

# OCARINA通信

The **OCU** Advanced **Research Institute for Natural Science and Technology**



—Special Feature Article—

Can we produce a core project?  
We are at the starting line again after 10 years of experience.

**Establishing an organization that can motivate  
young researchers and enhance their ability  
Addressing a larger theme under a new  
framework in the future**

—OCARINA's History—

**CHRONICLE of OCARINA**

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## Special Feature Article

### Establishing an organization that can motivate young researchers and enhance their ability Addressing a larger theme under a new framework in the future



OCARINA has dealt with research topics that have an influence on all human beings, and has aimed to produce human resources and put research results into practical use. At its 10th anniversary, OCARINA will be restructured into a new organization. We looked back on our 10-year history, focusing on the keywords of “advanced”, “composite”, “international” and “training young researchers”. Also, active discussion was carried out with regard to the potential of our project research system and the future OCARINA.

#### The project system advanced our research

##### Dr. Miyano/

As you all know, OCARINA will be reorganized next academic year.

Last year, the Education and Research Strategy Council, a President’s advisory organization, presented proposals for the new OCARINA’s principles. According to the proposals, the new OCARINA will be an organization that does not have full-time faculty members other than researchers who promote project research.

Now, at first, I would like to focus on the term “advanced” in the name of our organization. OCARINA has had several principles, including the pursuit of advanced research. Has the principle been realized or not? What do you think about that, Dr. Kamiya? You have been a full-time professor since 2010.

##### Dr. Kamiya/

Before answering that question, I would like to talk about OCARINA’s principles. We have carried out our research, keeping the keywords of “composite and advanced” in mind. We therefore focused on urban issues such as energy, the environment and disaster management in order to make proposals to the citizens of Osaka City. When we look back on these 10 years, we can divide them into two periods; the

first half until 2014 and the second since 2015. During the first half, we focused on research for photosynthesis and artificial photosynthesis.

Originally, we were planning to implement three big projects in parallel. However, we could not launch any large project other than the research on photosynthesis and artificial photosynthesis until 2014. Then, in 2015, a new research space was established, and it has been used by researchers who have obtained a large amount of external funds.

So, as for the advanced research within these 10 years you asked about, we have focused on certain fields of study in each period. Although the research scales vary, I think we have been able to accomplish “advanced” achievement to a certain level, as shown in the name of our organization.

##### Dr. Amao/

I have mainly worked for the Research Center for Artificial Photosynthesis since 2013 to now. As Prof. Kamiya said, the year 2015, when Prof. Yoshida joined our institute, was a pivotal point for OCARINA. Three new projects started, including the project on advanced materials by Dr. Shigekawa. The period of four years since 2015 was filled with the hope of creating new revolutionary research and development in OCARINA.

##### Dr. Miyano/

As Dr. Amao said, Dr. Yoshida was expected to put artificial photosynthesis into practical use in engineering. Including this

## Can we produce a core project? We are at the starting line again after 10 years of experience.



### profile

Eminent Professor & Professor Emeritus, OCU  
OCARINA

### Nobuo Kamiya

Graduated from the School of Science and completed the doctoral course at the Graduate School of Science, Nagoya University. Doctor of science. Worked as a guest researcher at the High Energy Physics Research Institute, Photon Factory (PF), a researcher/research sub head at RIKEN and the director of the R&D office of RIKEN Harima Center (SPRING-8). Became a professor of the Graduate School of Science, OCU in 2005 and changed to a professor of OCARINA in 2010. Took up his present post in 2019. Awarded the Asahi Prize in 2012.

point, what do you think about the period since 2015?

#### Dr. Yoshida/

I had the opportunity to give a presentation at the 2014 International Symposium a few months before I came here. At that time, I had the impression that OCARINA's research on natural photosynthesis was really advanced.

At the time of my arrival, many other engineering researchers who were creating various reacting materials also came to OCU. In that sense, I think we are now aiming for advanced achievements by adding new streams to OCARINA's original stream of natural photosynthesis.

#### Dr. Miyano/

Dr. Shigekawa has studied at OCARINA for five years, and his project is one of the "advanced" studies. Could you tell us your impression?

#### Dr. Shigekawa/

I am involved in a research project, so I will speak from that perspective. In this project system, we pay to use a room for our research. American universities have a similar system. I suppose this is a very good mechanism for implementing research efficiently in a limited time. I have been working as Vice Director for these few years, and I think we should maintain this system in some form. Recently, however, there are many projects underway, so we should streamline them.

## Supporting young researchers for composite research

#### Dr. Miyano/

Now, let's discuss the next keyword "composite". To what extent have we realized "composite" research in these 10 years?

There are various advanced projects in OCARINA. We discussed the difficulties in collaboration of distinctive, state-of-the-art topics in the previous meetings, and there was the opinion that young researchers could play a key role in connecting different projects.

#### Dr. Amao/

In OCARINA, specially-appointed young researchers are working as associate professors, lecturers or research associates. Young researchers have been collaborating and achieving new research results in recent years. Some specially-appointed researchers have jointly challenged to apply for the NEDO foundation for young researchers for these two years. They could proceed to the stage of a presentation of their project this year.

### profile

Professor, OCARINA

### Yutaka Amao

Obtained a Doctorate in Engineering at the Graduate School of Bioscience and Biotechnology, Tokyo Institute of Technology in March 1997. Worked as a researcher at the Kanagawa Academy of Science and Technology in April 1997 and the National Aerospace Laboratory of Japan in February 1998. Became a lecturer (February 2001) and then an associate professor (April 2002) at the Faculty of Engineering, Oita University. He became a professor of OCARINA in April 2013. He has also been acting as the Director of the Research Center for Artificial Photosynthesis since April 2015.



For young researchers, establishment of research based on their own ideas is the most important, and it is extremely difficult to pursue projects outside of research fields. In recent years, however, they have brought their research skills together and presented proposals. Now, they have been trained enough to explore what is necessary to achieve their research goal. The successful experience of proceeding to the stage of a presentation of their project is an extremely valuable for them. They have stranded to the start line of starting collaborative research with collection of wisdom of their individual researches. Young researchers are recognizing the significance of "hybrid research" and "advanced research".

#### Dr. Fujii/

I saw some young researchers having a heated discussion just nearby. If I were a little younger, I would participate in their discussion, but there is a strict limitation for age now. In other organizations, some researchers have no interaction with others, although they study in the same place; however, OCARINA's staffs are all very active in interaction. They have friendly relationships with each other, and these relationships are leading to scientific results. They are engaged in research topics they are interested in. I feel that it is an important factor in composite research that we are studying in a nearby place or the same place.

#### Dr. Miyano/

Although all the fields have not been involved in composite research yet, there is a project implemented by young researchers of different fields of science and engineering. Could you tell us about this, Dr. Yoshida?

#### Dr. Yoshida/

Composites, or collaboration, of young researchers are going very well. I see closely that new studies and experiments have started after the application for the NEDO subsidy was turned down. Another important point for passing a screening for external funds is how to appeal to judges. In that regard, it is a good thing that young researchers are asking their seniors to check their presentations beforehand or asking teachers from different fields to check their application forms, establishing lateral relationships.

#### Dr. Miyano/

Collaboration is required not only among the disciplines of engineering, science and human life science but also within each discipline. As Dr. Amao said, it is an aspect of OCARINA that even within the same discipline, terminologies are different and it is sometimes difficult to understand each other between the fields. Have we realized collaboration within each discipline?

## Special Feature Article



### profile

Associate Professor, OCARINA

### Ritsuko Fujii

Obtained a doctoral degree (Science) at the Graduate School of Science, Kansai Gakuin University in March 2001. Worked as a postdoctoral fellow (PD) at the Japan Society for the Promotion of Science, Graduate School of Science and Technology, Kansai Gakuin University, Osaka City New Industry Generation Center, and the Graduate School of Science, OCU. Became a specially-appointed associate professor at OCARINA and took up her present position in April 2013. She also worked as a researcher at PRESTO, Japan Science and Technology Agency until March 2016. Specializes in biophysical chemistry and spectroscopy.

### Dr. Amao/

Yes. That's why I sincerely hope that young researchers can get large budgets for research project. Chances have come nearby. I would like to continue to support for large budgets them.

## Establishing an environment to tackle a big topic

### Dr. Miyano/

We see the trend of composite research showing in the competition for an approval of a strategy key research project.

### Dr. Kamiya/

In the field of photosynthesis and artificial photosynthesis, which I am involved in, a bigger topic is better for achieving OCARINA's aim. Senior researchers should support young researchers by connecting their research, giving fertilizer, providing light and watering them like a growing plant. At first, Dr. Hashimoto and I were working on fundamental natural photosynthesis, keeping artificial photosynthesis in mind. If we started to work on artificial photosynthesis at full scale, it could not be done by ourselves alone. We needed to bring in new researchers. We once applied for the establishment of a graduate school for our project, but unfortunately, it was not approved. With that possibility in our mind, we would like to expand the framework of our project.

### Dr. Miyano/

"A bigger topic is better" means widening the range of the topic and creating an environment to bring in various fields and various young researchers.

### Dr. Kamiya/

Yes. We should establish projects or concepts that are widely open and can be implemented flexibly. That is important when we think of the two keywords of "composite" and "advanced".

### Dr. Miyano/

We did not have such an idea when OCARINA was established. We once accepted tenure-track specially-appointed professors. After that, the Excellent Researcher Introduction Project started, and excellent young researchers were hired from external institutions. They are now using the rooms of OCARINA. Dr. Shigekawa is involved in this project.

### Dr. Shigekawa/

The biggest bottleneck is the issue of space. If more

### profile

Deputy Director, OCARINA

### Tomoko Yoshida

Obtained a doctoral degree (Engineering) at the Graduate School of Engineering, Kyoto University. Awarded the Okamura Award, given to excellent female researchers, and her research was adopted as a project in the "GLOCAL base for constructing society with a smile, intelligence and health" initiative in 2017. Has studied optical functional material science at OCARINA since 2015. Deputy Director of the Research Center for Artificial Photosynthesis



researchers are hired than there is capacity for, the problem of research space will arise. Space is a more severe problem than money.

If we accept young researchers for composite research at OCARINA, we can provide them with enough research space. If we can train young researchers from the standpoint, or in the framework, of "composite", we can increase the importance of our existence, particularly for the training of young researchers.

## The time is ripe for international joint research

### Dr. Miyano/

Another principle we have had from our establishment is "internationalization".

We are required to make our presentation in English at the international symposium at the end of every academic year. However, this is not all that we have aimed for. What do you think of the keyword "internationalization"?

### Dr. Kamiya/

I think we succeeded in holding workshops including the international symposium. We were able to create the basis for "international" research through conferences and discussions. However, it should be joint research that can promote internationalization among all the members, including students. We should have tried to promote joint research more.

### Dr. Amao/

Now that internationalization is required for research, the Research Center for Artificial Photosynthesis was approved as a core institution from Ministry of Education, Culture, Sports, Science and Technology, and six foreign reviewers included in the steering committee last April. After that, our long hope was realized, and our project on artificial photosynthesis were selected for the Grants-in-Aid for Scientific Research to start joint international research with National Taiwan University. As a result, we can continue our research on artificial photosynthesis and carbon dioxide utilization jointly with National Taiwan University for five years. In this project, young researchers will not only write academic research papers, but also stay in Taiwan for a long time to conduct joint research experiments. It is a key issue how widely we will be able to expand the range of joint research in five years, including publishing academic journals. It is a significant achievement that this full-scale joint international research can be implemented with public funds, Grants-in-Aid for Scientific



### profile

Advisor to the President, OCU  
Director, OCARINA

## Michio Miyano

Completed the doctoral program of the Graduate School of Engineering, Tokyo Metropolitan University in March 1980. Doctor of Engineering. Was a full-time lecturer, a professor, Dean of the Graduate School of Human Life Science and the Faculty of Human Life Science, director and vice president, and took up his present office at OCU in 2016. Specialized in regional disaster management and housing safety engineering. Studying natural disasters such as earthquakes and wind and flood damage as well as daily accidents related to houses for the establishment of a safe, comfortable living environment.

Research.

### Dr. Yoshida/

Many young researchers are studying in an advantageous environment in Japan. We might need to force them to study abroad to establish human relationships. Essays can be written only through the exchange of data, this is not real “internationalization”.

### Dr. Fujii/

I was invited to participate in joint research by the director of the Ma Chung Research Center for Photosynthetic Pigments, Universitas Ma Chung, Indonesia. We are now studying and writing a manuscript together.

Also, I plan to start collaborative research with University in China through a postdoctoral researcher who graduated from my research group. As with Dr. Amao’s joint research, I’m also seeking collaboration with Asian countries.

### Dr. Miyano/

OCARINA’s photosynthesis and artificial photosynthesis project is a little different from others. For Dr. Shigekawa’s project, I think it is not essential to seek internationalization. It is important to promote multi-disciplinary research projects that can adapt to global trends and challenge the global tasks such as SDGs and environmental issues. We are not establishing the regulations of our new organization with an awareness of such a role.

### Dr. Shigekawa/

I will speak from the perspective of a person who will stay in OCARINA. I believe that SDGs, as Dr. Miyano referred to just now, is a very timely keyword. I also thought of another keyword; “large-boned”. We are all implementing a project individually, but we are required to produce a “large-boned” project that is comparable to the artificial photosynthesis project.

## Strong collaboration is key to the production of “large-boned” projects

### Dr. Miyano/

I think the idea of a “big topic” Dr. Kamiya referred to is a hint, but what do you think of the “large-boned” idea, Dr. Kamiya?

### Dr. Kamiya/

I think that the meanings of the two words overlap. I meant that if we start a project in a scale similar to the scale of the

### profile

Professor, Graduate School of Engineering, OCU  
Deputy Director, OCARINA

## Naoteru Shigekawa

Graduated from the Department of Physics, Faculty of Science, University of Tokyo in March 1984, and completed the master’s course at the Department of Physics, Graduate School of Science in March 1986. Studied chemical semiconductor hetero binding devices at NTT Atsugi Research Institute for Electrical Communication (present NTT Device Technology Laboratories) from April 1986 until Sep. 2011. Took up his present post in Oct. 2011. Doctor of Science



photosynthesis and artificial photosynthesis project, we will be able to attain “composite” research.

I think that we should look for organizations to collaborate with. We will be able to increase possibilities if we work with the URA center and obtain a proposal from them.

### Dr. Shigekawa/

You said that MIT is working like that.

### Dr. Kamiya/

Otherwise, OCARINA will end having just provided study spaces, as Dr. Shigekawa said at the beginning. Projects will end separately. We will not be able to obtain “composite”, “advanced” research results. I strongly feel that we should consider the frameworks and organizations when starting research projects in the new institution.

### Dr. Miyano/

Your idea is very encouraging. In fact, I am thinking of asking the URA center to commit to the work. First, the URA center must work organically and establish a research group of professors.

Are there any closing comments?

## Creating projects that meet the needs of the times

### Dr. Amao/

When I looked at our timeline in OCARINA, I noticed that it took five years to establish the Research Center for Artificial Photosynthesis from established in 2007. We look forward to establishing a new project-based research center in OCARINA renewed in 2020 for five years. That will be one meaningful aspect of OCARINA. Following the trends of the times may not always be appropriate for researchers. However, it is also true that the Research Center for Artificial Photosynthesis was established because OCARINA quickly recognized the trend of the time.

In 2025, the Expo will be held. If we can establish a new research center that is comparable to the Research Center for Artificial Photosynthesis, by selecting from large-boned projects present in the trends of the time as Dr. Shigekawa says, OCARINA will be able to play its role again.

### Dr. Miyano/

The fundamental policy of OCARINA is to establish a basis for new big projects. We would like to aim for that.

# OCARINA's History / CHRONICLE of OCARINA

## 2008

### March

**The International Symposium to Commemorate the Opening of the Institute<sup>#1</sup> held**  
(Meeting room, Media Center 1<sup>st</sup> floor, OCU)

### April

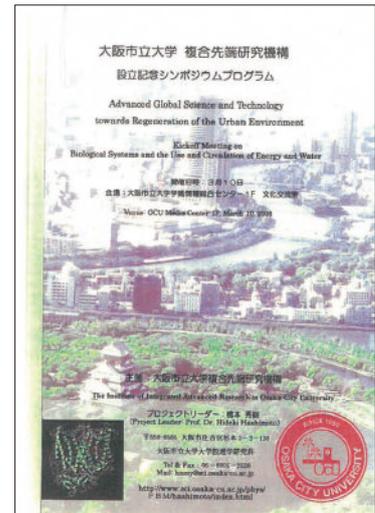
**The OCU strategic key research project (2008-2011) started**

Strategic development for urban regeneration of the environment

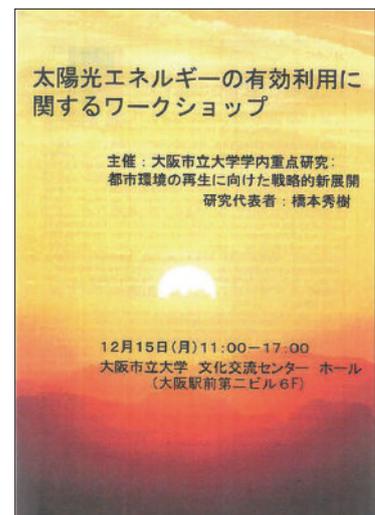
### December

**The International Workshop<sup>#2</sup> held**  
(OCU Cultural Exchange Center Hall)

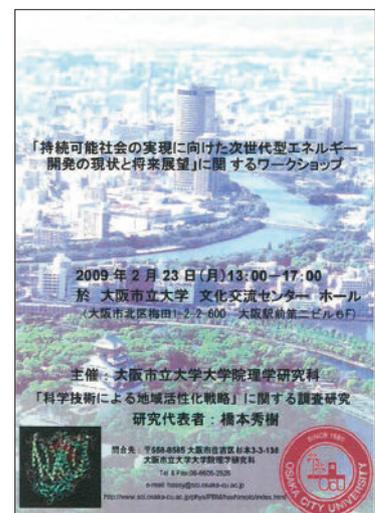
Workshop on the efficient use of sunlight energy



#1: The International Symposium to Commemorate the Opening of the Institute on March 10, 2008



#2: The International Workshop on December 15, 2008



#3: The workshop on February 23, 2009

## 2009

### February

**The Workshop<sup>#3</sup> held**  
(OCU Cultural Exchange Center Hall)

The workshop on the present situation and future vision of the development of next generation energy for the realization of a sustainable society

# 2010

## January

### The International Workshop<sup>#4</sup> held

(Kwansei Gakuin University Nishinomiya Uegahara Campus, Kwansei Gakuin Hall)

## March

### The 1st OCARINA International Symposium<sup>#5</sup>

(Awaji Yumebutai International Conference Center)

150 researchers participated, including 20 from Western and Asian countries

## April

### Enforcement of the official regulations of OCARINA

## October

### The Research Laboratory opened in Hall Number 2 in the Common Education Area

## November

### The Conference<sup>#6</sup>

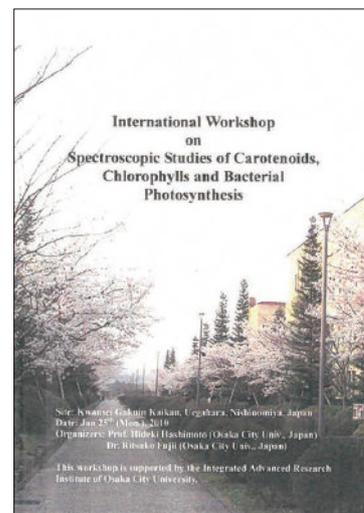
(Large conference room, Media Center, OCU)

The conference to commemorate the opening of Hall Number 2

## December

### The 2nd OCARINA International Symposium<sup>#7</sup>

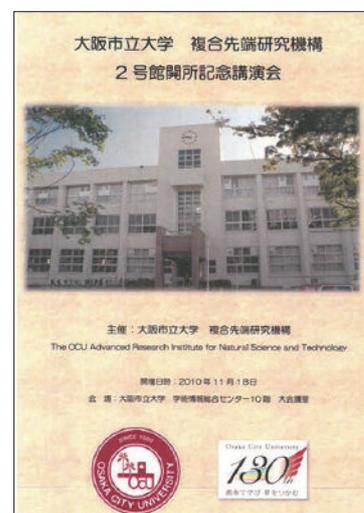
(Large conference room, Media Center, OCU)



#4: The International Workshop on January 25, 2010



#5: The 1st OCARINA International Symposium on March 8 and 9, 2010



#6: The conference on November 18, 2010

# OCARINA's History / CHRONICLE of OCARINA

## 2011

### March

**The 3rd OCARINA International Symposium<sup>#8</sup>**  
(Large conference room, Media Center, OCU)

### April

**Research paper by Nobuo Kamiya et al. was published in the electronic version of the British scientific journal, Nature.**

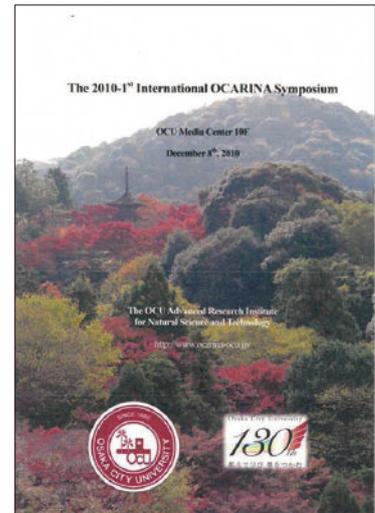
### November

**The Symposium<sup>#9</sup> held.**  
(Meeting room, Media Center 1st floor, OCU)

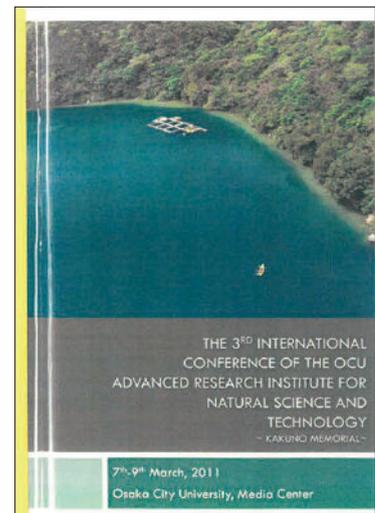
### December

**The research by Nobuo Kamiya et al. was selected as a “Breakthrough of the Year 2011” by the American academic journal, Science.**

Elucidation of the main structure of the photosynthetic protein PSII



#7: The 2nd OCARINA International Symposium on December 8, 2010



#8: The 3rd OCARINA International Symposium on March 7-9, 2011

## 2012

### January

**Professor Nobuo Kamiya was awarded the “Asahi Prize” for “Elucidation of molecular mechanism of water splitting and oxygen evolving in photosynthesis”.**

### March

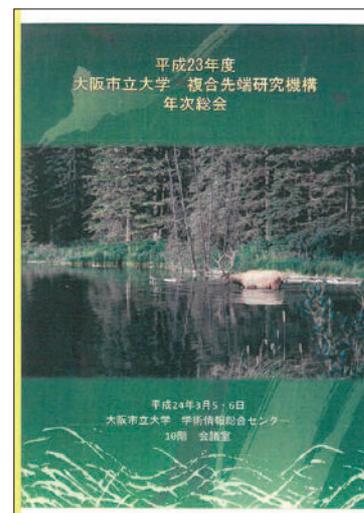
**The Annual General Meeting<sup>#10</sup>**  
(Large conference room, Media Center, OCU)  
The 2011 OCARINA Annual General Meeting



#9: The symposium on November 21, 2011.

**April****The OCU strategic key research project (2012-2013) started**

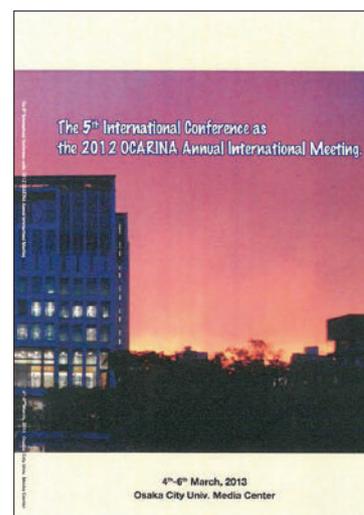
Generation of solar fuels by means of artificial photosynthesis

**June****Start of construction of the Research Center for Artificial Photosynthesis (ReCAP) - a base for collaborative research with companies regarding the practical use of artificial photosynthesis****July****School of Science Building C completed and started to be used partially**

#10: The Annual General Meeting on March 5 and 6, 2012.

**2013****March****The 4th OCARINA International Symposium<sup>#11</sup>**

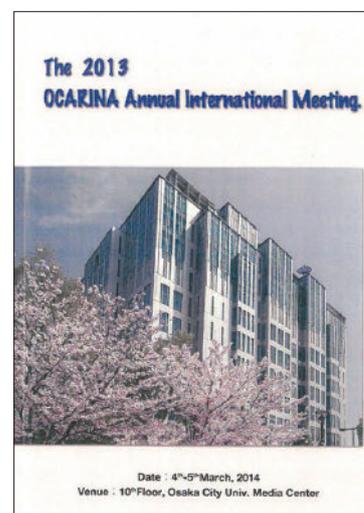
(Large conference room, Media Center, OCU)

**Completion of the Research Center for Artificial Photosynthesis****April****Two new full-time teachers joined****June****The Research Center of Artificial Photosynthesis opened**

#11: The 4th OCARINA International Symposium on March 4-6, 2013

**2014****February****The new building of the School of Science started to be used partially****One new tenure track teacher joined****March****One new tenure track teacher joined****The 5th OCARINA International Symposium<sup>#12</sup>**

(Large conference room, Media Center, OCU)



#12: The 5th OCARINA International Symposium on March 4 and 5, 2014

# OCARINA's History / CHRONICLE of OCARINA

**April**

**One new full-time tenure track teacher joined**

**The OCU strategic key research project (2014-2015) started**

New strategies for the construction of a city with renewable energy creation and circulation

## 2015

**March**

**The 6th OCARINA International Symposium<sup>#13</sup>**

(Large conference room, Media Center, OCU)

**April**

**One new full-time teacher joined**

**Three new projects started**

Projects regarding advanced materials, urban energy disaster management and advanced biology

## 2016

**March**

**The 7th OCARINA International Symposium<sup>#14</sup>**

(Large conference room, Media Center, OCU)

**April**

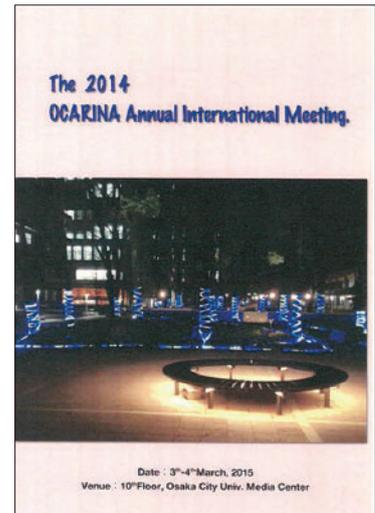
**The OCU strategic key research project (2016-2018) started**

Strategies for the creation of a low-carbon-energy circulating city, using ReCAP

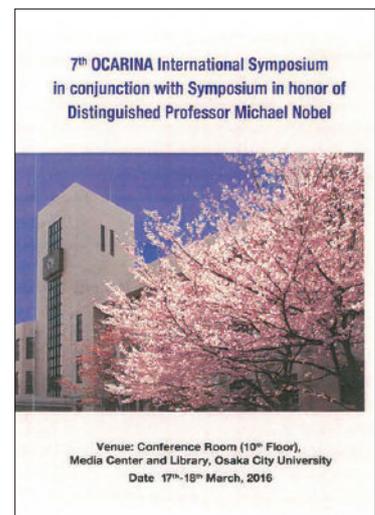
**ReCAP was approved as an institute for collaborative use and collaborative research by the Ministry of Education, Culture, Sports, Science and Technology**

**A new project started**

"Biomedical Engineering Science" project



#13: The 6th OCARINA International Symposium on March 4 and 5, 2015



#14: The 7th OCARINA International Symposium March 17 and 18, 2016.



#15: The 8th OCARINA International Symposium March 7 and 8, 2017

## 2017

**March**

**The 8th OCARINA International Symposium<sup>#15</sup>**  
(Large conference room, Media Center, OCU)

**April**

**A new project started**  
"Bio Resource" project

**August**

**A new project started**  
"Nano material optical control" project

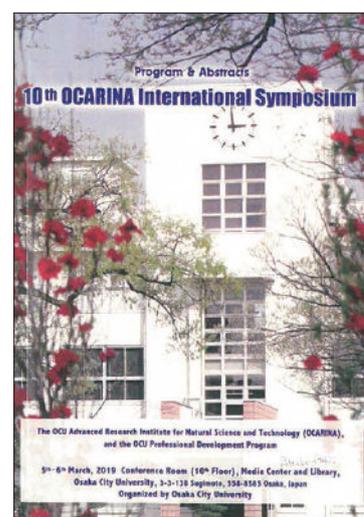


#16: The 9th OCARINA International Symposium on March 6 and 7, 2018

## 2018

**March**

**The 9th OCARINA International Symposium<sup>#16</sup>**  
(Large conference room, Media Center, OCU)



#17: The 10th OCARINA International Symposium on March 5 and 6, 2019

## 2019

**March**

**The 10th OCARINA International Symposium<sup>#17</sup>**  
(Large conference room, Media Center, OCU)



#18: The symposium scheduled on March 9 and 10, 2020 was postponed as a countermeasure against the novel coronavirus (COVID-19)

## 2020

**March**

**The 11th OCARINA International Symposium<sup>#18</sup>**  
**(Scheduled)**  
(Large conference room, Media Center, OCU)

## What is OCARINA?

The mission of OCARINA (OCU Advanced Research Institute for Natural Science and Technology) is to find solutions for global-level energy and environmental issues and complex and advanced research subjects, and contribute to the establishment of a sustainable society. As an urban-type university that promotes multidisciplinary research, we set up research projects across the graduate schools.

Since its foundation in 2010, OCARINA has been carrying out large-scale projects with competitive research funds, while promoting globalization, integration of different fields, training of young researchers, and recruitment of female researchers.

Currently, we have seven big projects at the four OCU research departments of Graduate School of Science, Graduate School of Engineering, Graduate School of Life Science and Graduate School of Medicine. The most distinguishing feature of OCARINA is the integration of different fields, which is conducted by a small number of selected researchers. With the major city of Osaka as our base, we will continue to promote original research, including collaborative research related to medicine.



We have carried out the activities of OCARINA for 10 years.

We will restart OCARINA as an organization without full-time staff from April 2020.

We hope for your continued support.