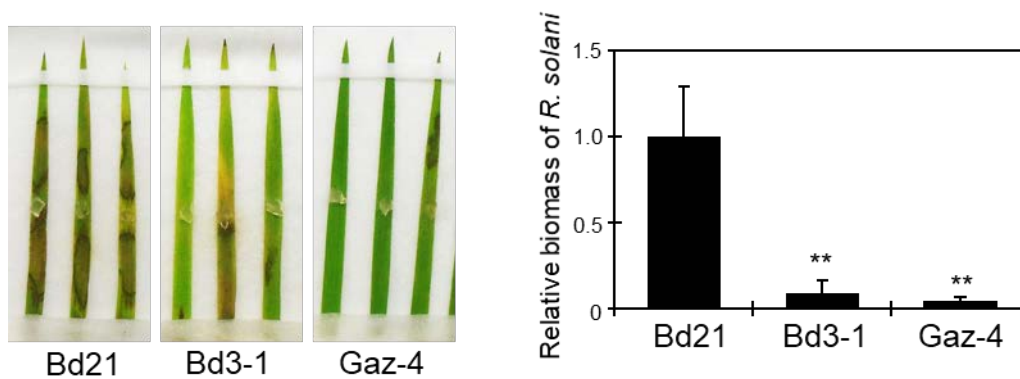


Fig.3. Disease symptom (left) and relative fungal biomass inside leaves (right) of three different accessions of *B. distachyon* Bd21, Bd3-1, and Gaz-4 inoculated with *R. solani*.

Reference:

Authors

Yusuke Kouzai, Mamiko Kimura, Megumi Watanabe, Kazuki Kusunoki, Daiki Osaka, Tomoko Suzuki, Hidenori Matsui, Mikihiro Yamamoto, Yuki Ichinose, Kazuhiro Toyoda, Takakazu Matsuura, Izumi C. Mori, Takashi Hirayama, Eiichi Minami, Yoko Nishizawa, Komaki Inoue, Yoshihiko Onda, Keiichi Mochida, and Yoshiteru Noutoshi

Title of original paper

Salicylic acid-dependent immunity contributes to resistance against *Rhizoctonia solani*, a necrotrophic fungal agent of sheath blight, in rice and *Brachypodium distachyon*.

Journal, volume, pages and year

New Phytologist 217(2), 771-783. (2018)

Digital Object Identifier (DOI)
10.1111/nph.14849

Journal website
<http://onlinelibrary.wiley.com/doi/10.1111/nph.14849/full>



Affiliations
Graduate School of Environmental and Life Science, Okayama University

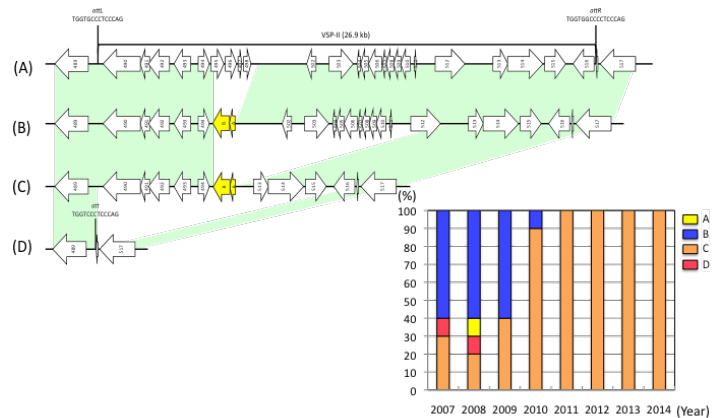
Author website
http://noutoshi-lab.com/english/index_e.html



Research Highlights

Comparative genomics of epidemic strains from cholera patients reveals evolution of *Vibrio cholerae* O1

Cholera is an acute serious diarrheal disease caused by the bacterial pathogen *Vibrio cholerae* O1, and this infectious disease is a major public health problem in many developing countries. The Bengal region including Kolkata City is considered the epicenter for cholera pandemics. Therefore, to control and prevent the spread of this disease, it is important to clarify and gain greater understanding of the genetic dynamism of the strains from cholera patients in Kolkata, India.



Genetic variation of VSP-II in *V. cholerae* O1 Kolkata strains.

By collaborating with other institutions including the National Institute of Infectious Diseases, Shin-ichi Miyoshi obtained and analyzed the whole genome sequence data of 80 strains isolated between 2007 and 2014 in Kolkata. Miyoshi and members of his colleagues also studied the periodical variation of the heterogeneous genomic region termed the *Vibrio* seventh pandemic island (VSP)-II.

The results of the comparative genomic analysis revealed the heterogeneity of VSP-II in Kolkata strains. Specifically, in 2010 they found the continuous mutation of the VSP-II and the resulting shift of the predominant strain to a virulent strain. These findings demonstrate that the epidemic of cholera in Kolkata was caused by several distinct strains that have been constantly changing within the genetic lineages of *V. cholerae* O1 in recent years.

Reference:

Authors

Daisuke Imamura, Masatomo Morita, Tsuyoshi Sekizuka, Tamaki Mizuno, Taichiro Takemura, Tetsu Yamashiro, Goutam Chowdhury, Gururaja P. Pazhani, Asish K. Mukhopadhyay, Thandavarayan Ramamurthy, Shin-ichi Miyoshi, Makoto Kuroda, Sumio Shinoda, and Makoto Ohnishi.

Title of original paper

Comparative genome analysis of VSP-II and SNPs reveals heterogenic variation in contemporary strains of *Vibrio cholerae* O1 isolated from cholera patients in Kolkata, India.

Journal, volume, pages and year

PLoS Negl Trop Dis **11**,e0005386 (2017).

Digital Object Identifier (DOI)

10.1371/journal.pntd.0005386

Journal website

<http://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0005386>



Affiliations

Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama University.

Graduate School website

<http://www.pharm.okayama-u.ac.jp>



■ Research Highlights

High temperature superconductors: Discovery of a new form of electronic wave

Electrons in superconductors move without feeling resistance so that no energy is dissipated. Copper-oxide high temperatures superconductors are promising materials to resolve the energy and environment problems of our society.

However, it is still elusive why the electrons can function at high temperatures up to 160 Kelvin (-110 degree Celsius) in the superconductors.

Now, a research group at Okayama University led by Guo-qing Zheng has found that electrons form an order called charge density wave before the material becomes superconducting in the high temperature superconductor $\text{Bi}_2\text{Sr}_{2-x}\text{La}_x\text{CuO}_6$.

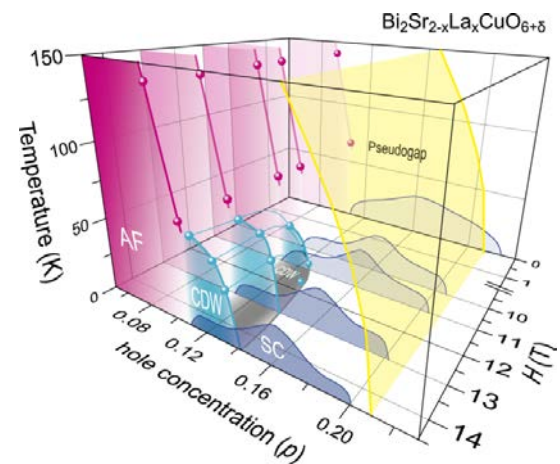


Figure caption: evolution of the new form of electronic wave (labeled as CDW) in the high temperature superconductors $\text{Bi}_2\text{Sr}_{2-x}\text{La}_x\text{CuO}_6$.

The finding was made by applying a strong magnetic field up to 45 Tesla in the CuO_2 plane which is the most basic unit of the material, then probing how the electrons moving around with the nuclear magnetic resonance (NMR) technique.

Furthermore, Zheng and colleagues demonstrated that electric charge takes over the role of electron spin that forces the material to become a magnet when a certain number of carriers are doped into the parent compound $\text{Bi}_2\text{Sr}_2\text{CuO}_6$.

This discovery sheds new light on the understanding of high temperature superconductivity and may help find new superconductors functioning at higher temperatures.

Reference:

Authors

Shinji Kawasaki, Zheng Li, Minoru Kitahashi, Chengtian Lin, Philip L. Kuhns, Arneil P. Reyes and Guo-qing Zheng.

Title of original paper

Charge-density-wave order takes over antiferromagnetism in $\text{Bi}_2\text{Sr}_{2-x}\text{La}_x\text{CuO}_6$ superconductors.

Journal, volume, pages and year

NATURE COMMUNICATIONS **8**, 1267 (2017).

Digital Object Identifier (DOI)

10.1038/s41467-017-01465-9

Journal website:

<http://www.nature.com/articles/s41467-017-01465-9>



Affiliations

Department of Physics, Okayama University.

Department website

http://www.physics.okayama-u.ac.jp/zheng_homepage/



■ Research Highlights

Identification of illegal users from pirated copies of multimedia contents

To identify illegal users from pirated copies, information about the identities of each user— so called fingerprints— should be inserted into multimedia content before selling. The most challenging issue is robustness against a collusion attack where a coalition of users remove/modify fingerprints by comparing their copies. Fingerprinting code is one of the most promising approaches for the collusion-secure tracing system.

In the identification of illegal users, each user's codeword is checked by calculating the similarity score with the codeword extracted from a pirated copy. Although an optimal scoring function has been reported using a conventional method, the realization is difficult because the number of illegal users and their attack strategy are inevitable.

Now, Minoru Kuribayashi and colleagues at Okayama University have developed a new scoring function and proposed a semi-optimal method which can effectively classify illegal and innocent users with a simple operation.

Their method estimates the attack strategy in order to select its corresponding weight for calculating similarity scores. The advantage of this method is the simplicity required for the estimation because it only observes the bias of symbols '0' and '1' and then roughly classifies the strategy into three classes.

The method also assumes a realistic situation such that a pirated copy may be distorted by additional attacks which intend to delete the fingerprint in a signal processing domain.

The performance was evaluated in the presence of additive white Gaussian noise, and it was compared with some state-of-the-art methods. As a result, it was confirmed that the best performance was obtained by the proposed method and it was very close to the optimal one.

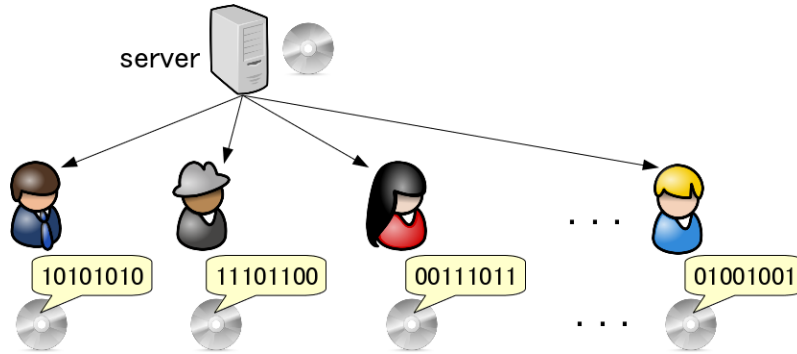


Fig.1: Framework of the fingerprinting system.

At the distribution of multimedia content, a server inserts unique ID information called fingerprint into the content. Once a copy is found, the illegal users can be identified if the fingerprint is correctly extracted.

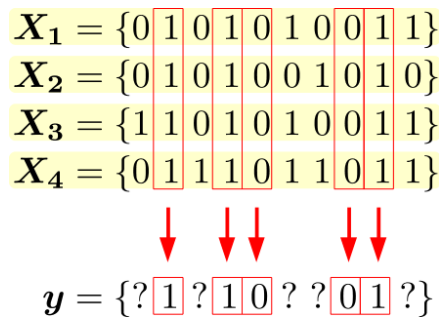


Fig.2: Collusion attack

If a coalition of users compares their codewords, they can find the positions where some of their symbols are same and they cannot modify the symbols at such positions. Otherwise, they can select the symbols with an arbitrary strategy such as majority voting, minority voting, and so on.

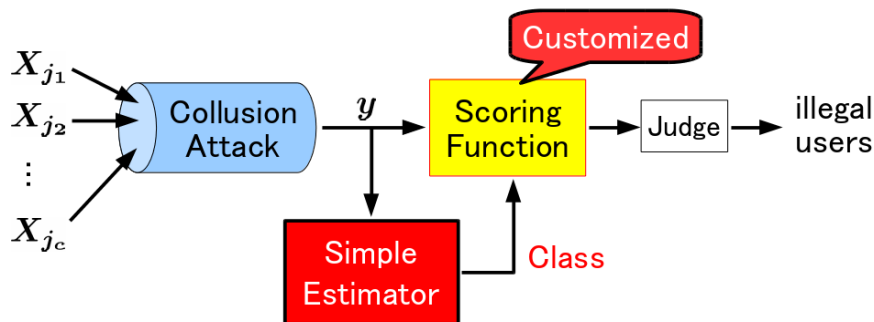


Fig.3: Flowchart of the proposed method

The proposed method first estimates the attack strategy into three classes, and then customizes the scoring function according to the estimated strategy. Both the estimator and scoring function exploit the bias of symbols in a pirated codeword y which can be observed directly from the codeword.

Reference

Authors

Minoru Kuribayashi and Nobuo Funabiki.

Title of original paper

Universal Scoring Function Based on Bias Equalizer for Bias-Based Fingerprinting Codes.

Journal, volume, pages and year

IEICE Trans. **E101-D**, No.1, 119-128, (2018).

Digital Object Identifier (DOI)

10.1587/transfun.E101.A.119

Journal website

http://search.ieice.org/bin/summary.php?id=e101-a_1_119



Affiliations

Graduate School of Natural Science and Technology, Okayama University.

Department website

<http://www.ec.okayama-u.ac.jp/~dist/kuribayashi>



■ Topics

Radio Message from International Students (World Heartful Message)

Okayama University is now broadcasting an internet radio program in which international students who have come to study at Okayama University talk on topics such as their lives in Japan as students, what it is like to live in Okayama City, and research themes. The broadcasts are produced in English or the native languages of the students.

Mr.Mandeep Singh Reen of the Graduate School of Natural Science and Technology from India talked about his research and plans for the future.



Mr.Mandeep Singh Reen (right)

Further information

https://www.youtube.com/watch?v=3ZDBIRONpo4&list=PLJikPQTwoCj4ggrOUY2cs_AJZleWdG4t8&index=3&t=363s



Radio Message from International Students
https://www.youtube.com/playlist?list=PLJikPQTwoCj4ggrOUY2cs_AJZleWdG4t8



◆ Further information

Okayama University
1-1-1 Tsushima-naka, Kita-ku, Okayama 700-8530, Japan

Public Relations and Information Strategy
E-mail: www-adm@adm.okayama-u.ac.jp
Website: http://www.okayama-u.ac.jp/index_e.html

Okayama University e-Bulletin
<http://www.okayama-u.ac.jp/user/kouhou/ebulletin/>

Okayama University Medical Research Updates (OU-MRU)
http://www.okayama-u.ac.jp/eng/research_highlights/index_id56.html

About Okayama University (YouTube 1)
<https://www.youtube.com/watch?v=iDL1coqPRYI>

Okayama University Image Movie (YouTube 2)
<https://www.youtube.com/watch?v=KU3h0IXS5kk>



◆ About Okayama University

Okayama University is one of the largest comprehensive universities in Japan with roots going back to the Medical Training Place sponsored by the Lord of Okayama and established in 1870. Now with 1,300 faculty and 13,000 students, the University offers courses in specialties ranging from medicine and pharmacy to humanities and physical sciences. Okayama University is located in the heart of Japan approximately 3 hours west of Tokyo by Shinkansen.



Hirofumi Makino, M.D., Ph.D.
President, Okayama University



SUSTAINABLE DEVELOPMENT GOALS



“Okayama University supports the Sustainable Development Goals”