Contents

From the Dean

The Establishment of the School's Educational System

Prof. Hisakazu MIHARA

Last academic year, our campus was abuzz with enthusiasm over news of the award of the Nobel Prize in Physiology or Medicine to Honorary Professor Yoshinori Ohsumi. In the aftermath of this excitement, the research group led by Professor Ohsumi has been reorganized as the Cell Biology Center, while Professor Ohsumi, as the Center's Director, remains committed to promoting the spread of fundamental scientific research and, through this, the training of scientific personnel.

The new educational system of the School of Life Science and Technology, which was inaugurated in April 2016, has now celebrated its second year. The School is a large-scale educational organization, consisting of a total of 120 professors, associate professors, lecturers, and assistant professors, and including both faculty members based at the School and other staff seconded from other research laboratories. We are making smooth and steady progress toward our university's major target of becoming one of the world's leading universities in science and engineering and ranking among the world's Top 10 research universities. I feel deep admiration and gratitude for the devoted efforts that have been made by our teaching staff over these last two years.

March 2018 saw the graduation of the School's first cohort of master's students, as our doctoral candidates and undergraduate students advance into their second year of studies. This new system also allows the 140 students enrolled in the former degree programs offered by the Department of Bioscience and Department of Biotechnology in the School of Bioscience and Biotechnology to conduct graduate research in any one of the School's nearly 75 constituent research laboratories. The graduate master's program involves an integrated entrance examination for admission to the School of Life Science and Technology as a whole. With a capacity of approximately 180 master's students, the system can accommodate graduates of many other universities in 75 research laboratories where a wide variety of research topics are being developed in the fields of life science and technology. As we are actively engaged in the recruitment of doctoral students, including from among working adults and overseas students, I would also like to invite our undergraduate alumni to consider pursuing a PhD in their field of interest.

From a research perspective, with support from Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT), we

have started making many of our life science research instruments available for joint use. This system allows anyone to make use of a wide variety of shared research instruments and facilities, which include the Shimadzu Corporation Precision Analytical Instruments Room, the Cell and Protein Analysis Facility, the Ultracentrifuge Facility, the Bioimaging Facility, the Aquatic Animal Laboratory, and the Microbial Culture Room. For newly appointed faculty as well as veteran members of staff, this system makes it easier to embark on research projects without having to make hurried arrangements for research equipment. Notably, the Shimadzu Corporation Precision Analytical Instruments Room is a shared use analysis facility equipped with state-of-the-art instruments donated to honor the founding of the School of Life Science and Technology as well as many other instruments manufactured by Shimadzu in the school's possession. The room is also used to host events such as equipment briefing sessions and workshops and is attracting attention as a unique attempt within the Japanese context.

The university's mechanisms for collaborations between industry and academia have also changed significantly. In response to this, the School has established a Life Science and Technology Open Innovation Hub (LiHub) within which eleven faculty research groups have been organized relating to fields including health, medicine, drug discovery, and microbiological engineering. LiHub is engaged in activities that aim to promote a more socially open model of research in disciplines relating to life science and technology, in order to become a crucible for joint collaborations and creations that establish links between society and the industrial sector.

Last but by no means least, the Life Science and Technology Alumni Association has been revitalized for the first time in almost a decade, and the 2nd Life Science and Technology Alumni Meeting in July 2017 was celebrated in grand style with the participation of approximately 200 alumni and retired and active faculty members. An Alumni Association website has also been created, and I urge you to visit the site and register with the Alumni Association. I should also note that the research laboratories in the School of Life Science and Technology are always open to everyone. In closing, I would like to thank you all, including the Alumni Association, for your continued cooperation and support.

From Staff

Greetings

Observing Biological Phenomena by Computer

Akio KITAO
Professor

I was appointed as professor July 2017. My

laboratory investigates molecular mechanisms of biomolecules and their assemblies using computational methods. More specifically, we mainly use computational chemistry/biophysics approaches such as molecular dynamics simulation and structural bioinformatics to observe biological phenomena and to elucidate its functional mechanism at atomic level. We are interested in individual functional principles of the biomolecular systems as well as common principles across different biomolecules.

Molecular dynamics simulation was used to be performed only to analyze and understand biological phenomena. Also, its calculation accuracy was used to be insufficient. Recently, these issues have been significantly improved by more refined models and calculation methods, and increasing computing power. The goal of our research is to expand the range of molecular dynamics applications even to predict molecular phenomena and to design biomolecules. To this end, we develop simulation methods with higher reliability, quantitativeness and predictability by closely collaborating with the experimental groups, and apply them to the prediction of functional principle and molecular design.

My undergraduate major at Faculty of Science, Kyoto University was mainly physics, then I majored chemistry at Department of Chemistry, Graduate School of Science and became Assistant Professor there. After spending a year at Center for Promotion of Computational Science and Engineering, Japan Atomic Energy Research Institute, I moved to Institute of Molecular and Cellular Biosciences, The University of Tokyo as Associate Professor before coming to Tokyo Tech. Research laboratories in our School cover a very wide range of approaches to study life science. I am really enjoying this environment with diversity because I also make full use of many approaches, physics, chemistry and computational science to investigate biological phenomena.

Greetings

Gut research for our health

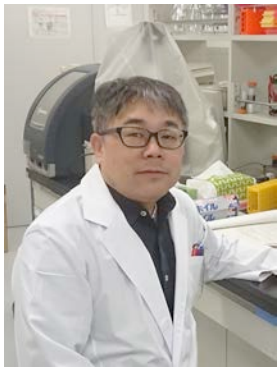
Naoyuki YAMAMOTO
Professor

I have worked for a food company in the R&D center for many years, then started my career at School of Life Science and Technology from October 2017. In the research center of the company, I was involved in research and development of functional food raw materials, such as probiotics and bioactive peptides. As for the probiotics research, I selected a *Lactobacillus* strain with an anti-allergy effect for the improvement of pollen allergy. The selected strain showed significant effects on various clinical studies and was firstly launched in Japanese market.

By the mechanistic study, I found that the *Lactobacillus* strain could access to gut immune system by interaction of specific cell surface protein with host cell protein. This study also shows that the anti-allergy effects of lactobacilli are different depend on the used species. Now, I am trying to find novel molecules displayed on gut which can be sensed by various food materials and intestinal microbes. These molecules are considered to be very important to develop novel functional materials in the future. In addition, I developed the anti-hypertensive peptides which were effective for control of blood pressure and artery stiffness. These peptides are already used in various supplements and functional foods in Japan and overseas. So, I would like to contribute to apply our basic science technology to final products available for our health.

After the term of office

Nobutaka NAKAJIMA
Associate Professor



In April 2014, I moved to Tokyo Institute of Technology from National Institute of Advanced Industrial Science and Technology (Hokkaido Center: Sapporo). The term of office was 3 years and 8 months. Since December 2017, I have returned to the original research institute, as planned. Currently, my work is focused on producing industrially useful compounds based on microbial genomic and metabolic information.

During my tenure at Tokyo Tech, I got a lot of wealth that would not have been obtained at AIST: new skills on research, new colleagues and seniors, and fun and difficulty in teaching to students. I greatly appreciate your support and cooperation. In the meantime, when I asked myself if I was able to contribute something to Tokyo Tech, I believe that the activities of iGEM was especially valuable. I think that I have been able to fully convey my acquired skills to the students.

The temperature in Sapporo when I am writing this article (February 2018) is minus 6 degrees Celsius, and the amount of snow cover is 60 centimeters. I tend to gain weight recently, but the blame is on the cold climate, slippery roads, and delicious Jingisukan, Sushi, and Miso ramen in Hokkaido. During my tenure at Tokyo Tech, it was the first time for me to live in Tokyo, and I felt that this city was attractive, because I could have and do anything. Especially, I was delighted to be able to go to see concerts as I desired.

Finally, I wish for everyone's happiness and further development of university. I kindly ask for your continued cooperation.

Greetings

Revealing “The World of Nucleus” with

chromatin live-imaging

Yuko SATO
Assistant Professor

I was appointed as an Assistant Professor of Hiroshi Kimura's laboratory, at the Cell Biology Center, Institute of Innovative Research. I also take part in educating students in School of Life Science and Technology. Before taking this position, I have been working in Kimura lab as a postdoctoral research fellow, establishing live-imaging systems for chromatin dynamics. I am going to continue developing the system and reveal the significance of epigenetics in gene regulation.

As a model of gene regulation, you often see cartoons, in which protein factors bind to DNA or nucleosome in a free space. I also have drawn like that. In living cell nucleus, however, proteins are present at a high concentration (>100 mg/ml), so it probably seems like DNA spaghetti packed in a very thick sauce rather than in a thin soup with a few ingredients. It is then important to address the questions how genes appeal to transcription machinery in densely packed nuclei.

I am now particularly interested in the mechanism of zygotic genome activation (ZGA) during early embryogenesis. Although ZGA has been studied for decades and many factors involved in the regulation have been identified, it is still not fully understood how chromatin is reorganized for gene activation. I hope we can reveal a new aspects of gene regulation using our original live-imaging techniques.

Greetings

Toshiaki FUKUSHIMA
Assistant Professor

In January last year, I took up my new post as an assistant professor in Komada Lab, Cell Biology Center, Institute of Innovative Research. Insulin and insulin-like growth factors (IGFs) are anabolic hormones that regulate glucose metabolism and body growth, as well as longevity in various species. I have a strong interest in "secrets of long life", and studied signal transduction of insulin/IGFs when I was a student in the University of Tokyo and an assistant professor in Hiroshima University. Although I did not yet find out the secrets, I showed that ubiquitination levels of the signal transducers are changed in response to various extra/intracellular stimuli, resulting in fine-tuning of glucose metabolism and cell proliferation through novel mechanisms. I also suggested that defects of the mechanisms may contribute to the onset of diabetes and cancers. In 2015, I joined Komada Lab, and have been

studying 1) regulatory mechanisms of ubiquitinating/deubiquitinating enzyme activities, 2) roles of ubiquitin in the formation of novel protein complexes for signal transduction and intracellular compartments such as stress granules, 3) pathogenic mechanisms of Cushing's syndrome by the genetic mutation of deubiquitinating enzyme USP8, and 4) the mechanism of action of a novel tumor suppressor protein Nrk. By studying sophisticated ubiquitin systems, I would like to understand the life phenomenon deeply, and develop therapeutic approaches for related diseases by evidence-based manipulation of ubiquitin systems. And, I would like to contribute to the elucidation of "secrets of long life". I appreciate your continued support and look forward to working with you.

Greetings

Takahiro MURAOKA
Assistant Professor

I transferred to Tokyo University of Agriculture and Technology in February, 2017. During I was working at Tokyo Institute of Technology for less than two years, discussions with many researchers with various backgrounds were valuable experiences for me. Such experiences were definitely thanks to the advantages of School of Life Science and Technology, to which many researchers in wide fields from chemistry to biology are belonging. I am deeply grateful for such chances.

The first year as a PI has gone by so fast due to the launch of the lab at the new place. Now our group including new undergraduate students can fully carry out experiments at the lab. Aiming at the development of my original researches about the life science based on synthetic chemistry, I devote myself to the research activities and look forward to the opportunities that I can present my new research achievements in front of you in the near future.

Greetings

Stop and smell the world

Ayumi NAGASHIMA
Assistant Professor

I was appointed as an assistant professor of Hirota lab at Center for Biological Resources and Informatics in September 2017.

I was a researcher of ERATO Touhara Chemosensory Signal Project at the University of Tokyo, where I received my doctoral degree.

In this project, we have been investigating olfaction of animals including mice, insects and humans, from molecular mechanisms to

behavior.

I previously worked on and shed light on the role of nasal mucosal enzymes in odor sensation of mice.

Thereafter, I expanded my research interest beyond animals to volatile perception in plants as my new challenge.

Recently, olfactory/odor have attracted considerable attentions because of its importance in our quality of life (food, medical treatment and so on).

Therefore, the research of molecular biology, neuroscience, organic chemistry and microbiology are indispensable and quite valuable for our interest.

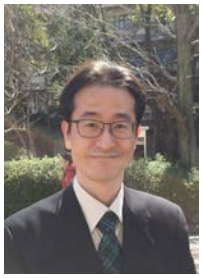
I would appreciate it if you would give me some advice.

I will try my best to work on research, education and service (promotion of analytical instruments room, outreach activity) while raising child.

Your continued support would be greatly appreciated.

Greetings

Hideo TSUBOUCHI
Assistant Professor



I was appointed as an assistant professor within the Iwasaki lab as of August, 2017. Just briefly looking back my academic career, I was appointed as an assistant professor while I was a Ph.D student at Osaka University. Then I moved to US to do a post-doc training followed by taking a job as a principal investigator in UK, running my own lab there for 8 years. So it has been a while since I got involved in research and education in Japan. As I started working here, I was struck by quantity and diversity of students in the lab (so many of them!), then I gradually started remembering that is exactly how it used to be back then in Osaka as well, although, I have to say, I am still in the process of adjusting myself to this new environment. My favorite model organism is budding yeast, one of the simplest eukaryotes. I have worked with this organism to uncover the mechanism of a phenomenon called “homologous recombination” and how cells maintain their genome integrity. It used to be that the research using budding yeast was (pretty much) about finding new genes involved in your favorite phenomenon, although, as the field matures, the focus naturally shifted towards understanding more detailed mechanisms at molecular and atomic levels even. It is interesting to find that the genes I previously identified are being subjected to such researches. As a matter of fact, I myself am working on enzymatic actives of some proteins encoded by the genes I identified a long time ago, which is very exciting since I am kind of in the position of testing how correct I was regarding predictions of functionality of the proteins based on

genetics and cytological data I had back then. I cannot help thinking that I am kind of fortunate to be able to do that myself. Now I will talk a bit about my research subject, "homologous recombination". Homologous recombination is a mechanism where two DNA molecules are closely examined for their homology and, once homology is identified, homologous sequences are mutually exchanged. You might notice that this provides a great model for improving things in general. You start off by comparing two systems, identifying what is similar and what is different, then adapting what is good, discarding what is bad. I have being involved in science in Japan, US and UK for a number of years, which allows me to make an in-depth comparison between these countries. My hope is to help facilitate "homologous recombination" between these sciences, thus contributing to making ours even better. I am ready to do my best for that.

Events

Open Campus 2017 for High School Students and Examination Candidates

Yuichi HONGOH
Professor

The 4th Open Campus (OC) was held on August 10, 2017 (Thr). The TokyoTech OC has become popular year by year so that our institute had to add "for high school students and examination candidates" to control the number of visitors. This time, partly because it was not a holiday, the visitors decreased from 15,000 to 12,000, which is probably proper number against the capacity of the Ookayama campus. Since it was cloudy and not much hot, I believe that the visitors comfortably enjoyed the OC.

Guidance Sessions

For this OC 2017, our Life Science and Technology school lined up (1) Guidance sessions for the entrance examination with focusing on the renewal of the examination system and the reform of our educational system (from the faculty-and-department model to the school-and department model), (2) Consultations for the entrance exam, including the exam for students of technical colleges, (3) Sample lectures by five members from our Life Science and Technology school, (4) Poster presentations from all laboratories, panel explanatory sessions, and an informal salon to discuss anything with visitors by (under)graduate students and professors, (5) Hands-on corner "I came, I saw, I touched life science and technology researches!", and also (6) Video presentation to introduce our school.

Sample Lecture

The sample lectures were presented by five Associate Professors: Hitoshi Nakatogawa, Kohji Seio, Eizo Miyashita, Mie Shimojima, and Yoichi Tagawa. So many high school students attended the classes, and the lecture halls were crowded with overflowing audiences. Sample lectures in OC have been proven to motivate the attendees to select TokyoTech and our Life Science and Technology school, and so have become one of the most important events for us.

Although the OC requires much effort especially from members of the OC working group and the laboratories in the Ookayama campus as well as supporting stuffs from broad TokyoTech sections, the product well meets the effort. The next OC 2018 takes place on Aug 10 (Fri), a weak day. Let us make an exciting and prosperous OC under the next OC leader of our school, Associate Professor Takashi Suzuki.

Poster Presentation

The 6th Bioscience and Biotechnology International Symposium

Hitoshi NAKATOGAWA
Associate Professor
Kazushi KINBARA
Professor

The 6th Bioscience and Biotechnology International Symposium was held on Jan 10th of 2018, at Suzukake-Hall in Suzukake-dai campus. This symposium was co-organized by ACLS. This year, the title of the symposium was “A New Epoch of Membrane Science and Technology: Interface between Living and Non-Living Systems”, focusing on membrane science, where we had two invited speakers were from abroad, three domestic invited speakers, and two invited speakers from Tokyo Tech. All the speakers gave excellent lectures on various aspects of membrane science, including fundamental basis to applied technology.

Two foreign speakers, Dr. Simon Web (Bristol Univ., UK) and Prof. Li Yu (Tsinghua Univ., China) gave lectures on their pioneering works of the synthetic mimics of signal

transducing molecule working in lipid bilayers, and migrasome and migracytosis, respectively. The domestic speakers, Prof. Tsutomu Hamada introduced his recent achievements on the dynamics features of phase-separated synthetic bilayers, and Prof. Shoji Takeuchi gave a impressive talk on fabrication of biosensors using MEMS technology. Prof. Noboru Mizushima gave a lecture on comprehensive study on autophagosome. To our delight, A Nobel *laureate*, Prof. Ohsumi joined his lecture. Tokyo Tech speakers, Prof. Atsushi Maruyama gave a stimulative talk on the control of the morphology of vesicles using synthetic polymers, and Prof. Mie Shimojima introduced regulation of lipid synthesis under environmental change in plants.

The membranes, a subject of this year's symposium, are drawing significant attention in various fields including life science, chemistry, physics, etc, and developing an interdisciplinary field which allows both scientific and technological approaches. In this sense, this topic well matches the philosophy of School of Life Science and Technology. While the contents of the lecutres are very versatile, many audiences seemed to enjoy them and get some inspiration for their own researches.

The number of registered participants are 378, as many as those for the past five symposiums. We also had many participants in the reception. Although this is the last year for ACLS, the organizing committee considers to continue this symposium so as to offer opportunities for young researchers and students to be exposed to cutting edge researches and world-leading researchers.

Awards

13th JSPS Prize

"Biochemical Elucidation of the Molecular Basis of Autophagy"

Hitoshi Nakatogawa
Associate Professor

On 8th February 2017, I was awarded 13th JSPS Prize at the Japan Academy, and given encouraging words for my research from Their Imperial Highnesses Prince and Princess Akishino.

Autophagy is a major degradation system within cells. It has been emerging that via degradation of various cellular components, autophagy is involved in a wide range of cellular functions and also linked to human diseases. Many people may have known this biological phenomenon, given Prof. Yoshinori Ohsumi's winning of the Nobel Prize in 2016. Since I joined his group at the National Institute for Basic Biology in 2004, I have been

working on the molecular mechanism of autophagy using budding yeast. Whereas my recent, representative achievements are about molecular biological and cell biological studies on autophagic degradation of organelles, my biochemical studies on the mechanism of membrane formation during autophagy were appreciated in this prize. When I started the study of autophagy, there were only a few people who took a biochemical approach in the autophagy research filed. This prize reminds me of the importance of originality in science. I hope to develop my future research on autophagy and a new project with an original perspective.

Last but not least, I would like to express my sincere thanks to my mentors and colleagues who taught me a lot, and students who enjoyed science with me.

GSJ Award for Young Scientist

Hidenori Nishihara
Assistant Professor

It's an honor to be awarded the GSJ (Genetics Society of Japan) Award for Young Scientists. I'm also honored to have had the opportunity to present the award lecture at the GSJ annual meeting in September 2017.

The awarded project was "Vertebrate phylogenomics and genome-scale evolutionary analysis of transposable elements". My research interest includes the process and mechanism of diversification of vertebrates, and genome-scale comparative analyses have revealed the phylogeny of various vertebrate groups including mammalian interordinal relationships. In addition, genome wide characterization of transposable elements (TEs) in fishes such as coelacanth and cichlids revealed a greater diversity of TEs than previously thought. Recently, I also demonstrated that TEs have had a dramatic impact on establishment and diversification of gene regulatory systems during mammalian evolution. I hope these and future studies will lead to an understanding of the evolutionary process of functional elements in vertebrate genomes.

Finally I would like to express my deepest appreciation to my former supervisors and excellent collaborators.

Tokyo Tech Challenging Research Award: A Special Award by the President
"Development of Innovative and Scalable Micro-flow Oligonucleotide Synthesis"

Shinichiro Fuse
Associate Professor

It is a great honor to receive 2017 Tokyo Tech Challenging Research Award. The award title is "Development of Innovative and Scalable Micro-flow Oligonucleotide Synthesis."

Oligo nucleotide-based drugs have both merits of small molecule-based drugs and protein-based drugs. In detail, both production cost and risk of side effects are low. In addition, Oligo nucleotide-based drugs are regarded as promising candidates for treating intractable diseases because they can interact with DNA and RNA those were not targets of other drugs. In recent years, further reduction in cost of oligo-nucleotides is highly important task to expand their use as drugs. Conventional phosphoramidite approach can produce desired products highly selective manner, however, building blocks containing phosphoramidite are expensive and emit a lot of wastes. Oligo-nucleotide synthesis using highly atom economic, inexpensive, and active reagent is ideal, however, the use of such reagents tend to result in poor selectivity. We have developed amide bond formation using highly atom economic, inexpensive, and active reagent in micro-flow reactors. We anticipated that our micro-flow technology enables highly efficient synthesis of oligo-nucleotides. There are many experts of oligo-nucleotide science in Suzukade-dai campus. This great environment will accelerate our research. I greatly appreciate Prof. Dr. Hiroyuki Nakamura for his fruitful suggestion to start this project.

Tokyo Tech Challenging Research Award

“Development of innovative crystallization analysis using *in vivo* protein crystals”

Satoshi ABE
Assistant Professor

It is an honor for me to receive 2017 Tokyo Tech Challenging Research Award. The award title is “Development of innovative crystallization analysis using *in vivo* protein crystals” .

Protein crystals have been utilized in the determination of three dimensional structures by X-ray crystallography. However, protein crystallization is still one of main subjects for protein crystallography. In this research, I have been pursuing development of crystallization analysis using *in vivo* protein crystals, which are formed spontaneously in living cells, by immobilization of target proteins and peptides in the protein crystals. This method allows us to facilitate the advancement of protein structure analysis. I am grateful to the lab members and collaborators who contributed to this research and Prof. Takafumi Ueno for his guidance.

JSPS Ikushi Prize/Chorafas Foundation Awards

Keisuke MOCHIDA
(2017 graduate, PhD)
Department of Biological Sciences

It is my pleasure to receive the 2017 JSPS

Ikushi Prize and the 2017 EPFL Dimitris N. Chorafas Foundation Award for my doctoral research. I am very honored to receive these two great awards. It was a valuable experience for me that I talked with Their Imperial Highnesses Prince and Princess Akishino after the Ikushi Prize ceremony.

I have been studying an intracellular degradation system, autophagy. I identified two proteins which mediate autophagic degradation of the nucleus and the ER, and revealed that selective autophagy can target these organelles. At the time when I started my research, I was not expecting all of these results. Whereas the existence of landmark proteins which mediate degradation of the ER was just as I expected, the fact that autophagy can degrade the nucleus was an unexpected and surprising discovery. These experiences made me agree with a theory that really interesting life phenomena are unexpectable. I wish to continue devoting myself to research while enjoying new discoveries.

Finally, I would like to express my appreciation to my supervisors, collaborators, and lab members.

Chorafas Foundation Awards

Shimpei OTSUKA
(2017 graduate, PhD)
Department of Bioengineering

It is a great honor for my doctoral thesis to have received the EPFL Dimitris N. Chorafas Foundation Award (Chorafas Award) in 2017.

Soon after the start of my research under Dr. Ogura's laboratory, I decided to research about porphyrin metabolism under hypoxic microenvironment. The end product of porphyrin metabolism is heme, which is an active center molecule of protein such as oxygen carrier hemoglobin. I thought porphyrin metabolism is controlled in the state where oxygen is locally deficient in the living body. Among my laboratory life, I brilliantly remember the excitement when I found the data proving the molecular mechanism of porphyrin metabolism in the hypoxic microenvironment. I believe that such an experience owes to the deep thinking of the research theme in my three years of laboratory life, and it is my treasure for me in my future research.

Finally, I would like to thank Professor Shun-Ichiro Ogura, who have taught me very graciously both in public and private. I also thank those involved in my research life.

Tejima Seiichi Research Award for Young Researcher (Fujino-Nakamura Prize)

Takahiro KUCHIMARU
Assistant Professor

I am horned to receive the award to my research project "Development of near-infrared

bioluminescence tools and their applications in cancer research". I am grateful to all project members including my supervisor Shinae Kondoh, graduate students of Kondoh laboratory and collaborators.

Bioluminescent creatures, such as the firefly, produce light through a chemical reaction that requires an enzyme (luciferase) and its substrate (luciferin). Since uncovering molecular mechanisms of the bioluminescence in nature, researchers have exploited the bioluminescence system for various applications in the community of life science. Of the applications, noninvasive imaging of small laboratory animals has been a killer application of bioluminescence system in these two decades. However, existing bioluminescence systems utilized visible light spectrum that are highly absorbed and scattered in biological tissues. This motivated us to develop new bioluminescence tools with a near-infrared light emission through chemistry and biochemistry approaches. Our near-infrared bioluminescence systems successfully outperformed exciting ones and achieved highly sensitive detection of micro metastases in deep tissues. This will facilitate understanding of the behavior of fewer cancer cells involved in cancer malignancies such as metastasis and drug resistance.

Suematsu Prize

Keisuke YOSHIDA
Assistant Professor

It is a great honor to receive the Suematsu Prize for my research on "Elucidating redox-based regulatory system in plant nucleus". Due to the sessile nature, plants must control their own physiological functions toward environmental fluctuations in a flexible manner. As a novel regulatory system, I am focusing on the thiol-based redox regulation, one of the post-translational protein modifications. I have already revealed that redox regulation system is highly organized in chloroplasts and mitochondria, which is critical for plant survival. In this study, I newly address the molecular basis and biological significance of nuclear redox regulation system. Nucleus is central to conservation and transfer of genetic information, but the involvement of redox regulation in these functions is elusive. Although my research is highly challenging, I will do the best toward comprehensive elucidation.

Suematsu Prize

Shun IWATANI
Assistant Professor

It is truly an honor to receive the 2nd Suematsu Prize, which was established by the donation from Honorary Professor Yasuharu Suematsu and aimed at encouraging the exploratory research of young scientists. The

awarded title is “Reveal the sialylation of *Helicobacter pylori* and its potential impact on host immune system.”

Helicobacter pylori is a pathogenic bacterium that colonizes the stomach of nearly the half of the world’s population. Despite the decades of research all over the world, there are still many unknowns about the mechanism of infection and/or the interaction between this bacterium and the host immune system. In this regard, my current research hypothesizes the sialylation of *H. pylori*, by which sialic acid groups are introduced onto the terminal of lipopolysaccharides and potentiate the infection and the virulence of this bacterium through the molecular mimicry and/or the immunomodulating activity. This hypothesis is being investigated by both molecular epidemiological and molecular biological approaches. Although the research has just launched, I hope our future findings will contribute to a better understanding of this pathogenic bacterium, as well as to an improvement of prevention or treatment of infections.

Lastly, I would like to express my heartfelt gratitude for Prof. Suematsu’s generosity and all the support and collaboration on this research.

The 1st Ohsumi Journal Award

Eri OKAMOTO

It is such a great honor for me to receive the 1st Ohsumi Journal Award for my PhD research article entitled “Migratory appendicular muscles precursor cells in the common ancestor to all vertebrates”, published in *Nature Ecology & Evolution*. In this study, I explored how appendicular muscles are evolved by using cartilaginous fish embryos as my research model. The cartilaginous fish group, which branched off approximately 400 million years ago from other vertebrates, occupies a key phylogenetic position for evolutionary studies. Here I discovered the basis of development of limb muscles has been established in cartilaginous fishes. Muscle precursor cells that will form limb muscles (so-called “migratory muscle precursors”) also contribute to the formation of tong muscles of terrestrial vertebrates and diaphragm of mammalians. How these muscle precursor cells can give rise to such various muscles in the body of vertebrates during evolution? I wish my research would help to answer such curious questions. I am grateful to Dr. Mikiko Tanaka and collaborators who guided and contributed to this research.

The 2nd Ohsumi Journal Award

Kazunori ANDO

It was a great pleasure to win the Oosumi Journal Award. Thanks to Dr. Atsushi Kawakami, Dr. Akira Kudo, and my colleagues spent in the lab with me, I was able to publish the paper which was subject to the award.

I did research on regeneration using zebrafish and focused on the cells that make bone, called osteoblasts. Bones are the fundamental structure of our bodies and essential for our lives. To maintain the robustness of bone throughout life, osteoblasts always need to make bone and therefore they need to be supplied continuously. From the analysis of the genes upregulated during regeneration, I have clarified the localization of progenitor cells that supply osteoblasts in vivo for the first time.

Currently, I am a postdoctoral associate in the lab of Dr. Kenneth D. Poss at Duke University in North Carolina, U.S.A. and keep doing research on regeneration using zebrafish. I hope to find the possibility of tissue regeneration in mammals by revealing the common mechanisms controlling the expression of regeneration related genes. As a winner of the Oosumi Journal Award, I will devote myself to live up to your expectations.

Students' Achievements

Tokyo_Tech team extends gold medal record at iGEM 2017

Hazuki HASEGAWA
3rd-year Department of Bioscience

The students of Tokyo_Tech obtained a gold medal in this year's iGEM competition (International Genetically Engineered Machine Competition). Tokyo_Tech extended its world record of consecutive gold medals to 11 consecutive years since the inception of the medal system. Of the 310 teams participating this year, the only teams holding this consecutive record are the University of Freiburg (Germany) and Tokyo_Tech.The iGEM competition is an international synthetic biology competition mainly for undergraduate students. The student teams are given a kit of standard genetic parts, called BioBricks, and are asked to design and build a new biological system. Each team gives a presentation showing their results which is evaluated by the judges. This year, the competition was held in Boston from the 10th to the 13th of November. A total of 310 teams from around the world participated, including renowned universities such as the Massachusetts Institute of Technology (USA), Heidelberg University (Germany), and Tsinghua University. The competition is divided in 10 categories.

This year's Tokyo_Tech Team consisted of 11 students from the School of Bioscience and Biotechnology, and 1 student from the School of Science. We worked on establishing a

co-culture system for human cells and *E. coli*. Although it seems to be easy, in the experiment, when bacteria are contaminated in the human cell culture environment, bacteria rapidly grow, and human cells die. However, in our body, it seems that symbiotic relationships with bacteria are established in various organs including the intestines. We believe that this co-cultivation technology can contribute not only to analysis of the symbiotic relationship from the viewpoint of "creating", but also to construction of a more life-like living system. We also plan to develop devices applying this co-cultivation technology next year, and to apply them to medical applications as well. In iGEM competition, creating "something with high social contribution" is becoming a prerequisite for acquisitions of the category prize and the special prize, and, by developing applied technology/device based on this year's product, we aim to receive special awards since next year.

- Participating students

Saki Arakaki (3rd-year, Bioscience, Department of Bioscience, School of Bioscience and Biotechnology)
Kohei Umedera (3rd-year, Biomolecular Engineering, Department of Biotechnology, School of Bioscience and Biotechnology)
Michio Takagi (3rd-year, Bioscience, Department of Bioscience, School of Bioscience and Biotechnology)
Hazuki Hasegawa (3rd-year, Bioscience, Department of Bioscience, School of Bioscience and Biotechnology)
Kazunori Motai (3rd-year, Department of Organic and Polymetic Materials, School of Engineering)
Takuma Yasue (3rd-year, Biotechnology, Department of Biotechnology, School of Bioscience and Biotechnology)
Hajime Fujita (2st-year, School of Life Science and Technology)
Kazuya Isawa (1st-year, 7th Academic Group)
Hinako Kataoka (1st-year, 7th Academic Group)
Tamon Sato (1st-year, 7th Academic Group)
Moe Takahashi (1st-year, 7th Academic Group)
Hakaru Nakaya (1st-year, 7th Academic Group)

- Instructors

Yoh-ichi Tagawa (School of Life Science)
Nobuhiro Hayashi (School of Life Science)
Nobutaka Nakashima (School of Life Science)
Masayuki Yamamura (School of Computing)
Hiroyuki Ohta (School of Life Science)
Akifumi Nishida (Yamamura Lab, Department of Computer Science, School of Computing)
Shyoya Yasuda (Yamamura Lab, Department of Computer Science, School of Computing)

- Campus Support

Global Resources Development Promotion Project
Tokyo Institute of Technology Revitalization Aizawa Foundation
Tokyo Tech Alumni Association

Tokyo Tech Alumni Association Kanagawa Branch Bio Creation Design Room

- External Support

Integrated DNA Technologies (IDT)
Cosmo Bio Co., Ltd
Promega Corporation
Leave a Nest Co., ltd.
Metabologenomics, lnc.
Japan Student Services Organization (JASSO)
MEDICAL & BIOLOGICAL LABORATORIES CO., LYD. (MBL)

- Presentation Instructors

Off-campus: Robert F. Whittier

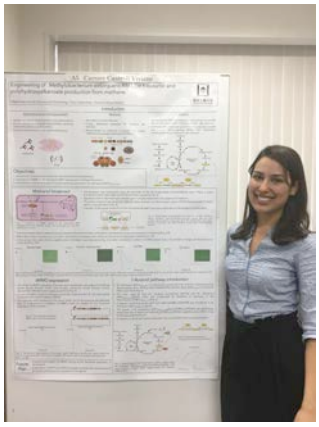
- Web PageiGEM Official Home Page

http://2017.igem.org/Main_PageTokyoTech Team Project Page
http://2016.igem.org/Main_PageTokyo Tech Team Project Page
http://2016.igem.org/Team:Tokyo_TechTokyo Tech team extends gold medal record at iGEM (2015)
http://www.titech.ac.jp/english/news/2015/032749. htmlTokyo Tech students win at iGEM three years in a row (2014)
http://www.titech.ac.jp/english/news/2015/029586. htmlTokyo Tech students win at iGEM two years in a row (2013)
http://www.titech.ac.jp/english/news/2013/024411. html

From Foreign Students

The Best Plan Award for IGP Progress Presentation 2017

Carnier Casaroli Viviane



It is a privilege to have been awarded the Best Plan Award for IGP Progress Presentation last year. Coming to do science in Japan is possibly one of the best choices I have ever made. What I have seen so far are labs with a solid infra-structure for research and supervisors who are the best in their respective fields. My laboratory, Fukui Lab, has two main lines of research: investigation of the metabolism and cellular functions of hyperthermophilic archaeon and elucidation of the physiology and metabolic pathways of PHA-producing bacteria. The research plan I presented for my Master's qualification was about engineering a methylotrophic bacterium called *Methylobacterium extorquens* in order to obtain bioplastic and biofuel from methane gas. This is a bold plan, since it would be the first time that the enzyme methane monooxygenase - an enzyme that can convert methane gas into methanol - is expressed in a non-methanotroph bacterium. I was glad to receive precious suggestions and criticism from the Professors

who evaluated my work, and to hear about the interesting research topics of my colleagues.

Of course, research is not done individually and there is a strong team working closely with me in the design and experiments of my research project. I would like to express my gratitude to my supervisor, Professor Toshiaki Fukui, and to Assistant Professor Izumi Orita, whose valuable insights have helped and guided me from the beginning of my research. Also, I would like to give special thanks to all members of Fukui Lab, who are the best lab mates a foreign student could ask for.

The Best Plan Award for IGP Progress Presentation 2017

Aa Haeruman Azam

First of all, I would like to express my sincere gratitude to Ministry of Education, Culture, Sport, Science and Technology of Japan (MEXT) for providing me scholarship.

It was such an honor for me to be selected as the best poster presenter of IGP progress presentation 2017. The research that I presented was focusing on analysis of phage-resistance mechanism of *Staphyloccus aureus* SA003 toward phage ϕSA012. Recently, antibiotic treatment of *S. aureus* infection has become worldwide concern due to the emergence of antibiotic resistance strain such as Methicillin-resistant S. aureus (MRSA). Phage therapy could be a best candidate to overcome this problem. In our lab, we have had screened very strong phage, namely ϕSA012 and ϕSA039, that can kill more than 93% *S. aureus* of tested strains. However, in co-culture of phage and host, *S. aureus* can developed to be phage-resistant. We believe that the emergence of phage-resistance *S. aureus* could be a big obstacle for the application of phage therapy. Thus, deeper understanding of phage-resistance mechanism is very critical. On my lab, we generate phage-resistance strains of *S. aureus* SA003 and analyze their whole genome. Finally, we revealed that most of genes in phage-resistance SA003 are linked to the phage adsorption inhibition and one of those genes is a “key point” of how two closely related phage ϕSA012 and ϕSA039 have difference host preference. For this achievement, I would like to thank Professor Tanji Yasunori and Assistant Professor Kazuhiko Miyanaga for their continuous advice. By receiving this award, I will keep trying my best to further study and give important contribution for this theme. I hope our current finding will give significant contribution for the research of phage therapy in general and for the treatment of *S. aureus* infection.