

From Kyushu University to the world.
Introducing research activities that will bring us to the realization of a carbon-neutral society.

Hello!

I²CNER

March
2020

vol. 23

International Institute for Carbon-Neutral Energy Research



I²CNER:

10th Year Anniversary and Pathway to the Future





Awards



Assist. Prof. **Nguyen Dinh Hoa**

2019 Masao Horiba Awards HORIBA, Ltd.

Assist. Prof. Nguyen Dinh Hoa from the Energy Analysis Division, received the Masao Horiba Awards 2019. The purpose of this award is to encourage and recognize scientists and engineers relatively early in their careers who are achieving distinguished results in the field of analytical science and technology.

The target technical field of 2019 is advanced analytical and measurement technologies to maximize the performance of electric power and battery usage for efficient control systems. The field for the award is decided every year with a focus on the principles and fundamental technologies fostered by HORIBA, Ltd.



Professor **Yasuyuki Takata**

ATPC Significant Contribution Award

12th Asian Thermophysical Properties Conference (ATPC 2019)

Professor Yasuyuki Takata (Thermal Science and Engineering Division), received the ATPC Significant Contribution Award at the 12th Asian Thermophysical Properties Conference (ATPC 2019), which was held in Xi'an, China from October 2-6, 2019.

The purpose of this award is to honor a professional scientist on thermophysical properties who has made significant contributions to Asian Thermophysical Properties Research and been recognized by the academia.



Assoc. Prof. **Motonori Watanabe**

The Young Scientists' Prize

The Minister of Education, Culture, Sports, Science and Technology

Assoc. Prof. Motonori Watanabe (Molecular Photoconversion Devices Division) received the *Young Scientists' Prize* by the Minister of Education, Culture, Sports, Science and Technology (MEXT) in Japan. He was awarded the prize for "Research of water splitting using organic/inorganic hybrid photocatalysts". Every year the Minister honors those who have made outstanding contributions in research and enhancement of understanding in science and technology.



Assist. Prof. **Biao Shen**

Outstanding Paper Award

14th International Conference on Heat Transfer, Fluid Mechanics, and Thermodynamics

Assist. Prof. Biao Shen, Mr. Tomosuke Mine, Dr. Sumitomo Hidaka (Post-doctoral Research Associate), Prof. Koji Takahashi, Prof. Yasuyuki Takata (Thermal Science and Engineering Division), and their research group have been awarded the *Outstanding Paper Award* at the 14th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics in Wicklow, Ireland.

The purpose of this conference is to provide researchers with opportunities to present the results of their research in the field of heat transfer, fluid mechanics, and thermodynamics.



Assoc. Prof. **Elif Ertekin**

Emerging Leader Award

The Society of Women Engineers

Assoc. Prof. Elif Ertekin from the Molecular Photoconversion Devices Division, has been selected to receive Emerging Leader Award from the Society of Women Engineers (SWE).

The award honors individuals who have been actively engaged in an engineering or technology profession and have demonstrated outstanding leadership skills as an individual resulting in significant accomplishments.

Ertekin was one of 10 women from across the U.S. selected to receive the competitive award. She was recognized for her leadership in interdisciplinary research, her exceptional teaching and mentoring of the next generation of engineers.



Editor's Note

■ ICNER holds a variety of events. For details, please see: <http://i2cner.kyushu-u.ac.jp/en/>



■ This issue is the final issue of ICNER's PR magazine. Thank you very much for supporting ICNER over the last 10 years. We hope to continue to research and develop technologies for carbon neutral energy solutions. Please visit our homepage, Facebook or other SNS for further information. We are open to any feedback you may wish to share. Thank you.

Hello! ICNER vol.23 March 2020

[Published by] International Institute for Carbon-Neutral Energy Research (ICNER)
ICNER Administrative Office, 744, Motooka, Nishi-ku, Fukuoka City
Fukuoka Prefecture, 819-0395 (Kyushu University Ito Campus)
☎ +81-(0)92-802-6935 ☎ +81-(0)92-802-6939
✉ wpiyogai@jimu.kyushu-u.ac.jp
🌐 <http://i2cner.kyushu-u.ac.jp>
📘 <https://www.facebook.com/i2cner.news>
🐦 <https://twitter.com/i2cner>

[Edit & Design] Kijima Printing, Inc
[Photography] Arisa Kasai
[Edit & Planning] ICNER Administrative Office
(Tomoya Koga, Yuki Nogami, Shoko Koga, Yuko Inoue)



2019.9.

Local School Students Visiting I²CNER

Local Junior High School Students visited I²CNER as a part of a local government project, Itoshima City and Fukuoka Prefecture, promoting local projects to students.

Two junior high schools in Itoshima attended a lecture class presented by researchers at I²CNER. Prof. Chapman gave a talk about energy systems in the local area and Japan. He spoke in fluent Japanese which captured the students' attention with his talk. The other students learned about hydrogen energy society through an experiment demonstration on how hydrogen can be made by a photocatalytic process. The students paid attention and learned about the exciting scientific world of Photocatalytic through the demonstration.



Assoc. Prof. Watanabe holding two chemicals and giving a demonstration to the students



Assoc. Prof. Chapman asking a question to the students

2020.1.

Energy Week 2020

Kyushu University Energy Week 2020 was held on January 27th – 31st 2020, with the theme: “*Energy Intelligence Beyond Borders: Sharing Sustainable Energy Visions.*”

The Energy Week event attracts people from academia, industry, and government offices both inside and outside of Japan, to discuss and share their research. I²CNER and the Research Center for Hydrogen Industrial Use and Storage (HYDROGENIUS) Joint Research Symposium, and the I²CNER and Institute of Math for Industry (IMI) Joint International Workshop, were held respectively on January 30th and 31st, as part of the Energy Week. During the workshops, there were a lot of questions and discussions that showed the enthusiasm from participants, academics, and researchers from institutions and industries across Europe, Asia, U.S., and Japan.



Discussion during the Applied Math for Energy workshop



International Workshop at Catalytic Materials Transformations Division

I²CNER: 10th Year Anniversary and Pathway to the Future



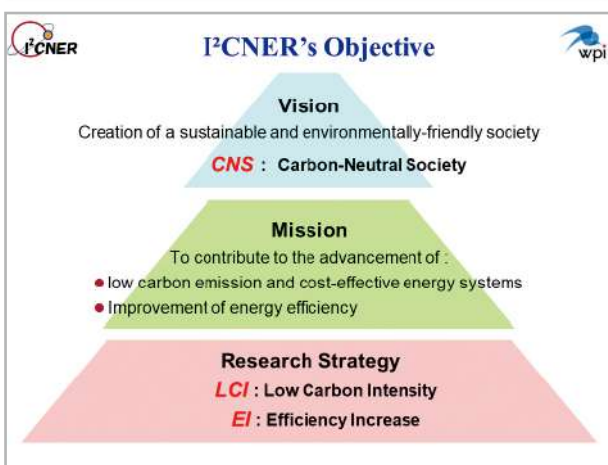
I²CNER Building circa 2013, during the early stage of Ito-campus consolidation

This year marks the 10th anniversary of I²CNER as a center which exemplifies the vision of the World Premier International Research Center Initiative (WPI) of the government of Japan. I²CNER maintains a premier international reputation, infrastructure, research productivity and quality, and an open research platform for the international community to engage in and tackle the energy challenge of the 21st century. The high-impact transformational reforms, being instituted by I²CNER's strategy for furthering technology-driven research, is positioning KU as a world-wide leader. Since its inception in 2010, I²CNER has increased diversity, provided a new culture for young scientists to thrive independently, formed many transdisciplinary teams to help its research culture break out of "groupthink," fostered collaborations around the world, and generated recognized world-class research results. In fact, these results truly bear the mark of I²CNER because they could not have been accomplished outside the framework of the I²CNER project. Developing its brand identity on energy engineering, I²CNER has continuously engaged industrial partners through open innovation and technology transfer.

I²CNER's mission and accomplishments are directly in line with Japan's vision for a robust energy future that optimizes energy resources in concert with Japan's overarching energy vision: energy security, economic efficiency, and environmental protection without compromising safety (3E+S).

Through its mission-driven basic research, the Center has defined and produced the development of the science to dramatically reduce Japan's CO₂ emissions while strengthening Japan's energy security. I²CNER's many accomplishments have been built on the development and growth of extremely strong research teams between KU and at the Satellite Center at the University of Illinois at Urbana-Champaign.

Vision and Strategies



I²CNER's vision is to contribute to the creation of a carbon-neutral society (CNS) through basic research underlying technology that will address the energy challenge for Japan and the world, and establish a model international academic environment for the 21st century, and establish a model international academic environment for the 21st century.

In pursuing our mission, we consider two major principles, efficiency increase (EI) in energy conversion and energy use, and lowering the carbon intensity (LCI) of fuel and electricity to adopt and develop future technologies. To carry out its mission, I²CNER's research is driven by well-defined milestones and targets that are identified in roadmaps of the underlying technologies.

Advancing Research of the Highest Global Level

Evidence of I²CNER's international stature and relevance can be seen in its 2816 publications since inception with a total number of 47147 citations and an h-index of 88 which is on par or better than the h-index

of peer institutes. Our researchers have joint publications with researchers from 573 institutions around the world, and 343 internationally recognized researchers visited I²CNER for scientific interaction and exchange.

The Institute's researchers are globally engaged and have been responsible for organizing, co-organizing, or serving on the scientific committees of 207 international conferences, 278 international conference sessions/symposia or workshops, and 68 I²CNER international workshops. In addition, I²CNER researchers have received a total of 310 national and international awards from various professional societies and institutions around the world.



Generating Fused Disciplines

I²CNER provides unique opportunities for bottom-up research, giving researchers opportunities to create and establish new research directions. In particular, young researchers have formed an important part of I²CNER. In order to foster advance interdisciplinary research, applied math and economics are integrated into I²CNER's research portfolio. The "Applied Math and Economics for Energy" is now a new interdisciplinary research direction, and will be an important component of I²CNER.

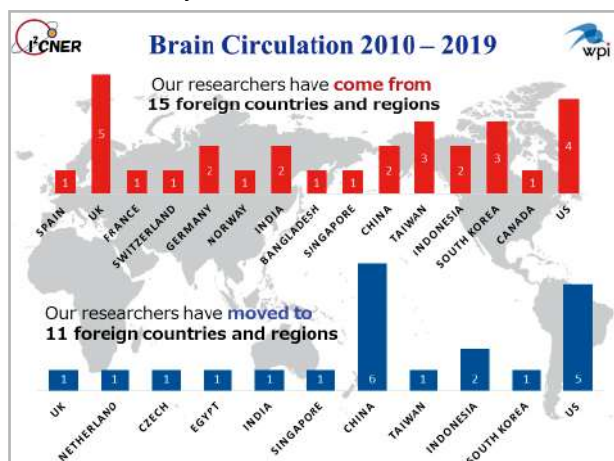
I²CNER's annual symposia are used as platforms to explore fusion of disciplines and come up with action plans for nurturing new cross-cutting interdisciplinary research directions and guiding new faculty hires. By way of example, major outcomes of the 2016 and 2017 symposia is that they helped in the respective establishment of computational science and applied math as integral components of I²CNER's research portfolio.

The disparate nature of the disciplines involved in the I²CNER research fields facilitates interdisciplinary work through collaborations across division boundaries. By necessity the research teams are composed of scientists and engineers from disparate disciplines including chemistry, physics, materials science, mechanics, geoscience, biomimetics, applied math, economics, and social sciences, and the research addresses phenomena that span many decades in spatial and temporal scales.

I²CNER's roadmap and research portfolio updates are also informed by the Institute's scientific exchanges with a stellar list of distinguished scientists from 25 partnering institutions across the globe, including the University of California, Berkeley; the University of Wisconsin-Madison; MIT; the National Fuel Cell Research Center at the University of California, Irvine; the State of California Air Resources Board (CARB) in the US; Imperial College, London in the UK; and the University of Göttingen in Germany.

Realizing an International Research Environment

The environment at I²CNER provides a rich platform to pursue transformative research in non-traditional and highly multi-disciplinary environments, bringing together researchers from domestic and international settings to address issues critical to Japan's transition to a carbon neutral society.



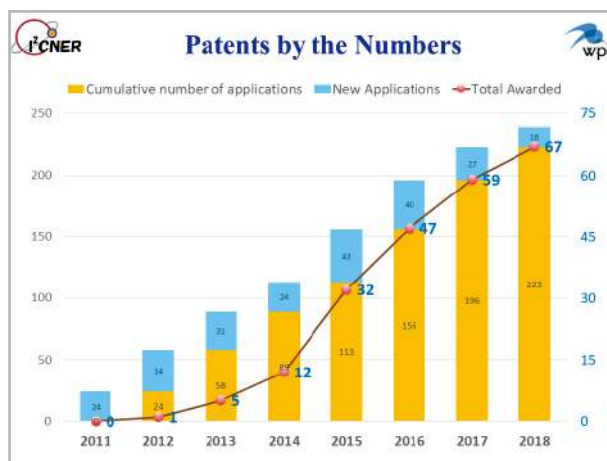
I²CNER has hosted 40 international symposia; held 143 seminars in the Institute Interest Seminar Series (I²SS) with 256 speakers of which 158 were non-Japanese; 157 seminars in the I²CNER Seminar Series with 161 total speakers of which 105 were non-Japanese.

As part of its commitment to fostering globally-aware researchers starting from the undergraduate level, I²CNER sends approximately 6 undergraduate students from Kyushu University to carry out research in the laboratories at the University of Illinois on an annual basis. The Institute also hosts 6 undergraduate students from the US (Illinois, Northwestern, and the University of California, Berkeley) who participate in summer research programs in I²CNER laboratories.

I²CNER's mission is enhanced by its Satellite Center at the University of Illinois, which serves to advance an impressive number of collaborations across the USA, including top-tier US universities, prestigious national laboratories, and government agencies. In addition, the Illinois Satellite is enabling Kyushu University to execute its reform and revitalization program for the internationalization of its education and research missions.

Feeding Research Outcomes Back Into Society

The relevance of the I²CNER research efforts and objectives to enabling the green innovation initiative of the government of Japan is demonstrated by the large number of collaborative projects in which its researchers are involved with industry. Total 53 cases of technology transfer have been accomplished. Currently, more than 30 industries have been involved in the joint research with I²CNER, and over 20 projects are under planning. Since inception, I²CNER has filed for 239 patents and was granted 69 patents.



In FY 2017, MEXT established the new WPI Academy to take the vanguard in internationalizing and further renovating Japan's research environment, making it place that expands and accelerates the international circulation of the world's best brains. The WPI centers that have achieved "world-premier status" will be the initial members of the WPI Academy. I²CNER has been recognized as a world leader in terms of achievements in research standards and operation of the center for 10 years, and will begin its activities as a WPI Academy from FY2020.

I²CNER will streamline its research portfolio by reshaping its strongest research themes. The three streamlined thematic research clusters or 'Thrusts' will be 1) Advanced Energy Materials, 2) Advanced Energy Conversion Systems, and 3) Multiscale Science and Engineering for Energy and the Environment. This structure allows us to capture our most relevant existing capabilities and to organize them for the best future impact. It also provides an efficient mechanism for top international and Japanese researchers to work interactively to accomplish common goals which cut across disciplines.

By leveraging the achievements of international collaborative research, we will promote a wide range of fusion and joint research on energy research in various fields such as social science, economics, law, and politics, as well as education jointly with "Q-PIT" (Kyushu University Platform of Inter/Transdisciplinary Energy Research) .

While further enhancing our identity through global exchange and partnerships, I²CNER aims to contribute significantly to the realization of a carbon-neutral society through joint research and technology transfer with industry.



2018: Completion of Ito-Campus consolidation