

Program for Leading Graduate Schools

Fostering Long-Term Creativity and Innovation  
with Science and Technology  
Disciplines Based on Ochanomizu Spirit  
"Migakazuba" in the Next Generation of  
Global Leaders

Program for Leading  
Graduate Schools



# Bouquet

Newsletter

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## Preparing to take flight into careers

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お茶の水女子大学  
Ochanomizu University

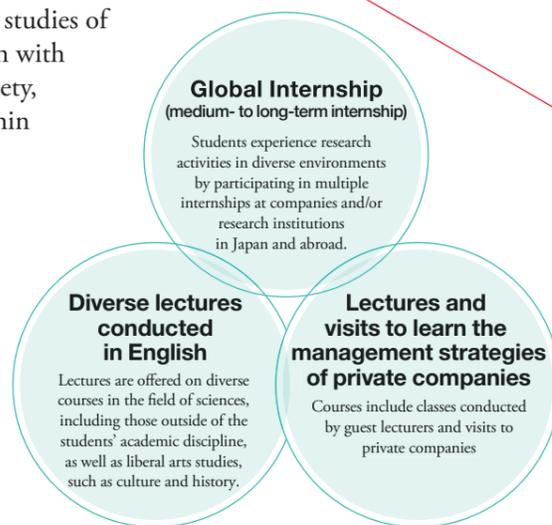
# Preparing to take flight

Our Program for Leading Graduate schools is based on foundational studies of physics, mathematics and information science, and produces women with doctorates, able to respond swiftly to the changing needs of our society, continuously creating innovations, and achieving global success within government, industry or academia.

This program offers diverse opportunities including the three shown on the right, and strengthens the students' foundational education as well as their capabilities as global leaders.

In this newsletter, we introduce the activities of the *PBTS (Project Based Team Study)*, the most highlighted feature of our program. PBTS is a team-based research activity modeled after project research actually practiced at companies. Students majoring in different fields—such as physics, mathematics, information science, chemistry, biology, life sciences, food and nutritional sciences, and life and environmental sciences—decide on a theme to work on by themselves, and conduct joint research in the English language.

As of October 1, 2017, ten teams are performing PBTS.



## PBTS PBTS Project Based Team Study Teams Introduction

Introduction of research activities conducted by students to answer social needs

|  | Research details  | Latest topics   |
|--|---|---|
| <b>1st class of students</b><br>Now in their fourth year, these students are strengthening their efforts to summarize their research results and present their findings. | <b>Anti-Aging</b><br><br>In order to lengthen the healthy life span and spread the traditional tea drinking habit in our society, the team's goal is to develop a new tea product with high anti-aging property.   | In PBTS I, cooperating with Matoba tea factory and Tohouen tea company, we demonstrated that tea leaves with a long time steaming and under freeze-dry method, and crushed in smaller pieces, could extract more catechins and Vitamin C. In PBTS II, we hypothesized that blending different sizes of crushed leaves can maximize the release of anti-oxidant molecules and make it possible to brew the same tea leaves 2 or 3 times without altering the taste. We are conducting chemistry experiments and sensory tests on our blending tea samples. |
|  | <b>Education</b><br><br>We designed a course on programming for high school students, aiming at improving their understanding of mathematical induction, which is a difficult topic in high school math. In our course, the students make a simple game using a technique similar to mathematical induction. | This summer, we gave two lectures at Saitama Prefectural Kawagoe Girls' Senior High School. To evaluate the outcome of our class, we will be conducting a test on mathematical induction in two groups: the class of students who participated in our lectures, and a non-participants class.   |
|  | <b>Synchronization</b><br><br>In order to unveil the mechanism of interaction between cultured skin cells and collagen, we investigate the collective patterns that cultured skin fibroblasts form on collagen-coated dishes.  | By focusing on the fact that the shape of cultured skin cells depends on collagen concentration, we are improving our mathematical model and testing with simulations.  |
|  | <b>Water Treatment</b><br><br>Our study is aimed at improving an existing wastewater treatment system using enzymes for wastewater from food factories to remove oil that is a big environmental burden.   | We carried out oil-degradation experiments with some collaborators such as food factories, and presented the results at an international conference in England.   |

# into careers

|   | Research details   | Latest topics   |
|---|--|---|
| <b>2nd class of students</b><br>Doctoral program students in PBTS II are working on new themes.   | <b>Green Filtering</b><br><br>Development of a biomimic-green filter for air pollutants.  | We visited Tokyo University of Agriculture and Technology researchers to discuss biomimetics. We are planning a collaboration with a laboratory of hydro simulation.  |
|   | <b>Health Care</b><br><br>Our project goal is to develop a recipe recommendation application in order to solve diet-related health problems and promote people's awareness of environmental issues.   | We are developing a recipe recommendation application using Ajinomoto's recipes data. One of our members is working for a project "Panasonic - AIST" team, engaging in the development of dialogue system through image for recipe recommendation.  |
| <b>3rd class of students</b><br>These students are proceeding with their activities by strengthening their relationships with the business world. | <b>Science Education</b><br><br>In order to respond to the social problem of gender diversity among specialists in pure sciences we seek to promote female role models for students at women high schools. The aim is to increase interest in science education. | We interviewed a female leader of science working for a company in business with 3M, NTT Docomo and Kose. We learnt about science talent in society and collected data on role models.  |
|   | <b>Fly Trap</b><br><br>In order to control fly laying eggs in fruit and contribute to the cultivation of organic fruit in Japan, we explore new fly-repellent substances.   | <b>Other PBTS features</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Research meetings are conducted in English once a week under the guidance of a non-Japanese instructor complemented by cooperation with outside specialists (from universities, private companies, research institutions) depending on the research topic.</li> <li><input type="checkbox"/> Furthermore, students deepen their understanding of their research and enhance their presentation skills by giving presentations and answering questions in English, twice a year, in front of an audience and instructors from both inside and outside of the university.</li> </ul> |
| <b>4th class of students</b><br>Ten students started their team-based research in October 2017.   | <b>Traffic Jam</b><br><br>In the future, autonomous cars will be put to practical use. Traffic will be mixed with normal and autonomous cars. We aim at finding a new method of easing jam in the mixed traffic by computer simulations.                        |   |
|   | <b>Water Recycling</b><br><br>We aim to make effective use of greywater resources for irrigation by reusing household wastewater from washing machine. In the initial step, we propose to develop a feasible system for removing surfactant in water.           |   |

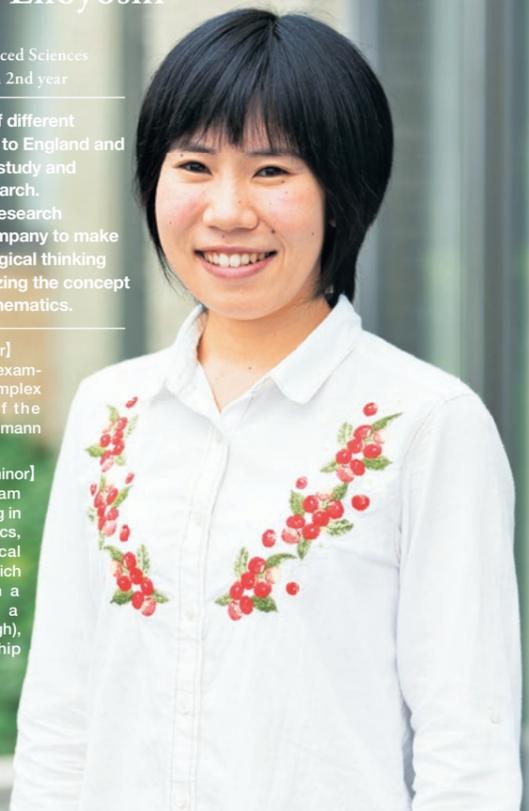
## Kanako Enoyoshi

Mathematics  
Division of Advanced Sciences  
Doctoral Program 2nd year

Being curious of different subjects, I went to England and South Korea to study and enjoy team research. I hope to get a research position in a company to make full use of the logical thinking ability of organizing the concept of abstract mathematics.

[Research in major]  
I try to construct examples of totally complex submanifolds of the associative Grassmann manifold.

[Activities in the minor]  
Along with my team members majoring in biology and physics, I study the physical mechanism by which skin cells form a pattern (like a picture of Van Gogh), and the relationship with collagen.



## Nanami Kawaguchi

Chemistry and Biochemistry  
Division of Advanced Sciences  
Doctoral Program 2nd year

I am aiming to work in R&D field as biochemist to sustain people's healthy life.

[Research in major]  
I have researched on a lipid digestive enzyme, pancreatic lipase. I work to establish the expression system of pancreatic lipase using E.coli and to clarify the biological significance of its carbohydrate binding activity.

[Activities in the minor]  
I pursue a team project regarding purification of oil-contaminated wastewater discharged from food factories with other students majoring different academic fields. To carry out this experimental research, I have also collaborated with some specialists in companies and universities.



## Dongyang Li

Chemistry and Biochemistry  
Division of Advanced Sciences  
Doctoral Program 2nd year

I am investigating functional food and nutrition component, such as soybean protein, for the prevention of lifestyle disease, such as fatty liver and obesity.

[Research in major]  
My research topic is to reveal the circadian disruption during the development of obesity, thus to find functional food components for the modulation of circadian disruption to prevent obesity.

[Activities in the minor]  
In order to elongate healthy lifespan and spread tea drinking culture, I'm cooperating with other two students from different fields to develop a novel Japanese tea product with higher anti-aging properties. I would like to work in private enterprises, such as drug companies, cosmetic companies, food companies for products development or research.



## Yuko Caballero

Life Sciences  
Nutrition and food Science  
Doctoral Program 1st year

I would like to use my studies of nutrition in projects for international cooperation.

[Research in major]  
After finishing my study in the university, I would like to work on international cooperation projects.

[Activities in the minor]  
Searching algorithm for estimating energy expenditure from heart rate. PBTS theme: We are developing a new type of green tea. I did an internship in the United States for three months this year and I conducted the green tea tasting test in Los Angeles. I am doing a comparative study using the collected data on green tea tasting test from Japanese and non-Japanese.



**Doctors will soon be entering careers to lead the new era**  
**Aiming to be the type of person who has broad perspectives not limited to single area of expertise**

1st and 2nd class of students (students not included)

- Ritsuko Tamura (Biological Sciences, Division of Life Sciences)
- Akiko Mito (Chemistry and Biochemistry, Division of Advanced Sciences)
- Kei Hashimoto (Biological Sciences, Division of Life Sciences)
- Kimiko Yamashita (Physics, Division of Advanced Sciences)
- Misato Takahashi (Physics, Division of Advanced Sciences)
- Duong Thi Thu Ha (Biological Sciences, Division of Life Sciences)

## Yuyu So

Computer Science  
Division of Advanced Sciences  
Doctoral Program 2nd year

I have overseas experiences such as visiting universities and giving talks at international conferences. I am looking forward to working with people having different backgrounds, using my expertise in functional programming and programming education.

[Research in major]  
My research interests center on the theory of programming languages. In particular, I am trying to combine "control operators", which allow us to handle control flow of programs, and "dependent types", which allow us to write programs with strong guarantees.

[Activities in the minor]  
I designed a programming class for high school students with my colleague. This summer, we gave a trial lecture at Saitama Prefectural Kawagoe Girls' Senior High School, and we are now analyzing the outcome of our lecture using the results of the post-test.



## Kaori Takagi

Human-Environmental Sciences  
Doctoral Program 2nd year

I am majoring in environmental engineering. I am doing a survey of rainwater use possibility in households to achieve sustainable water supply.

[Research in major]  
I am focusing on the sustainability of water environment from the perspective on wastewater treatment. I am studying how to improve the existing treatment method of wastewater from food factories with a student majoring in biochemistry.

[Activities in the minor]  
I would like to contribute to the improvement of global life environment.



## Megumi Kitagawa

Mathematics  
Division of Advanced Sciences  
Doctoral Program 1st year

I aim to broaden my horizons for my career development using logical reasoning skill I improved through the study in mathematics and experiences of conducting our team study.

[Research in major]  
My study is operator algebras, compact quantum groups and their representation theory. The theory of operator algebras has an application to mathematical physics especially quantum mechanical mechanics and quantum field theory.

[Activities in the minor]  
I am undertaking Project Based Team Study in collaboration with students majoring in Physics, Biochemistry and Bioinformatics. As an effort to prevent people from being adversely affected by air pollution, our project is to create an environmentally-friendly filter to remove air pollutants. Besides, I am planning my fourth overseas internship this winter.



## Moeka Nakayama

Chemistry and Biochemistry  
Division of Advanced Sciences  
Doctoral Program 1st year

Through global internship and overseas conference, I gained the ability to jump into the "away" environment. After graduation, I would like to work at a company in cooperation with people from various countries and fields by taking advantage of the expertise and leadership cultivated in this doctoral course.

[Research in major]  
We are examining a mechanism of a protein, which has anticoagulant activity. The aim is to contribute to the development of antithrombotic drugs that do not affect hemostasis.

[Activities in the minor]  
I'm working on the treatment of air pollutions as a global issue from biochemical approaches. I did an internship at a chemical company in Germany and evaluated the safety of chemicals to the environment and health.



## Report on students' activities

### Six students gave poster presentations at the 2017 Work in Progress

Ochanomizu University regularly hosts the Work in Progress event, which provides a place for doctoral students to interact with private-sector companies and organizations. The event for the 2017 academic year was held on September 27. Six students of the Program for Leading Graduate Schools, who have an interest in working at a private company, participated.

The event was planned and held in three parts. The first part consisted of a *Corporate Seminar*, with representatives from companies, speaking about what they expect from doctoral human resources and about the doctoral-degree personnel that they have hired in the past. The second part of the event was a *Poster Presentation* given by the students, and the final part comprised of Individual Exchanges in which students visited the booths of the different companies.

It was a lively event, with a continuous stream of corporate participants coming to visit the students' poster presentations and actively engaging in conversations with the students. In the previous academic year, this type of event helped connect students and companies, even led to internships and employment. Thus, this event has become important for the students of our program to encounter the business world.



#### ▶ Participating companies (alphabetical order)

Accenture Japan Ltd., Aspark Co., Ltd., Data4C's K.K., IBM Japan, Ltd., National Institute of Advanced Industrial Science and Technology, NEC Central Research Laboratories, Novartis Pharma K.K., PwC Consulting LLC, Ricoh Company, Ltd., Shiseido Company, Limited, Weathernews Inc., The Yokohama Rubber Co., Ltd.



## Message of encouragement from business people and research institutions involved in the Program for Leading Graduate Schools

### Have the mindset of continuing to enhance your own values and put it into practice

▶ **Mina Aoyama**, General Manager / Raw Materials, In-Process Materials and Outsourcing Products Assurance Department / Manager / Diversity Promotion Unit / Bridgestone Corporation

To work is to serve society, a business, and an organization. And roughly summarized, output is equal to productivity multiplied by work hours. At a time when we are striving to reform our ways of working and reduce the hours spent at work, it is becoming increasingly important to increase productivity to enhance the value of the individual as a working person.

When I look back at my younger days, I was busy gaining knowledge during my student years. And then after starting work, I was putting all my efforts toward using the knowledge that I had gained. I was also constrained to try to achieve a balance between work and raising my children. So when I think back, I believe I may have lacked the mindset of trying to continuously enhance my own value.

The values that are desired by you from society change depending on what stage you are in with your work, your position, the environment around you, and other factors. When you are young, you are required to learn how to assemble a plan for

conducting experiments and acquire deeply specialized knowledge, among other things. Eventually, it becomes important to acquire the ability to see things from a comprehensive perspective, make swift judgment from little information, lead a team, and gain the support of those who oppose you as well as those with different cultural backgrounds.

I hope that you, students in the Leading Program, will try to not only further your specialized knowledge during your student years, but also lay the foundations for being highly productive persons. Furthermore, in order for you to continue producing effective output, not only right now but also into the future, I hope you will have the mindset of continuing to improve your productivity while looking ahead at the values that will be required of you. If you have that mindset, and if you put it into practice, you will find that you can do well regardless of where you work and where you go, and this will become the key to your future success.



### Be smart at times, and be lost at times

▶ **Keisuke Tajima**, Team Leader, RIKEN Center for Emergent Matter Science

When I was a member of the faculty at a university, I thought that today's students are all very smart. My impression was that many of them already had some idea of their career and future plan, and that they were taking

action to achieve those life plans. When I look back at myself when I was a student, I had no idea about my career path, even at key points when I was selecting my academic discipline or furthering my studies in a doctoral program. I had merely been choosing the best environment for doing what I thought was interesting at that time. I think now that I was putting myself into a narrow world, without looking at what lies beyond that. Later, when I was in

the position of instructing students, there were times when I felt that the students were being too smart with their decision making, and thought that it was a bit of a shame because there were times when it seemed as if the students might have found something worthwhile if only they would have immersed themselves in that particular study without thinking about anything else beyond that.

The Leading Program at Ochanomizu University provides a wonderful and diverse curriculum designed to produce global human resources with good foundational skills, which I think is very helpful in designing a smart career plan and achieving that path. I think that sometimes it is necessary to immerse yourself in what interests you, without being limited to your field of research, and head straight into its unknown outcome, even if you might feel lost. I hope that the students will achieve a good balance between these aspects as they lead our future society.



Note: Professor Tajima has been involved in the Leading Program from April 2017.

### Hoping to see female researchers create a new area of study that will lead the era

▶ **Michiko Yoshitake**, Chief Researcher, Semiconductor Device Materials Group, International Center for Materials Nanoarchitectonics, National Institute for Materials Science

We are currently in a period where we are experiencing a major shift. We are in the midst of a fourth industrial revolution, following the industrial and information revolution, as we see developments in IoT, VR (virtual reality), and AR (augmented reality) that connect computers and network technologies to the real world, as well as deep learning (multi-layer neural networks) that have innovated calculations. At a time when artificial intelligence is expected to reduce the currently available jobs by half, we will likely see the start of an era when we begin to question what it means to be a human being.

In these times, which are unlike any we have seen before, we need human resources who have broad perspectives that extend beyond the confines of humanities and sciences. Such persons should think about what kinds of studies are needed, and create those studies with an understanding of the unique aspects of what it means to be a human being. During the high-growth

period when the currently dilapidating Tokyo metropolitan highway was built, roads and buildings were built only from the perspective of architecture and civil engineering. However, today, the standard thinking is to build infrastructure while taking into account the design of the entire town, including the use of social sciences aspects, such as taking into consideration the movement of the people in the surrounding areas. As you study in your major academic discipline, all of you students are provided with an opportunity to develop foundational skills, such as the methods for discovering problems and finding approaches toward resolving them, as well as the ability to see things from diverse perspectives that are different from your expertise through participation in PBTS. I hope you will look ahead at the problems that will arise by the changing of the times, and create a new area of study that does not exist today, but that will be needed to help us prepare for our future.



#### New Student

Introducing a new student who entered in October 2017

### Kayo Kinjyo

Physics  
Division of Advanced Sciences

- ▶ Hometown: Tokyo, Japan
- ▶ Hobbies: Taking a walk

#### Major research topic

I am studying the relaxation of isolated systems. This subject is classified as statistical mechanics.

#### What I would like to do in this program, and my future goals

I want to improve my English communication skills and expand my horizons through PBTS. Also, I want to learn how to make a good presentation in English.

# Updates

## Students from overseas partner institutions participated in PBTS

**JULY 21 AND AUGUST 25, 2017**

Venue: PBTS Room, Ochanomizu University

The 3rd class of students gave presentations to students from our overseas partner institutions participating in the July Summer Program. And in August, the 4th class of students formed, for only one day, a mixed PBTS team together with graduate students from Asian science universities, and had lively discussions. This gave students a chance to experience the difficulty of explaining in English what they are studying, as well as the difficulty of making people unfamiliar with their studies

understand their research.

Overseas students showed interest in the fact that PBTS involves students from different fields to conduct research in line with social issues, experiencing trial and error. After the group work, students were seen enjoying conversing with one another.

This type of exchange with overseas students is an effective opportunity for this program in developing human resources that will be successful on a global level. We are planning to continue offering such programs with voluntary activities by students.



## The head of the Leading Graduate School Promotion Center gave a lecture at a symposium in Tokyo to promote active participation of women in sciences

**SEPTEMBER 21, 2017**

Venue: Conference room at the Ministry of Economy, Trade and Industry

Sponsor: Ministry of Economy, Trade and Industry and JRIA (Japan Research Industries and Industrial Technology Association)

A symposium was held as part of the Ministry of Economy, Trade and Industry's activities to increase participation of women in science. Professor Hiroaki Yoshida, the head of the Leading Graduate School Promotion Center, gave a lecture as a university representative. He discussed the current situation and issues that universities face in their efforts towards boosting the active participation of women in sciences; initiatives by Ochanomizu University.

women in sciences by developing female global leaders who have the skills to be immediately successful in working at private companies.

This symposium had many participants from private companies, with a string of lively questions being asked after the lecture, even during the break period, demonstrating the high interest that the business world has in promoting the active participation of women in science. It was a great opportunity to inform people in the government, industry and academia that the students of our program are educated with diverse perspectives that will enable them to become global leaders.



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**Ochanomizu University**

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