Contents

Message from the Dean

Dean of the School of Life Science and Technology
Susumu KAJIWARA

My name is Susumu Kajiwara, Dean of the School of Life Science and Technology as of April 1, 2022. Until summer 2021, I was responsible for science, technology and academic policies in Japan as a Deputy Director-General at the Ministry of Education, Culture, Sports, Science and Technology (MEXT). Prior to that I gave lectures and performed research at the Tokyo Institute of Technology, and I have spent the bulk of my career as a university faculty member. As Dean, I plan to take full advantage of my experience in promoting science and technology, and academia. I look forward to working with you for the next two years and will devote myself to the management of the School of Life Science and Technology.

It has now been two years since the onset of the COVID-19 pandemic. Although we have seen progress in the development of multi-dose vaccinations and antiviral treatments, more time is required for the situation to be brought under control. Under such circumstances, our institution has made great strides in moving classes online and establishing remote practices for research to minimize pandemic-related interruptions to teaching and research. As we gradually return to pre-pandemic conditions, we are working to build new education and research systems that effectively incorporate remote and online models.

The Faculty of Life Science and Technology, the predecessor of the current School of Life Science and Technology established in 1990, and of the Graduate School of Life Science and Technology established in 1992, was the first organization in Japan to promote education and research in science and engineering related to people and life, a field that will inevitably be necessary to the twenty-first century. This year marks the thirtieth anniversary of the founding of the Graduate School of Life Science and Technology. Despite the COVID-19 crisis, we are still hoping to implement our plans for the thirtieth anniversary of the graduate school, while observing appropriate measures to prevent infection.

Various challenges facing our society continue to increase, including achieving the sustainable development goals (SDGs), global warming, climate change, large-scale disasters, pandemics such as emerging infectious diseases, birthrate decline and an aging population. I believe that science and technology will play a central role in solving these challenges. Our institution will continue to contribute to the global society by promoting a wide variety of

cutting-edge basic research in the fields of life science and technology that will lay a foundation for resolving these challenges.

From New Staff

Development of genome editing technology and generation of environmentally stress tolerant plants

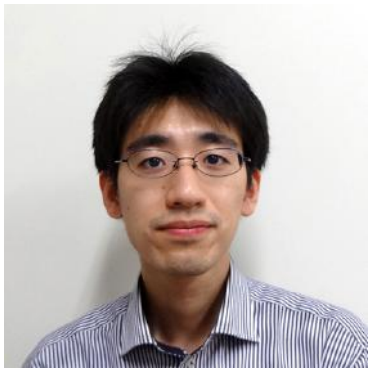
Professor
Yuriko OSAKABE

My name is Yuriko Osakabe, and I joined the School of Life Science and Technology in April 2021. Since I was transferred during the prevention of the spread of COVID-19, I have had minimal opportunities to interact with faculty members since I arrived and the start-up of my laboratory did not go smoothly.
However, thanks to great supports of Dean of School of Life Science and Technology, Professor Kondo, and all the administration staff, we were fortunately able to start the laboratory. I would like to express my heartfelt gratitude.

We have been conducting research on the development of genome editing technology that has key functions in functional modification of various organisms. Recently, we have developed a new genome editing technology using the unidentified CRISPR-Cas, called TiD, and we are now developing the basis of this new technology for gene functional modification that can be used for animal and plant cells. In addition, as a target for application of such technology, we are also conducting functional elucidation and molecular breeding research on genes involved in improving plant tolerance to environmental stresses. It is aim to improve the functions of plant resources to enable a sustainable society in the future. We have been conducting joint researches with researchers from various domestic and international research institutes and companies. We hope to expand our strong research network by developing the core of our research here and disseminating it more widely. I am also very much looking forward to building new laboratory with students and staff to further deepen our research together. I am excited to be involved in a variety of activities in education and management of the institute and look forward to your continued guidance and encouragement.

Greetings

Assistant Professor
Tetsuo IWATA



I am honored to have been serving as an assistant professor in the Hirota Laboratory

since April 2021. I received my Ph.D. degree from the Department of Bioengineering, Graduate School of Bioscience and Biotechnology in December 2014. After working as a postdoctoral researcher, I was appointed as a technical staff in the Technical Department (current the Open Facility Center, OFC) and worked for about four years to provide managerial and technical supports for the Center of Experimental Biology. I would like to thank all the member of the Life Science and Technology for their long support on this opportunity. In addition to these operations and research support, I am also going to be making efforts in education and research. I'm looking forward to working with you.

Regarding to my research, I have developed a new genome engineering technology using *Bacillus subtilis* and explored regulatory sequences for odorant receptor gene expression based on mouse developmental engineering technology. Currently, I am focusing on an identified characteristic transcriptional regulatory sequence (extraordinary long-range acting enhancer) and challenging to elucidate their gene regulation mechanisms. Beyond research tasks, I am currently participated in establishing a new animal research facility together with Professor Junji Hirota, Director of the facility, and the staff of the Biomaterials Analysis Division and the Animal Research Facility at OFC. Lastly, I am going to continue my efforts to provide a good animal research environment for all users.

Greetings

Assistant Professor
Kazuki MIURA

I'm Kazuki Miura, who appointed at Nakamura-Okada lab in the Laboratory for Chemistry and Life Science as an assistant professor in April 2021. I worked in Keio university as a research associate until getting the current position.

My research is the development of novel applicable bioactive compounds for the pharmaceuticals. In particular, we approach the drug discovery study using dry and wet studies, such as *in silico* analysis and originally constructed probe and cell-based assay systems. Moreover, using various chemical biology approaches, we identify intracellular mechanism of action of bioactive compounds such as anti-cancer activity compounds. Thank you in advance for your support and cooperation.

Nano bio-block

Assistant Professor
Yuto HONDA

My name is Yuto Honda, and I have been appointed as an Assistant Professor in the Nishiyama-Miura Laboratory of the Institute of Chemical and Life Sciences, Institute for the Creation of Science and Technology, as of April 2021.

I graduated from the Department of Applied Chemistry, Faculty of Science, Tokyo University of Science in 2014, and entered the Nishiyama Laboratory of the Department of Environmental Chemistry and Engineering, Tokyo Institute of Technology as a first-year master student. After completing my master's program, I worked as a researcher in a chemical company for two years, and then again enrolled in the doctoral program in Nishiyama Laboratory in 2018, and received my PhD degree in March 2021. I am very happy to be able to work with the professors who helped me during my student days. Especially, I would like to thank Prof. Kondo, Prof. Ueda, Prof. Maruyama, and Prof. Kitamoto (Life Engineering Course) who reviewed my doctoral thesis and helped me a lot.

My research field is the construction of drug delivery systems. In particular, I am mainly interested in elucidating the function of supramolecules constructed with biocompatible molecules, termed nano bio-block. Recently, we are also working on bulk materials and their integration with physical energy. As a philosophy of my research, I try to take a fuzzy and simple approach rather than precise and detailed molecular design.

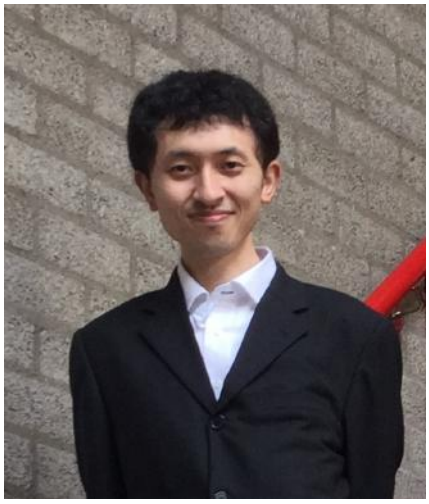
When I was in high school, my dream was to study polymers and biomaterials. Because I was fascinated by the effects of differences in polymerization degree and slight differences in structure of polymers on their functions. Even now, I still feel that research is fun through discussions with various professors and experiments (Although it is often painful..). I would like to thank Professor Nishiyama and Associate Professor Miura for giving me this opportunity. I would be happy if I could share the joy of research with students and various researchers.

I look forward to working with you in the future.

Greetings

Assistant Professor

Nobuaki FUNAHASHI



I was appointed as an assistant professor at the Koshikawa Laboratory in May 2021.

After graduating from advanced course of National Institute of Technology, Suzuka College, I obtained a Doctor of Pharmacy from the Graduate School of Pharmaceutical Sciences, Osaka University in 2011. After that, I was engaged in research work for about 10 years as a postdoc at Kobe Pharmaceutical University, a research fellow and senior research fellow at the Research Institute National Center for Global Health and Medicine (NCGM), and researcher at the Kanagawa Cancer Center Research Institute.

My specialization is transcriptional regulation and epigenetics. To elucidate how vascular endothelial cell-specific gene expression is regulated, I chose the vascular endothelial cell-specific gene Robo4 and investigated the regulation of its gene expression at transcriptional level, which occurs via transcription factors and DNA methylation in the graduate school. In addition to such basic research, I was involved in clinical research to elucidate the pathological mechanisms of obesity, non-alcoholic steatohepatitis (NASH), and obstetrics and gynecology disease in the Research Institute NCGM. At this time, I learned the importance of clinical research.

My current research is to clarify the relationship between liver carcinogenesis and laminin γ2. Through this research, I hope to elucidate a part of the pathological mechanism of liver cancer and contribute to the treatment of liver cancer.

Finally, I would like to contribute to the further development of Tokyo Institute of Technology. I'm looking forward to working with you.

Greetings

Assistant Professor
Kei NISHIDA

I am honored to serve as an assist. Professor in the Kobatake-Mie Lab. since Sep. 2021. I majored in polymeric biomaterials science at Tokyo Medical and Dental University and received my PhD in March 2019. Then, I worked as a JSPS Research Fellow PD at the Institute for Materials Chemistry and Engineering, Kyushu University until Aug. 2021. I am pleased to have been given the opportunity to engage in research and education at this university.

My research background is a design of synthetic polymers for biomaterials applications. In particular, I have synthesized functional polymers to regulate cell functions from extracellular or intracellular environments. In this regard, I focused on the direct interaction between materials and cellular components as the driving force to induce cell signaling. In the field of biomaterials science, I have experienced not only polymer chemistry but also interface

and colloid chemistry, molecular biology, and experimental animal approaches. I believe that the viewpoint of not only synthetic polymers but also biomacromolecules will be important for further biomaterials development, and am promoting research based on synthetic proteins in Kobatake-Mie Lab. Based on the experience which I have gained in my research to date, I would like to develop novel biomaterials using the advantages of synthetic polymers and synthetic proteins. I am looking forward to working with you.

From Promoted Staff

Exploring the developmental mechanisms of morphological evolution

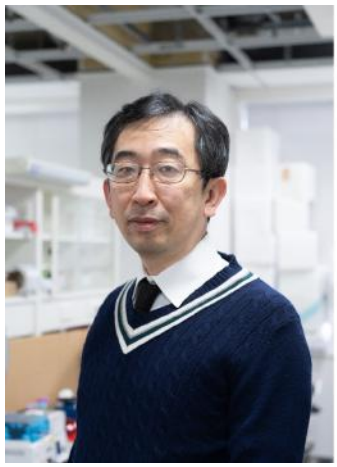
Professor
Mikiko TANAKA

I started my career in Tokyo Tech in 2004 as an associate professor at the Department of Biological Sciences, and was promoted to a full professor in 2022. When I was appointed 18 years ago, in fact, I was the first female faculty member in this department. It was not easy for me to start my laboratory soon after returning from 6 years of post-doctoral life in the UK and the US. With the warm support of everyone around me, I managed to successfully launch my laboratory. I am truly grateful for your help.

In our laboratory, we have been interested in understanding the molecular genetic mechanisms of how vertebrates acquired novel structures during evolution. Our current interest is to elucidate the possibility that ecological features could have directly modified the body plan. For example, we recently found that environmental oxygen might have been the key for the evolution of novel developmental mechanisms, such as the interdigital cell death of tetrapods. Our research highlights the importance of a multidisciplinary approach for understanding the evolution of new traits; and thus I believe the collaborative work would be the key to addressing this issue.

Greetings

Professor
Kohji SEIO



I have been appointed as a professor since 2021. I entered the School of Life Science and Technology at Tokyo Institute of Technology as a student in the Department of Life Sciences, Faculty of Science. Since then, I have been involved in for more than 30 years, even

excluding the period when I was enrolled in a pharmaceutical company. During that time, the Faculty of Life Science and Technology and the Graduate School of Life Science and Technology were established, and I am very pleased to be able to be involved in the development of the school until it was reorganized into the Faculty of Life Science and Technology. Also, I am very pleased to be able to continue research on nucleic acid chemistry, with many excellent students and staffs.

With the coming 30th anniversary of the establishment of the School of Life Science and Technology, further development is expected in the future. I would also like to make some contributions in all aspects of research, education, and management. Thank you in advance for your continued supports.

Toward realization of an attractive future society through AI proteomics

Professor
Nobuhiro HAYASHI

On May 1st, 2021, I was promoted to professor of the School of Life Science and Technology.

Based on my interest in molecular functions of proteins, I have been elucidating mechanism of signal transduction between cell membrane fraction and cytoplasmic region by functional analysis of myristoylation, which is one of the post-translational modifications, and developing novel functional antibodies using our original antibody libraries. In recent years, we have succeeded in acquiring high-quality proteomics images at high throughput by improving two-dimensional electrophoresis method, and we have succeeded in AI aided diagnosis of diseases by machine learning using a large amount of data obtained by this technology as the teaching data. Currently, based on the results, we are aiming to realize an attractive future society by implementing AI proteomics in society through collaboration among citizens, companies, government, and academia. I was originally graduated from Department of Physics at the Faculty of Science, but when I noticed that I am working on the social implementation of science and technology, which is located at the opposite extreme against basic science, I feel interest of life.

Looking back on my research life so far, I am once again grateful that many of my research has been joint research and that I have been blessed with collaborators and colleagues. In addition, I received excessive kindness from my teachers and seniors, and I have been able to grow up in the free and easy going atmosphere. I am blessed with laboratory staff and students, and I think about the importance of the relationship between people. I would like to take this opportunity to express my deepest gratitude to all of them about the kindness I have received so far as much as possible. And, I would like to ask for guidance and encouragement so that I will make efforts to

contribute for the development of the School of Life Science and Technology and Tokyo Tech.

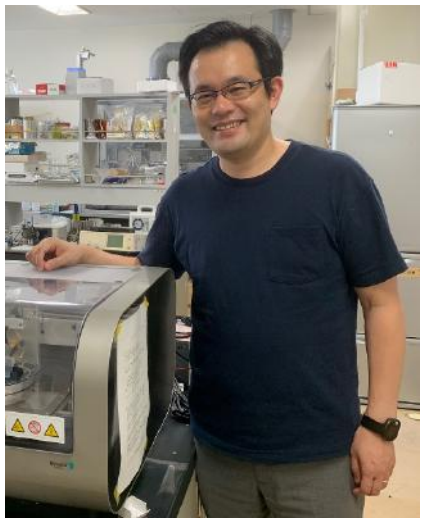
Molecular neuroscience of the olfactory system

Professor
Junji HIROTA

It is my great honor to take this opportunity to address you all. I was promoted to Professor as of June 1st, 2021. I entered the Department of Biotechnology of Tokyo Tech as the first-generation students in 1986 and spent my student days until I received my Ph.D. After working at the University of Tokyo, the Rockefeller University, and Osaka Prefecture University, I returned to Tokyo Tech in 2008 as an Associate Professor at the Center for Biological Resources and Informatics. My laboratory is involved in research to understand the sense of smell at the molecular level, which I began at the Rockefeller University. Due to the great efforts of my students and colleagues over this past 10 years, we have contributed to the understandings of the molecular mechanism underlying odorant receptor gene expression in mice. Meanwhile, since my appointment, I have also been engaged in the management and direction of animal experiments, and in FY2022 we are finally able to launch the SPF animal experiment facility at here Tokyo Tech. I will continue my efforts to contribute to the development of the field of life science and technology, and to create an environment for the next generation of young scientists to have an excellent research and experience.

Greetings from promotion

Associate Professor
Toshinori FUJIE



I am Toshinori Fujie, who was appointed to the position of Associate Professor in June 2021. I was appointed to the School of Life Science and Technology as a tenure-track faculty member in November 2018. I have fond memories of painting my lab wall with my students when I arrived, and two and a half years have passed in the blink of an eye. During this time, we were hit by the Corona disaster and very worried about what would happen to the management of the lab. But, together with the lab members, we kept running aggressively and successfully produced a couple of graduates so far. Now, the number of our lab members, which

started with two first-term students, has now grown to a total of 18, including researchers and other staff members.

Thanks to the great support by Tokyo Tech, in terms of research, the number of research papers we have published has gradually increased since my appointment. I have also had the opportunity to launch new research projects and work on the development of next-generation biomaterials and medical devices. I have also had the opportunity to establish a venture company originating from Tokyo Tech in order to bridge the technologies developed in our laboratory to society. On the other hand, in terms of education, I am struggling with both face-to-face lectures and online lectures, and we continue to search for a lecture style that fits the current era.

Finally, I would like to thank former Dean Prof. Mihara, Dean Prof. Kondo, and mentor Prof. Maruyama for their kind support during my tenure-track period. I would also like to express my sincere gratitude to the professors and administrative group members of the School of Life Science and Technology, and all the members of Fujie lab for their great support and advice. I would look forward to your continued guidance and encouragement.

Environmental Response Mechanism of Plant Photosynthesis

Associate Professor
Keisuke YOSHIDA

I am Keisuke Yoshida, who became a new Associate Professor of Prof. Kan Tanaka lab at Laboratory for Chemistry and Life Science in October 2021.

I have been interested in the environmental response mechanism of photosynthesis in plants. Photosynthesis is a reaction that supports all life activities on the earth by converting the solar light energy into chemical energy. How do plants regulate their own photosynthetic function under ever-changing terrestrial conditions? It is a central issue in the field of plant physiology. This is also an important issue in order to contribute to social needs such as securing food resources. To elucidate this issue, I am studying at various scales from molecular to plant individual levels. Over the past decade, I have gained many important insights into the redox-based regulatory system of photosynthesis.

I have been working in Prof. Toru Hisabori lab in the same institute as a postdoctoral fellow and assistant professor since April 2009, and I have been very inspired by the activities of everyone at the department of Life Science and Technology. I look forward to working all of the members.

From Transferred Staff

Greetings

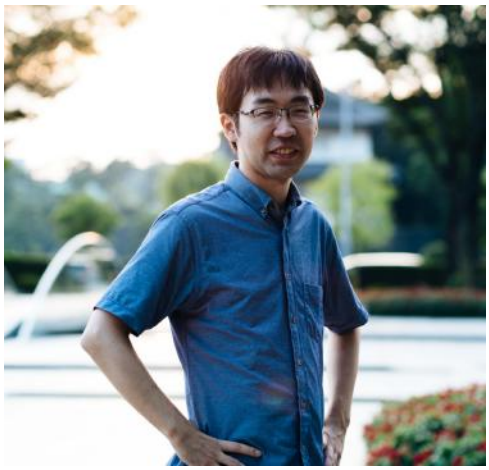
Associate Professor
Sousuke IMAMURA

I moved to Nippon Telegraph and Telephone Corporation in March 2021. It has been 9 years and 2 months since I was appointed as an associate professor at the Chemical Resources Laboratory (currently the Laboratory for Chemistry and Life Science). I could concentrate on my research and education by getting much support from professors and staff. Thank you very much.

Currently, at the NTT Space Environment and Energy Laboratories, I am engaged in research on environmental load reduction technology on a scale that looks at the earth from space. The focus of this research is on photosynthetic microalgae and land plants, and I aim to create new technologies and research fields by fusing my educational and research experience in Tokyo Tech with NTT's ICT technologies. Taking advantage of my position as a distinguished researcher in the company, I will continue to push forward with my research, so I would appreciate your continued guidance and encouragement. Lastly, I hope for your continued success and good health.

Greetings

Assistant Professor
Keisuke HIRATA



In April 2021, I moved to Ishiuchi Laboratory in Department of Chemistry, Graduate School of Science at Tokyo Institute of Technology as an assistant professor. During my two short years as an assistant professor in Fujii lab, I had the opportunity to interact with researchers and students in various research fields. As I originally specialized in chemistry (cluster chemistry and molecular spectroscopy), the education and research at the Department of Life Science and Technology was very stimulating and provided me with fruitful experience for my future career. I would like to express my sincere gratitude to the professors and staff of the Department, who kindly welcomed and nurtured me. I will continue my research to elucidate the mechanisms of molecular recognition in living organisms from a molecular perspective in Ishiuchi Laboratory,. As I will continue my research at Tokyo Tech., I may interact with some of you in future.

Greetings

Assistant Professor
Ryudo OHBAYASHI

In October 2021, I moved to Shizuoka University and started my own laboratory as a PI. It has already been half a year since I came to Shizuoka, and the work environment is finally getting ready for me to do some experiments. The first students have recently been assigned to my lab, and I have recently been having enjoyed working with the students every day. The students' themes have been selected and now the laboratory is ready to start up.

I joined the Tanaka Lab at CLS in August 2020 and have been there for only about a year, but I would like to thank everyone for their great support. It was a great experience for me to hear about a lot of research that I had never been involved in before at CLS. The only regret is that, due to COVID-19 pandemic during I was working, there were few opportunities for face-to-face discussion with researchers in School of Life Science and Technology and to go out for drinks.

So far, I have used photosynthetic prokaryotes called cyanobacteria to study the mechanisms of chromosomal replication. Cyanobacteria are the ancestor of chloroplast and have multi-copy genomes per cell, similar to chloroplasts. However, the detailed mechanistic, evolutionary and biological significance of this "many genomes" is largely unknown. In the future work, I would like to continue my original researches, including the evolutionary background from cyanobacteria to chloroplast.

Greetings

Assistant Professor
Kazuhiko MIYANAGA

I moved to Jichi Medical University in January 2022. 21 years and 9 months have passed since I joined the Faculty of Bioscience and Biotechnology in April 2000, and I have spent a lot of valuable time with many faculty members and students. Concerning research field, I started to work on environmental microorganisms such as biological wastewater treatment under Emeritus Professor Hajime Unno, then on climing…oops, on pathogen control by bacteriophage under Emeritus Professor Yasunori Tanji, and on intestinal bacteria and food science under Professor Naoyuki Yamamoto. Furthermore, although my original background is engineering, I could

exchange a lot of information and/or knowledge not only in engineering but also in science, agriculture with many stuffs mainly from the former Department of Bioengineering, not only in engineering but also in science and agriculture over the years (mediated by fermented drinks). I would like to express my heartfelt gratitude to all of you for your continuous warm and encouraging words and support. Moreover, it is my precious treasure I could meet many international researchers and students. My only regret is that due to the COVID-19 infection control, recently we couldn't interact with each other as much as before.

From now on, although medicine is a new field for me, I'd like to make use of the experience and knowledge gained at School of Life Science and Technology, with the common denominator of "microorganisms (bacteria, phage)" as the axis, and devote myself to apply basic research to clinical applications. I look forward to your continued guidance and encouragement.

Events

Open Campus Online 2020 for high school and prospective students

Associate Professor
Hiroshi TSUTSUMI

The online orientation for high school students was held on Sunday, April 18th, 2021. In addition, the Open Campus Online 2021 was held on Tuesday, August 10th, 2021. The open campus event at Tokyo Tech has been recognized as an annual summer event by high school and prospective students at the campus, but this year, two open campus events were provided using the online system to prevent the spread of the coronavirus infection. It was unfortunate that we could not provide the opportunity for high school and prospective students to find Tokyo Tech attractive in the face-to-face manner. However, the online event has merits such as the participation of students far from Tokyo and easy discussion using the chat system. Therefore, a lot of students joined these two open campus events.

The online orientation in April was a new challenge by focusing on third-year high school students. Each school including our school provided the information about education and research for participants. Although discussion time was limited, we had many questions from students. I felt that so many students were hoping to be Tokyo Tech students.

The online open campus in August had 78 programs containing 6 programs from School of Life Science and Technology. Most of students who participated in the online orientation joined to the online open campus. Our school provided "Orientation for School of Life Science and Technology", "Academic lecture", "Interactive Web lecture", "Introduction of research in School of Life Science and Technology", "Round-table discussion by the current students" and "Consultation for girl students". I believe that all participants had a fun day through these events.

Over 400 students joined to the orientation for School of Life Science and Technology. Dean Kondoh and Professor Kume introduced the unique educational curriculums and the attractiveness of cutting-edge life researches in our school. The participants were actively asking many questions, suggesting that many students have much interests to our school.

Associate Professor Ogura provided the academic lecture “Illuminating cancer !” for over 150 students. This lecture explained about the cancer research from basic to application. In addition, the lecture movie of Associate Professor Fujie about “Collaboration of nano/bio/electronics technologies” was delivered before the online campus, then, students interactively discussed with Associate Professor Fujie. This is a new challenge to inform attractive points of our school using the online technology.

In the session of “Introduction of research in School of Life Science and Technology”, we had many questions from the students. Five professors talked about interesting points of various research in our school.

In the roundtable discussion, 11 undergraduate and graduate students from our school participated and introduced the campus life including lectures and club activities. Many students were interested in the talks and asked a lot of questions until the end of the session.

In this year, we planned the session of “Consultation for girl students”, because many girl students enter our school every year. Professor Mikiko Tanaka kindly answered the questions and anxiety from the girl students.

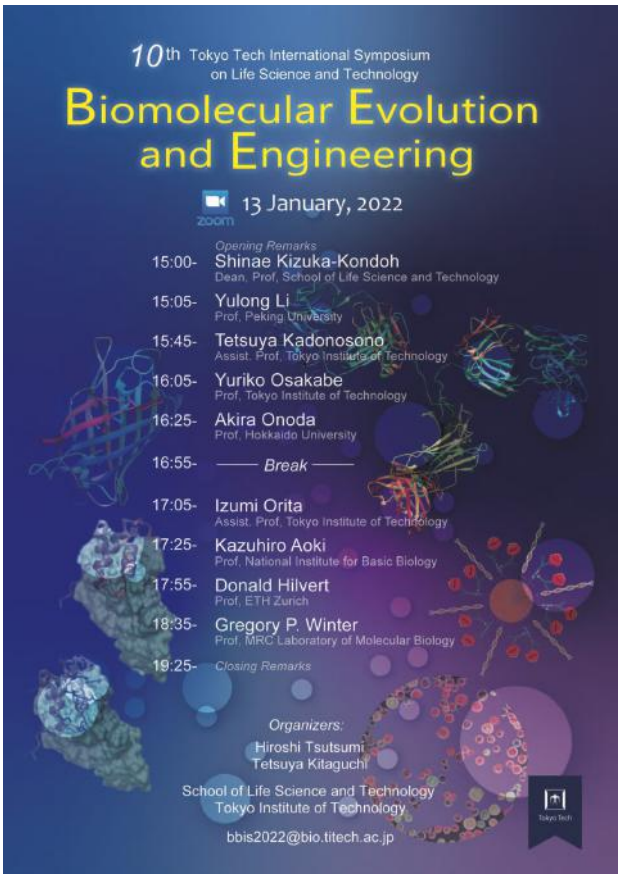
The open campus is an excellent opportunity to inform our school’s appeal. Many laboratories are making movies to introduce their research. In near future, the open campus using both the online technology and face-to-face events will be provided. All members of our school will continuously work together for the open campus under the next leader, Associate Professor Akira Kato.

The 10th Bioscience and Biotechnology International Symposium

Associate Professor
Hiroshi TSUTSUMI
Associate Professor
Tetsuya KITAGUCHI

On January 13, 2022, the 10th International Symposium on Bioscience and Biotechnology was held by the School of Life Science and Technology. The theme of this year’s symposium was “Biomolecular Evolution and Engineering”. Three overseas speakers, two domestic speakers and three young researchers from Tokyo Tech gave talks. There were many active discussion about wide range topics including protein-based drugs, biocatalysts, designed protein assemblies, fluorescent protein biosensors and biodegradable polymers using

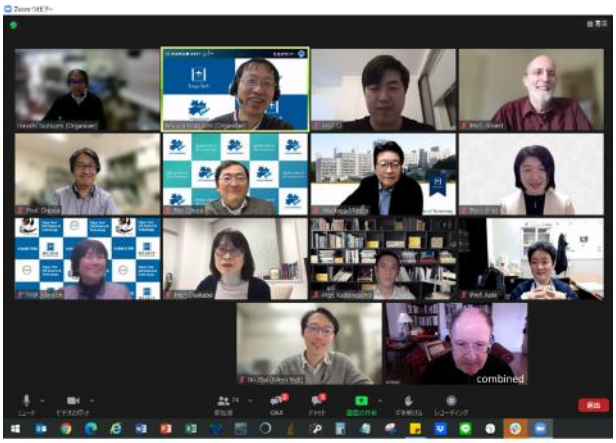
various technologies such as evolutionary molecular engineering, protein engineering, genetic engineering, genome-editing technique. Due to COVID-19 problems, this conference was held as an online manner using Zoom webinar. Even so, it was great success with 301 registrations and 237 participants through the conference.



Prof. Yulong Li (Peking University, China) presented his research on the fluorescent imaging of neuromodulation using fluorescent protein-based biosensors. Prof. Donald Hilvert (ETH Zurich, Switzerland) presented the design and control of virus-like protein assemblies. Both were interesting research using artificial protein evolution techniques. In addition, fortunately, we could hear the lecture given by Sir Gregory P. Winter (MRC Laboratory of Molecular Biology, England) who is a Novel Prize winner in Chemistry (2018) about the development of phage display technique and its application to the drug discovery research.

Prof. Kazuhiro Aoki (National Institute for Basic Biology, Japan) introduced his research on the optogenetic tool using the engineered photo-responsive protein to regulate physical tension by living cells. Prof. Akira Onoda (Hokkaido University) introduce his research on the development of new biocatalysts by chemical and biological engineering of proteins.

We also had presentation by our department researchers. Prof. Yuriko Osakabe talked her original genome editing tools and their application. Assist. Prof. Tetsuya Kadonosono talked the development of post-antibody drugs using a computational method and a molecular engineering technique. Assist. Prof. Izumi Orita talked biodegradable biopolymer production by genetic engineered microorganisms.



Our school promotes the world research hub initiative through manufacturing in the life science field by collaboration of

chemistry/physics/biology. In this symposium, we could provide the chance to feel the cutting edge research about biomaterials, life science tools and biomedicines. Although face-to-face communication has been still limited by COVID19 problem, the online meeting system can produce the international exchange situation which stimulates students and young researchers.

Awards

FY2021 MEXT Award for Science and Technology (Research)

Professor
Hiroshi KIMURA

The human body is composed of ~30 trillion cells, most of which have the same DNA sequence as they are originated from a single fertilized egg. Even carrying the same genetic information, different cell types were generated because the genes expressed in each cell are different. Elucidating the mechanism how gene expression is regulated is important for understanding the life and medical sciences.

We have developed a method for live imaging of post-translational protein modifications, which are critical for the regulation of gene expression especially in the process of transcription from DNA to RNA. Although the discovery and application of fluorescent proteins had made it possible to observe the localization and movement of any protein of interest in living cells, it had not been possible to selectively visualize protein modifications. By using the live-cell probes that can detect protein modifications, we revealed that histone acetylation promotes transcription.

The research was accomplished in collaboration with many researchers, including past and present laboratory members. In addition, we were able to achieve this research with the help of management expenses grant, the Grant-in-Aid for Scientific Research, and other funding. I would like to express my deepest gratitude to all the people and institutions involved.

FY2021 MEXT Award for Junior Scientist

The 18th JSPS Prize

The 11th Frontier Salon Nagase Prize (Grand Prize)

Associate Professor
Ayuko HOSHINO

I am very honored to receive the MEXT Young Scientists' Prize, the 11th Frontier Salon Nagase Prize, and the 18th JSPS Prize (listed in order of date of award) during the fiscal year 2021. Although the JSPS Prize ceremony was cancelled due to the pandemic, I was able to attend the ceremony for the MEXT Prize as a representative of the Young Scientists' Prize winners. I also had the opportunity to speak online to more than 2,000 high school students at the Frontier Salon Nagase Award, which provided me with an opportunity to recall my own initial thoughts and gave me a great deal of inspiration. I would like to take this opportunity to express my sincere gratitude to the members of the Society of Japanese Women Scientists (SJWS) for recommending me for the JSPS Prize, to the Japan Science and Technology Agency (JST) for recommending me for the MEXT Award, and to the many professors and laboratory members who have supported my research life on a daily basis.

Description of Awarded Research: It has been known for more than 130 years that cancer metastasis is organ-specific, but it was unknown what factors determine the organ tropic metastasis. Exosomes are nano-sized vesicles that are secreted by all cells. They were first discovered as a waste disposal mechanism. However, in 2007, secreted exosomes were reported to be incorporated into other cells, revealing a novel function in cell-cell communication. Furthermore, biological information contained in exosomes are reported to reflect body condition, offering potential use as biomarkers for various diseases. We have shown that cancer cells prior to arriving at the metastatic organ, send exosomes to the future organ site and change their environment to a favorable one for cancer to successfully metastasize. Furthermore, using proteomic analysis of exosomes circulating in the blood, we have found that it is possible to determine presence and absence of cancer as well as distinguishing the cancer type. These results may lead to the development of therapies to prevent cancer metastasis and to the application of new diagnostic markers for cancer.

2021 US NAM Catalyst Award

Associate Professor
Ayuko HOSHINO

I am very grateful to receive the Catalyst Award from the National Academy of Medicine.

This award is the result of a collaboration between Dr. Lav Varshney of the University of Illinois, USA, and Dr. Alexandru Hanganu of the University of Montreal, Canada.

We met through the Interstellar Initiative, an international science and technology R&D initiative sponsored by the Japan Agency for Medical Research and Development (AMED)

and The New York Academy of Sciences (NYAS). In this program, early career investigators were invited from all over the world and randomly assigned to work in teams for two days to develop a research theme that would work toward solving a problem in the field of medical research related to "Healthy Longevity".

Last year, the event was held online, and it was exciting and refreshing to meet for the first time with researchers of different specialties, introduce ourselves, and then discuss the theme that we could only come up with as a trio: Dr. Varshney, an AI expert, Dr. Hanganu, a specialist in Alzheimer's disease imaging and machine learning, and I, who specializes in exosome research. The study we have come up with turned out to be a theme that extends far beyond the projects I have considered on my own, and I am very much looking forward to the future development.

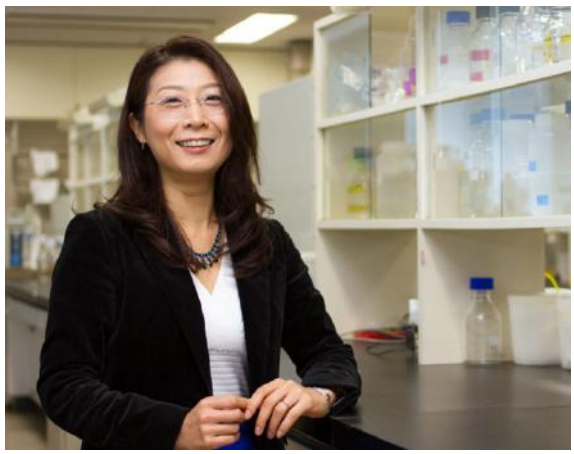
FY2021 JPS Prize

Professor
Hisakazu MIHARA

As being involved in peptide science for almost 40 years, I am very honored to receive the Japanese Peptide Society Award for the research entitled "Construction of Functional Peptides Based on De Novo Design Approaches". I would like to express my sincere gratitude to all the students, graduates, and staffs in my group of Graduate School of Bioscience and Biotechnology and School of Life Science and Technology, Tokyo Institute of Technology for their support and cooperation in the research. The concept of peptide design, which is now a commonplace method, coupled with the subsequent peptide library technology, has become a research approach that has revolutionized the conventional method of structure-activity relationship studies of peptides with amino acid substitutions. In addition, we have made significant contributions to the development of chemical biology, synthetic biology, and biomaterials science by incorporating techniques for structural and interaction analyses of peptides and proteins, molecular biology, and cell biology. We will continue our efforts to contribute to the development of peptide science.

The 41th Saruhashi Prize

Professor
Mikiko TANAKA



In 2021, I was awarded the Saruhashi Prize, for our achievements on the mechanisms of how shapes of vertebrate limbs (arms and legs) have changed during evolution. The roots of such changes are found in the developmental programs that control the body plan. Thus, our group are seeking to understand how developmental programs of living organisms modified, especially in response to environmental changes. I hope that such approaches allow us to further exploration of the ecological features could have directly modified the body plan.

I am deeply pleased and honored to receive this prestigious award. I feel I owe this honor entirely to the guidance and support of everyone around me, including my mentors, colleagues, friends and students. I would like to express my sincerest gratitude to all of their supports.

Students' Achievement

Graduate School Students Won Ohsumi Journal Award

The excellent students whose research papers were published in high-impact journals have been commended by "Yoshinori Ohsumi Memorial Fund" established in 2017. In 2021, six graduate school students won Ohsumi Journal Award.

The 12th Award (2021/07/07)

Mr. Masato Saito

(M2 Fujie Lab)

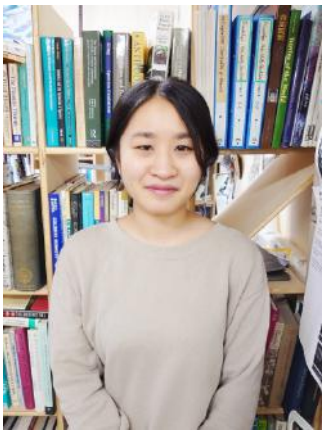
"Flexible induction heater based on the polymeric thin film for local thermotherapy" *Advanced Functional Materials*

The 13th Award (2021/09/01)

Ms. Haruna Nakamura

(D4 Nikaido Lab)

"Genomic Signatures for Species-Specific Adaptation in Lake Victoria Cichlids Derived from Large-Scale Standing Genetic Variation" *Molecular Biology and Evolution*



The 14th Award (2021/11/15)

Mr. Tetsufumi Suwa

(D3 Yamaguchi Lab)

"Three human RNA polymerases interact with TFIIH via a common RPB6 subunit" *Nucleic Acids Research*

The 15th Awards (2022/1/24)

Mr. Kosuke Kikuchi

(D1 Ueno Lab)

"Protein Needles Designed to Self-assemble through Needle Tip Engineering" *Small*

Ms. Beni Lestari

(D2 Kato Lab)

"Placental mammals acquired functional sequences in NRK for regulating the CK2-PTEN-AKT pathway and placental cell proliferation" *Molecular Biology and Evolution*

The 16th Award (2022/2/14)

Mr. Satoshi Uchino

(D2 Kimura Lab)

"Live imaging of transcription sites using an elongating RNA polymerase II-specific probe" *Journal of Cell Biology*

Graduate School Students Won Chorafas Award

The excellent students in the fields of biotechnology and related sciences have been commended by "Dimitris N. Chorafas Foundation" since 1992. In 2021, two graduate school students won Chorafas Award.

Dr. Khanh Tien NGUYEN

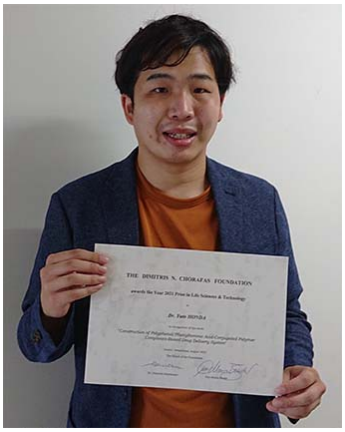
(2020.09 completed Ueno Lab)

"Engineering of Protein Crystals for Development of Artificial Biomaterials"

Dr. Yuto Honda

(2021.03 completed Nishiyama-Miura Lab)

"Construction of Polyphenol/Phenylboronic Acid-Conjugated Polymer Complexes-Based Drug Delivery System"



Presentation Awards in Symposium

Mr. Hibiki Terami

(M2 Ishii Lab)

International Society of Magnetic Resonance Conference—Asia-Pacific NMR Symposium 2021, Asia-Pacific NMR Symposium Poster Award

Other Awards

Mr. Kota Okuyama (B4)

Tokyo Tech Award for Student Leadership

The 2nd from the right is Mr. Okuyama

Mr. Tomoki Takahashi (B3)

Captain of Tokyo Tech team, which won Group 4 in Fall 2021 Tohto University Baseball League

The person with the cup in the center is Mr. Takahashi

From International Student

Anantya PUSTIMBARA

Since the very beginning, Japan is known to be a country with rapid technological growth and research developments. Japanese universities are also known to have the best graduates especially in the field of research, reflecting on the lecturers who taught at my previous campus. When I found out that I was accepted to pursue my two years of Master's course followed by three years of Doctor's at Tokyo Institute of Technology, I realized that this will be a chance for me to develop myself to become and learn about high-level science. Currently, I have just finished my Master study in September 2021. With the help of the MEXT scholarship and joining International Graduate Program A, I was able to immediately continue my studies up to the Doctoral level, and I am now in my first year of Doctoral at Suzukakedai campus, Tokyo Institute of Technology.

At the moment I am carrying out my studies by joining Ogura Laboratory. Ogura Laboratory focuses on cancer diagnostics and cancer therapy, specifically on the utilization of a non-proteogenic amino acid known as 5-aminolevulinic acid or also known as ALA. ALA is the first compound in the porphyrin synthesis pathway, which then forms heme that is useful for blood development. In addition to functioning as a natural amino acid, exogenous ALA is also later known as one of the compounds that can be used as an alternative in curing cancer, specifically for photodynamic therapy and diagnosis.

Apart from being used for photodynamic therapy and photodynamic diagnosis, ALA can also be used for other cell types namely induced pluripotent stem cells, also known as iPS cells. The current use of iPS cells has been used for various purposes, including cell culture for finding alternative medication or being used to produce cultured cells for tissues that are difficult to obtain. In my master study, I focused on the utilization of iPS cells for the discovery of alternative medicine for mitochondrial disease.

I have learned a lot of things during the 2 and half years of study at Ogura Laboratory. I would like to express my deepest gratitude to my supervisor, Assoc. Prof. Dr. Shun-Ichiro Ogura, for allowing me to do this research and all the support he gave me regarding life and study in Japan for these 2 years. I would also express my humble gratitude to the Ministry of Education, Culture, Sports, Science, and Technology (MEXT) Japan for the opportunity to achieve my Master and Doctoral degree in Japan with the scholarship support. I hope that my opportunity to undertake Master and Doctoral studies at the Tokyo Institute of Technology can

provide many benefits for the advancement of research in the future.

Editor's Note

Two years have already passed since the term, “COVID-19 pandemic”, became common. There has been no period like this one when I realize adaptation to environments. COVID-19 adapts to an environment emerging a new variant one after another. To adapt to the environment, we human have not only developed vaccines and therapeutic agents against the virus but also changed social systems. Digital transformation in Japan, especially, is something amazing. I suppose that such a quick shift has not been achieved without COVID-19 pandemic. Although it primarily aimed to adapt to COVID-19, we have resultantly created a novel environment. I realize that society changes in this way.

The newsletter provides, also in this year, articles of brilliant activity of the faculty members and students. I wish your seeds will continue bearing fruits under appropriate environments.

Editor-in-chief
Eizo MIYASHITA