Contents

Message from the Dean

School Initiatives Toward a Post-Covid Era

Shinae KONDOH
Professor, and Dean of the School of Life Science and Technology

In my second year as dean, I once again dedicated myself to our measures against the COVID-19 (coronavirus) pandemic. While inoculation with vaccines that have been developed at an astonishing pace has now begun in Japan and we are seeing signs of the end of infections, there have also been reports of variant outbreaks and vaccine shortages, and it seems likely to take some time before the pandemic is completely over.

The COVID-19 pandemic that began last February has unequivocally reordered our daily lives and the structure of society. Ideas proposed in the past, but which had heretofore progressed only slowly – innovations such as remote work, digital transformation (DX), cashless payments, and online meetings – were suddenly adopted wholesale. At the university, as well, we began to hold almost all of our events online, providing us with an opportunity to rethink the constraints of geography. Almost all of our lectures and some practical training sessions were also held online, prompting serious discussion about the nature of these offerings. Our graduate school entrance examinations and degree examinations also went online, leading to a reconsideration of the significance of entrance examinations and the acquisition of degrees. Faced with the closure of our research laboratories for the first time since the School of Life Science and Technology was established, the problems we had to tackle as an entire faculty in terms of risk management at our school – an institution based on biological resources – were also cast into sharp relief. Our experiences have also reaffirmed the importance of stable networks and strong security.

The past year has called upon us to provide many unprecedented responses. That we were able to weather it as a school without experiencing any major problems can be attributed entirely to the dedicated response by all of our school faculty and staff and the generous cooperation of our students. Our many efforts included timely responses to an irregular curriculum, an active commitment to online lectures, the operation of an attendance-mandatory research management system to meet attendance constraints, a rapid shift to online entrance examinations, the rearrangement of training schedules in anticipation of a second and third wave of the pandemic, and numerous

countermeasures that were put in place to prevent the spread of infection. In each case, I feel proud that these wonderful initiatives made full use of the wisdom and ingenuity of our faculty and staff. I am confident that the active use of online and DX technologies cultivated by faculty and staff amidst the demand for extraordinary measures will bring forth significant advancements in teaching and research activities that have been temporarily stalled.

Even in the face of the COVID crisis, we have steadily worked to implement the three goals we set last year. First, toward our efforts to increase the number of female faculty, I can report that we have added one professorship during the 2020 academic year and one associate professorship (hired at the end of the 2019 academic year), and plan to appoint another female professor and another associate professor in the 2021 academic year as well. Second, our plan to reorganize our academic faculty into four groups according to their fields of teaching and research began in earnest in April 2020, and since then has been functioning effectively in terms of the systematic reorganization of our educational curriculum by faculty members in each group, and the collection of opinions on improving the research environment and academic administration. This has also served to contribute greatly to the promotion of teaching and research, and the smooth operation of the school as a whole. Finally, regarding our efforts to advance into the field of medical engineering, the long-awaited opening of our SPF（Specific Pathogen Free）animal facility will enable us to make significant progress in this area. To that end, we have also proposed a “Seamless Imaging Analysis Base Initiative” that encompasses everything from molecules to individuals, a proposal that was adopted in the third supplementary budget at the end of the 2020 academic year. In 2021, I would like to promote these initiatives and increase our institutional presence by taking advantage of our school’s unique characteristics in order to contribute to the achievement of our goal of becoming “the World’s Paramount Science and Technology University.”

From New Staff

Clinical Application of Extracellular Matrix to Cancer Medicine

Naohiko KOSHIKAWA
Professor

I joined as a faculty to the School of Life Science and Technology, Tokyo Institute of Technology on June 1st, 2020.

I have been consistently elucidating the molecular mechanism for cancer malignant progression regulated by extracellular matrices (ECMs) and their degrading enzymes such as MMPs. Among them, I am focusing on cancer-

specific laminin molecules that I discovered in my graduate school about 25 years ago.

At present, my laboratory is conducting research with both basic research and translational research to cancer-specific laminin molecules. Therefore, the aim of my research is to produce therapeutic and diagnostic tools that will be useful for the next-generation cancer medicine by expanding the results of basic research to clinical applications.

Lastly, since I have joined after the lockdown of the university due to the expansion of COVID-19 infection, I had a very difficult time because the start-up of my laboratory did not proceed well. I would like to thank Dean of school of Life Science and Technology, Professor Kondo, and administrative staff for your support of the start-up. From now on, I will do my best to contribute the education, research, and management for this department.

Thank you in advance for your support and cooperation.

Bottom-up Construction of Living Systems and its Application

Tomoaki MATSUURA
Professor

My name is Tomoaki Matsuura, and I started my position as a Professor at the Earth-Life Science Institute (ELSI) on September 1, 2020. Firstly, I would like to express my sincere gratitude to all the faculty at the LST. I have not had many opportunities to meet with the students yet because of COVID situation. In addition, I have only met a few LST faculty. In spite of such situation, I received a lot of guidance from the professors. I finally started to understand the educational and management system. When I first arrived, I had no idea about the School, Department, and Course. (I think there are still many points that I don't understand well. To be honest, it is very complicated).

I am working on reconstituting molecular systems with certain functions using biomolecules as main materials (constructive approach). By constructing new molecules and molecular systems, I have been able to reveal new properties of biological systems and at the same time succeeded in creating novel molecules and tools. I have been collaborating with various people not only from academia but also from industry. I am very much looking forward to building a new network and conducting interesting research at Tokyo Tech.

The Earth-Life Science Institute (ELSI), to which I belong, is located at the Ookayama campus, so there is a physical distance between me and many of the LST faculty. Once the COVID situation settles, I am looking forward to visiting the Suzukake campus and seeing many of you in person and not online.

Exosome in Disease Etiology and Detection

Ayuko HOSHINO
Associate Professor

Please allow me to take this opportunity to introduce myself as a newly appointed Associate Professor in the Department of Life Science and Technology. My appointment was on mid-March of 2020, therefore, not long after I arrived the first emergency declaration due to COVID-19 pandemic was issued. We had to put all our plans on hold, such as moving equipment, cleaning, and constructions for setting the environment. Despite the uncertainty created by COVID-19, I was heartened by the socially distanced support I received by emails from many people. Fortunately, now with all the effort by my lab members and outpouring support, my laboratory is running and we are conducting experiments in a newly established setting.

I graduated from the Department of Applied Chemistry at the Tokyo University of Science, and received my PhD in 2011 from the University of Tokyo. My fascination towards the elements in the periodic table brought me into science, but after a friend of mine was diagnosed with osteosarcoma during my second year of university, I was determined to study cancer and molecular changes that are happening systemically in our body when cancer resides. For graduate school, I wanted to find a place where I could learn as much as possible about cancer, from the basics to the clinical side, so I joined the laboratory of Dr. Atsushi Ochiai, Department of Pathology, Cancer Center Hospital East, who is also a professor at the University of Tokyo, and studied how the interaction between cancer cells and the surrounding stromal cells contributes to the development and progression of cancer.

My laboratory focuses on a cell-secreted particle called exosomes and how they are altered by specific disease conditions. I first encountered with exosome when I was a third-year doctoral student. I was studying as a visiting graduate school student in the laboratory of Dr. David Lyden at Weill Cornell Medicine, where his lab had proposed the existence of a "pre-metastatic niche", which is a phenomenon where organ of future site of metastasis are readily changing its phenotype prior to cancer cells arrival. There, Dr. Lyden wanted for me to "explore the possibility that exosomes define the future metastatic site," in other words, to investigate whether exosomes secreted by cancer cells trigger the formation of the pre-metastatic niche. Exosomes are microvesicles produced by all cells, and were originally recognized as a cellular garbage disposal mechanism. However, Dr. Lyden's laboratory was one of the first in the world to promote a new understanding that normal cells take up exosomes produced by cancer cells, and that they transform their phenotype to a favorable environment for the cancer cells to metastasize. Eight and a half years of research at Weill

Cornell Medicine has helped me reveal that exosomal proteomics information not only define future metastasis sites, but also provide a variety of information such as whether a person has cancer or not, and what type of cancer they have.

In our laboratory, we are trying to understand how the information contained in exosomes changes depending on various pathological conditions, such as neurodegenerative diseases, autism spectrum disorder, Alzheimer's disease, and pregnancy complications, in addition to cancer. By studying the exosome functionalities in various diseases, we hope to elucidate the biological significance of the exosome as well as disease-specific mechanisms. Research in the field of exosomes is just beginning to develop, and I am looking forward to working with other laboratories from various fields to create an interdisciplinary research project.

Magnetic Nanotools for Imaging and Controlling Biological Functions

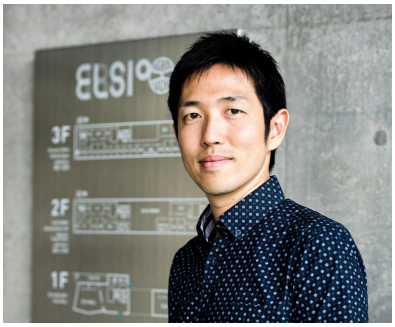
Satoshi OKADA
Associate Professor

I'm Satoshi Okada, a new Associate Prof. of Prof. Hiroyuki Nakamura lab at Laboratory for Chemistry and Life Science. I was a postdoc in MIT until 2018 and then worked in AIST as a researcher until getting the current position. Although this one year has gone so fast without knowing normal situation, I could fortunately start up and focus on the research. I'd like to thank Prof. Hiroyuki Nakamura and the lab members for the tremendous support for research and campus work.

My research is the development of MRI contrast agents detecting signaling molecules. I also work on the development of magnetic tools regulating biological functions. I'm always inspired by the researchers of various scientific fields in the School of Life Science and Technology. This experience is essential to understand needs of biologists in order to design the chemical tools. I'm looking forward to collaboration and keep the research going.

Using Synthetic Biology to Tackle the Origins of Life

Kosuke FUJISHIMA
Associate Professor



Hello, I am Kosuke Fujishima, who became a tenure track Associate Professor of Earth-Life Science Institute (ELSI) in October 2020 and also affiliated to the department of Life Science and Technology. In my research group, we mainly use synthetic biology to create various functional polymers *in vitro*, to elucidating the chemical reactions and molecular mechanisms that are important for early life. My major is

molecular biology, but through my research on the evolution of tRNA molecules involved in protein translation, I became interested in the origin of macromolecules such as proteins and RNA, which are essential polymers for life. Which brought me to U.S. to study astrobiology at NASA Ames Research Center. There are three fundamental questions in astrobiology: Where did we come from? Are we alone? Where are we going? These big questions go beyond the framework of life science, however, through collaborations with professors at ELSI, School of Life Science and Technology and others, I believe that we can reach a plausible and solid hypothesis. Last but not least, while COVID-19 has been difficult for all of us, I look forward to meeting and discussing the research with you in the near future.

Evolution and Chemical Origin of Life

Shawn McGLYNN
Associate Professor

We are interested in how life began and its history on Earth. We study biology in multiple systems to calibrate our thinking about how it works, how it has changed through time, and how specific chemical events created the self replicating entities we recognize today as cells.

• In our hot spring microbiology work, we are discovering new types of life in relationship to current and past environments.

• In our single-cell microbiology work, we study how populations are derived from the aggregate of individuals.

• In our work in protein evolution, we study how different protein families evolve and how enzyme catalysis left biological imprints on Earth in the form of isotope fractionations.

• In our chemistry work, we study how energy transfer reactions occur in the absence of life, focusing on redox reactions.

At Tokyo Tech, my main affiliation and place of research is at the Earth-Life Science Institute (ELSI) where we focus on understanding the origin of planets and life in the universe. With my recent affiliation to the School of Life Science and Technology, I am excited to form new research collaborations, and also to promote educational activities. I look forward to collaborating with you all. Let's do good work together!

I'm Looking Forward to Working with You

Toru KONDO
Associate Professor（lecturer)

I joined the Department of Life Science and Technology as a tenure-track lecturer associated

with the Leading Initiative for Excellent Young Researchers (LEADER) of MEXT from November 2020. I opened my own lab to carry out a biophysical research using the advanced microspectroscopy.

My research interests focus on the relationship between the protein dynamics and its function. For the last quarter-century, a huge knowledge of protein conformations has been provided by novel structural analyses, revealing the structure-function relationship in biological systems. However, how the protein structural dynamics, such as conformational fluctuations and local distortions, contribute to its function is still unclear despite the importance and should be a new frontier in the biophysical research field. To answer the question, I apply the single-molecule spectroscopy to chromoproteins. Furthermore, I work on developing a spatiotemporal microscope incorporating femtosecond laser technologies to visualize an ultrafast and microscopic photophysical process in biological systems. I attempt to understand familiar (but mysterious and attractive...) biological phenomena at the macroscale from a physical perspective at the microscale.

My group welcomed two undergraduate students, and now we are establishing a laboratory. I believe they can enjoy the science by proactively tackling a lot of challenges through their research activities. Additionally, I hope they will be a truly educated person who is not just any professional but has a wide range of interests and can consider from a multilateral viewpoint.

Several months have already passed since I came here. I really appreciate great support during the period from faculty members, office clerks, and facility staffs. I will keep on doing my best for both research and education. I am looking forward to working with all members of the Life Science and Technology department and Tokyo Institute of Technology.

Metal Ion Working in Living Organisms

Hidehiro ITO
Assistant Professor

I was appointed as an assistant professor in Kamachi Laboratory in February 2020. I received my Ph.D. from the Department of Bioengineering, Graduate School of Bioscience and Biotechnology, Tokyo Institute of Technology in March 2013, and worked as a specially assistant professor at the Education Academy of Computational Life Sciences and JST-ALCA project. I appreciate the support of the members of Life Science and Technology from the time I was in the doctoral program and later as a specially assistant professor. I will take this opportunity to further my research and education as a member of Life Science and Technology.

I have studied bioinorganic chemistry targeting metal ions working in living organisms

since my doctoral course. I have been working on the production of useful substances using metalloproteins such as redox enzymes and electron-transfer proteins, as well as on the use and mechanisms of microorganisms that respond to metal ions. In particular, I research on methanotrophs, which use methane as their sole carbon source. I have recently researched on the utilization of C1 compounds, including light-driven methane oxidation combined with photosynthetic reactions and methanol production by adding metal ions using genetically modified bacteria. In addition, based on the experience in organic synthesis that I cultivated until my master's degree, I have developed oxygen probes using oxygen-responsive metal complexes and used them for imaging of oxygen or small molecule compounds in cells using confocal microscopy. In combination with other fluorescent probes, I am conducting research aimed at elucidating the reaction mechanisms in vivo by observing oxygen dynamics in the biological activities of various cells.

After I arrived at my new position, COVID-19 required us to deal with lectures, research activities, and university tasks differently than before. It made me think about how I should develop my research and educate students at this turning point of the times. Gratefully, I had the opportunity to participate in the young researcher development program and to conduct joint research with professors inside and outside, which allowed me to formulate a plan for the future. I am determined to devote myself to this goal every day, and I look forward to your continued guidance and encouragement.

Greetings

Junichi YAMAMOTO
Assistant Professor

I was appointed at the School of Life Science and Technology as an assistant professor in March 2020. I feel nostalgic and excited to return to Tokyo Institute of Technology as a faculty member, where I spent my undergraduate and doctoral years.

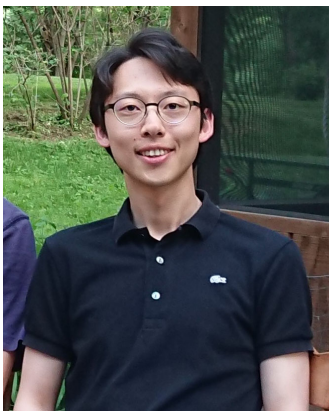
Previously, I was involved in research on the pharmacological effects of thalidomide derivatives at Tokyo Medical University. Although thalidomide is famous for its serious teratogenicity, it was later confirmed to have useful pharmacological effects, such as anticancer effects on blood cancer, and returned to the market. Today, thalidomide derivatives have established themselves as a first-line drug for the treatment of multiple myeloma. The mechanism of action of thalidomide derivatives is unique in that they lead to the degradation of specific protein targets, and this "protein degrader" is attracting attention as a new modality for drug discovery. Since assuming my current position, I have been working on elucidating the molecular mechanism of drug

resistance to thalidomide derivatives and on research aimed at target-derived drug repositioning.

I would like to contribute to the development of our university. I'm looking forward to working with you.

Exploring the potential of immunobiosensor and molecular evolution

Bo ZHU
Assistant Professor



I am honored to serve as an assistant professor in the Ueda/Kitaguchi Lab at Tokyo Tech since May 2020. As an international alumnus of the Global 30 Project and Leading Graduate Schools Program of Japan, this is my treasurable opportunity to contribute to the Japan society in return. I received my Ph.D. degree at Nagoya University in 2016. After that, four years of post-doctoral researcher experience at the University of Minnesota and Kobe University strengthen my faith to pursue my career in academia.

My research background is about high-throughput molecular evolution technology and protein engineering. I started my immunobiosensor-related work with Prof. Ueda in the middle of this COVID-19 pandemic. The SARS-CoV-2 recognizing biosensor with fast response (1-minute) was successfully developed during this period. I was also attracted by the release of the Tokyo Tech Future Chronology last year, which is currently consisting of 24 Future Scenarios. Connecting my future studies to some of these scenarios will be one of my working directions.

Tokyo Tech is hosting over 1,700 international students by May 2020, which makes it a nice platform for both international and domestic students to build a global vision. I understand how important the English-based education and cross-culture teamwork training are for students who would like to pursue their careers at a global level, and I would like to try my best to promote them.

In the end, I wish everyone in the School of Life Science and Technology and Tokyo Tech stay well in this with/post-corona age, and let's turn this challenge into the energy for building a more brilliant future society.

Greetings

Taiki MORITA
Assistant Professor

I started my career as an assistant Professor in Nakamura-Okada lab in April 2020, though I have spent a total of 10 years in this university.

In 2010, I entered this university as an undergraduate student belonging to Class 3. After graduation, I went on to Department of Applied Chemistry, Graduate School of Science and Engineering in the same university. Having completed master's course, I belonged to School of Life Science and Technology in 2016. Then, I was awarded my Ph.D. in organic synthesis from Tokyo Institute of Technology in March 2019. Before I came back here, I worked as a researcher in Sumitomo Chemical Company for one year. I'm so glad and excited to restart research activities with a lot of excellent students in Tokyo Tech.

Throughout my research life, I have been working on heterocyclic chemistry to provide novel derivatives. It should be noted that there are still many compounds which are not accessible by already established synthetic methods. In addition, chemistry of some unique and potentially useful heterocycles is yet premature to produce a variety of derivatives. Given these backgrounds, I have challenged organic transformation of those heterocycles to generate my original compound library. I'm looking forward to delving into the heterocyclic chemistry and challenging new projects. Thank you in advance for your support and cooperation.

Events

Open Campus Online 2020 for high school and prospective students

Akihiro OHKUBO
Associate Professor

The Open Campus (abbreviated as OC) Online 2020 was held on Saturday, November 8th, 2020. The OC at Tokyo Tech has been recognized as an annual summer event by high school and prospective students, but this year it was held in the autumn to prevent the spread of the new coronavirus infection. Although there was concern about reducing the number of participants due to change to the online event and the delay in the holding period, many motivated students participated in the OC Online.

The online OC had 60 programs containing 4 programs for School of Life Science and Technology: "Orientation for School of Life Science and Technology ", two "Academic lectures", and "Round-table discussion by the current students ". I think the participants had a fun day through various events.

Orientation for School of Life Science and Technology

At the orientation for School of Life Science and Technology, Dean Kondoh and Professor Tokunaga introduced the unique educational curriculums and the attractiveness of cutting-edge life researches in our school. In addition, there was an explanation about the new system of university entrance exams, which will be

introduced in 2021. The participants were actively asking questions.

The academic lectures were "Nucleic Acid Medicine to Cure Intractable Diseases" by Associate Professor Seio and "Regenerative Medicine for Diabetes -Making Pancreas from Stem Cells-" by Associate Professor Shiraki. Both lectures explained in detail the contents from the basics to the application, which were highly attractive for the participants.

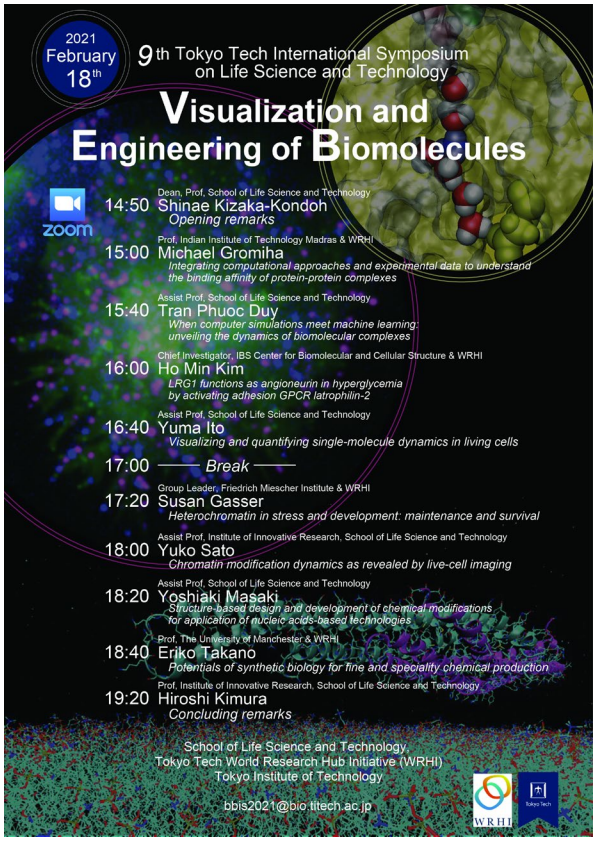
In the roundtable discussion, 12 undergraduate and graduate students participated and introduced the campus life including lectures and club activities. Many participants were interested in the talks and asked a lot of questions until the end of the session.

While OC aims to explain entrance examinations and campus life to high school and prospective students, it is also an excellent opportunity to convey our school's appeal.

OC online 2021 will be held in April and August. All members of our school will work together for these events under the next OC leader, Associate Professor Tsutsumi.

The 9th Bioscience and Biotechnology International Symposium

Satoshi MURAKAMI
Professor
Hiroshi KIMURA
Professor



On February 18, 2021, the 9th International Symposium on Bioscience and Biotechnology was held jointly by the School of Life Science and Technology and the Tokyo Tech World Research Hub Initiative (WRHI). The theme of this year's symposium was "Visualization and Engineering of Biomolecules". Four overseas speakers (WRHI faculty) and four young researchers from Tokyo Tech gave talks. The topics discussed ranged from basic research on the visualization of biomolecules to their application, which is in line with the idea of the School of Life Science and Technology to develop bioscience from basics to application. In order to prevent spreading SARS-CoV-2 whose pandemic has been continued for a year, this conference was the first to be held online using Zoom. Even so, it was a great success with 248 registrations and over 100 participants throughout the conference.

Dr. Michael Gromiha (Indian Institute of Technology Madras, India) presented his research on prediction of protein-protein interactions using computational science. Dr. Ho Min Kim (Institute for Basic Sciences, Korea) presented structure and function of proteins with leucine-rich repeats and their physiological function. Dr. Susan Gasser (Institute for Experimental Cancer Research, Switzerland/Friedrich-Miescher Institute for Biomedical Research, Switzerland) presented the role of histone methylation in the regulation of gene expression. Dr. Eriko Takano (University of Manchester, UK) talked about the synthetic biology center at the University of Manchester. We also had a presentation by Tokyo Tech young researchers, including Dr. Tran Phuoc Duy talking a new molecular dynamics method for protein structure analysis, Dr. Yuma Ito who presenting a single molecule imaging method to reveal the real-time dynamics of proteins in cells, Dr. Yuko Sato presenting a technique for in vivo visualization of protein translational modifications to elucidate the regulatory mechanism of gene expression, and Dr. Yoshiaki Masaki introducing his latest research on RNA degradation by antisense oligos for nucleic acid medicine.

In the field of life science research, it is extremely important to understand the function and 3D structure of proteins, based on imaging at different levels from atoms and molecules to cells and tissues and cells. Technological innovations and the development of new functional molecules have made it possible to discover phenomena that were previously difficult to visualize, such as the temporal disassembly and movements of molecules in cells. The new insights gained by these approaches will lead to the development of applied research including drug discovery. At the Tokyo Institute of Technology who is going to create an international center of excellence in manufacturing, we believe that this symposium provided an opportunity for discussion in the field of life sciences.

In addition, under the restriction of people's movement now in the pandemic situation, this symposium provided an opportunity of international exchange to stimulate students and young researchers.

Awards

FY2020 Minister of Education, Culture, Sports, Science and Technology Award (Research)

" Human gut microbiome study in colorectal cancer development "

Takuji YAMADA
Associate Professor

Colorectal cancer has surpassed stomach cancer as the most common cancer in Japan. It is thought that the westernization of lifestyle, including diet, is the cause, but its mechanism is not clear.

The number of cells in the human body is about 37 trillion, and the number of intestinal bacteria per person is about 40 trillion, weighing about 1 to 1.5 kg. In 2012, Fusobacterium nucleatum, which is known to cause periodontal disease in the stool of patients with colorectal cancer, has been reported to be present in large numbers and has been verified.

Colorectal cancer develops through the formation of polypoid adenomas and intramucosal carcinoma, which can eventually progress into more advanced forms, which is called multi-stage carcinogenesis. Although a number of bacteria have been associated with advanced stages of colorectal cancer, those that are associated with colorectal polyps (adenomas) and intramucosal carcinoma at very early stages have not been identified. In addition, colorectal cancer associated metabolites have rarely been studied in stool samples.

In this study we collected frozen stool samples from patients with colorectal cancer and performed metagenomic and metabolomic analyses. As a result, we identified bacteria and metabolites in the stool of patients with multiple polyps (adenomas) and very early colorectal cancer (intramucosal carcinoma).

Our research requires a multidisciplinary collaboration with a team of medical doctors in clinical practice, a bioinformatics team, and an experimental team. Thanks to the efforts of many collaborators and cooperators, we were able to accomplish the research series for which we received this award. I would like to take this opportunity to thank all of them.

In addition, we will continue to collect various types of data from clinical practice based on joint research and further develop research from this data through strong collaboration and cooperation with a wide range of researchers in Japan and overseas while integrating with many other fields.

JST Brilliant Female Researchers Award

Ayuko HOSHINO
Associate Professor

As one of its efforts to promote the activities of female researchers, JST has established the "Brilliant Female Researchers Award" in 2019 to honor female researchers who are conducting outstanding research that contributes to a sustainable future society, as well as institutions that are supporting female researchers' activities. The selection criteria are based on research achievements, having global perspective, and involvement in community services. I am honored to be awarded the 2nd Brilliant Female Researchers Award (The JST President Award) in recognition of my eight and a half years of overseas research experience and achievements, as well as my continuous activities on accepting and planning an event for Japanese students to experience and learn about what it is like to conduct research overseas.

I first encountered with exosome in the laboratory of Dr. David Lyden at Weill Cornell Medicine in New York. Exosomes are 30-150 nm vesicles produced by all cells, and were originally recognized as a mechanism to dispose of cellular waste. However, recently, it was discovered that exosomes released from cells can be taken up by other cells, therefore, are attracting attention as a new tool for intercellular communication. I was awarded with the JST President Award for my research conducted while I was at Lyden lab, demonstrating that cancer cell-derived exosomes are involved in the mechanism for preparing a favorable niche to form organ-specific metastases, which was published as an article in a journal Nature. Moreover, we reported that proteomic analysis of plasma-derived exosomes can be used to determine the presence or absence of cancer, or even to identify cancer types, which was published in a journal Cell. We believe that these findings have the potential to be applied to a wide range of cancer diagnostic methods, as well as a novel therapeutic strategy to target exosomes to suppress metastasis. Behind the scene of our publications, at the time when I first joined the Lyden Lab, many researchers were questioning the involvement of exosomes in the development of cancer and some even didn't believe in the existence of exosomes. However, because Dr. Lyden continued to believe in her hypothesis and guided us, we were able to believe in our research as well and were able to pull through the tough times.

The Brilliant Female Researchers Award was established in cooperate with the Ashida Fund, which was established by the fashion designer Jun Ashida for the purpose of nurturing the younger generation. Jun Ashida's daughter, Tae, who has taken over the brand after her father, was present at the award ceremony. According to Tae, Jun Ashida, now a world-famous designer, had gone through tough times at first because his relatives said it was shameful for a man to design dresses for women and tried to convince him to stop designing. Even so, he never stopped and continued to work as a designer, and became a globally recognized designer. Award shield I received at the ceremony has engraving, "Follow the path you believe in. Even if the road has only few people

walking.", which was a phrase from Jun Ashida. Dr. Lyden continued to believe in the existence of the exosomes that contributes to cancer progression, and successfully reported the function. Together with my lab members who have trusted and decided to walk with me, I too, am determined to follow the path I believe in to accomplish my research goal, even if it is a "path with very few people". I hope this path will be a successful one, and will greatly appreciate any guidance and support from the members of the Tokyo Institute of Technology.

Picture taken with Tae Ashida (right), holding the Award shield with message engraved.

Bioindustry Research Award 2020

“ Bio-Adhesive Optoelectronics for Emerging Photodynamic Cancer Therapy”

Toshinori FUJIE

Associate Professor (Lecturer)

The Bioindustry Research Award recognizes promising researchers engaged in research aimed at applications related to bioscience and biotechnology by the Japan Bioindustry Association. From the perspective of further leap in this field and promotion of industrialization of research results, the award aims to widely recognize the achievements of the award winners, deepen their understanding of the importance of biotechnology, and further promote research and development.

This research was carried out under a biomedical-engineering collaboration system, and I am very pleased that the research results, which are packed with the efforts of various researchers, were evaluated in this occasion. I would like to take this opportunity to express my sincere gratitude to the collaborators and students in the laboratory. I would also like to thank Prof. Hisakazu Mihara for his recommendation.

In this study, our group developed an implantable light-emitting device and demonstrated a novel photodynamic cancer therapy (PDT) for the first time in the world. In particular, the development of a bio-adhesive technology for stably fixing the light emitting device to the living tissue became a breakthrough. We have then succeeded in continuously activating a photosensitizer (a type of anticancer drug) by operating a light emitting device embedded in the living body by wireless power supply. The results of this research are

expected as an advanced medical technology that will expand the applications of PDT, which is already covered by insurance in Japan. In the future, we will aim for social implementation of this technology by strengthening industry-academia joint research. We will continue to make efforts in research and development so that this technology can be delivered to patients, their families, and medical professionals fighting cancer as soon as possible.

Lecture at the award ceremony

2020 JBC Herbert Tabor Early Career Investigator Award

Ayumi NAGASHIMA
Assistant Professor

It is my great honor to receive the 2020 JBC Herbert Tabor Early Career Investigator Award. This award was established in honor of the late Dr. Herbert Tabor (1918-2020), who served as Editor-in-Chief of Journal of Biological Chemistry (JBC) from 1971 to 2012. The award is given to the early-career first authors of JBC papers published in the previous year. The winners will be invited to give talks at the annual meeting of The American Society for Biochemistry and Molecular Biology (ASBMB). I was originally scheduled to give a talk in April 2020, but it was postponed due to my maternity leave. Since the 2020 meeting was cancelled due to COVID-19, and the other 2020-award-winners also had to postpone their talks, we will all end up giving our talks together at the 2021 meeting.

Our award-winning research was aimed at revealing the molecular mechanism of volatile sensing in plants. Using tobacco as a model, we identified volatile compounds released in response to stress and receptor like molecule involved in volatile sensing.

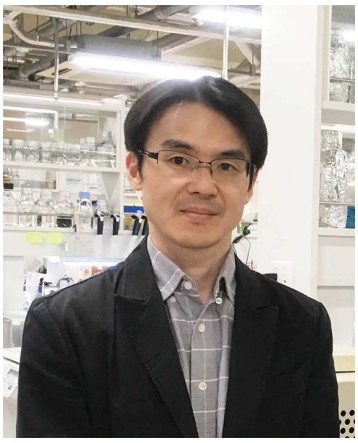
I would like to express my gratitude to Prof. Kazushige Touhara of the University of Tokyo, to my collaborators who taught me how to handle plants and the basics of organic synthesis, and to the many people who supported my research. I would also like to express my deepest gratitude to the professors of the School of Life Science and Technology who visited me when I presented this research at the conference, and to all those who were involved in the publication of the award-winning article on the Tokyo Tech website. The article led to an opportunity for me to give a talk at the Tokyo Tech Research Showcase. This award made me realize again how many people support me, including

administrative staff, students and even staffs who retired from Tokyo Tech. I would also like to express my heartfelt gratitude to the Associate Editor of JBC who suggested that I postpone the award lecture due to my maternity leave, my husband who supports me every day, and my children whom my pride and joy. Encouraged by this award, I will continue to push forward with my research on the sensory physiology of plants and other organisms.

Young Scientist Initiative Award of the Society of Evolutionary Studies, Japan

"Genome evolutionary studies on mammalian transposable elements"

Hidenori NISHIHARA
Assistant Professor



It's an honor to be awarded the 2020 Young Scientist Initiative Award of the Society of Evolutionary Studies, Japan. My research deals with transposable elements, specifically retrotransposons, which are DNA sequences that can amplify their copy sequences and occupy nearly half of the human genome. They are traditionally recognized as harmful mutagens or parasitic sequences that are of no use in the genome. However, it has recently been discovered that a part of the retrotransposon sequences among the large number of copies have important functions in the genome. I believe that transposable elements have contributed to the morphological evolution such as the secondary palate and mammary glands in mammals, by generating a large number of gene regulatory sequences during evolution. I found molecular evidence for this hypothesis through various approaches, and I feel that the importance of retrotransposons is finally being recognized by the world.

Finally, I would like to express my deepest appreciation to my professors, collaborators, and everyone who has supported my research activities. I would like to continue more interesting evolutionary research on mammalian genome evolution.

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 2020, two graduate school students won Ohsumi Journal Award.

Ms. Mariko Takeuchi (Hongoh Lab)

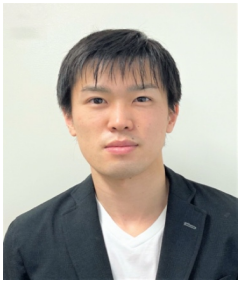
"Parallel reductive genome evolution in *Desulfovibrio* ectosymbionts independently acquired by *Trichonympha* protists in the termite gut"

The ISME Journal

Mr. Shun Sasaki (Kinbara Lab)

"Synthetic Ion Channel Formed by Multiblock Amphiphile with Anisotropic Dual-Stimuli-Responsiveness"

The Journal of American Chemical Society



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 2020, two graduate school students won Chorafas Award.

Dr. Wakako Sakamoto (Maruyama Lab)

"Cationic Comb-type Copolymers act as Chaperones for a Membrane fusogenic E5 Peptide"

ACS Biomaterials Science & Engineering

Dr. Ingrid Rosenburg Cordeiro (Mikiko Tanaka Lab)

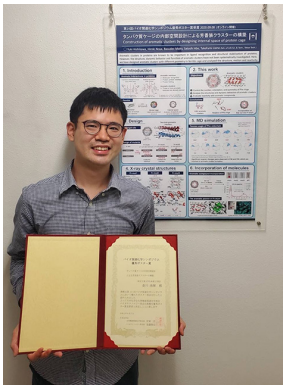
"Environmental Oxygen Levels and the Evolution of Interdigital Cell Death in Tetrapods"

Developmental Cell

Presentation Awards in Symposium

Mr. Yuki Hishikawa (Ueno Lab)

The 14th Bio-Related Chemistry Symposium, Poster Award

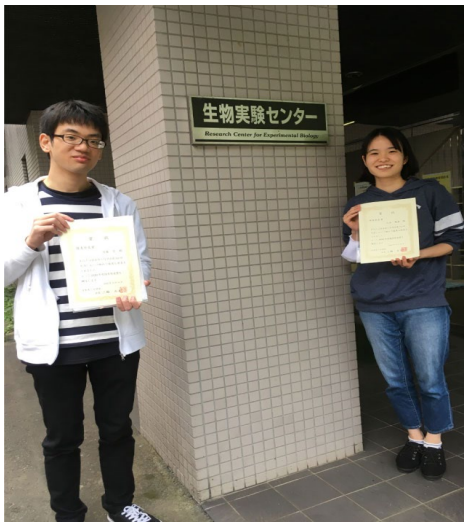


Mr. Hiro Kondo (Hirota Lab)

The Japanese Association for the Study of Taste and Smell, the 54th Symposium, Presentation Award

Ms. Satsuki Kitamoto (Hirota Lab)

The Japanese Association for the Study of Taste and Smell, the 54th Symposium, Presentation Award



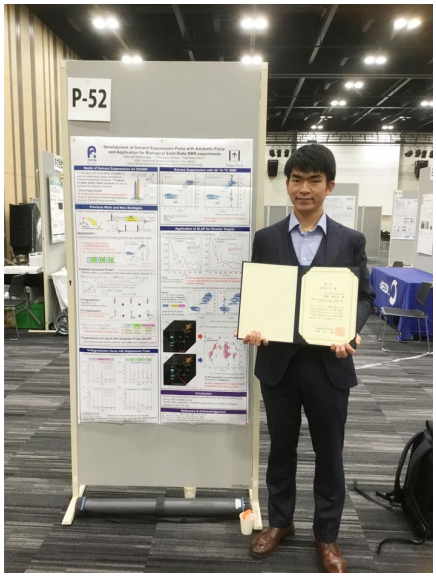
Left: Mr. Kondo, Right: Ms. Kitamoto

Mr. Riki Kawamura (Nikaido Lab)

The Japanese Association for the Study of Taste and Smell, the 54th Symposium, Presentation Award

Mr. Ryotaro Okabe (Ishii Lab)

The 59th Annual Meeting of the Nuclear Magnetic Resonance Society of Japan, Poster Award



Mr. Yasunobu Asawa (Nakamura-Okada Lab)

The 10th CSJ Chemistry Festa, Poster Award

Mr. Masato Tsuda (Nakamura-Okada Lab)

The 10th CSJ Chemistry Festa, Poster Award

Left: Mr. Tsuda, Right: Mr. Asawa

Other Awards

Ms. Moe Takahashi (Taguchi Lab)

2020 Tokyo Tech Award for Student Leadership

Ms. Takahashi (The front row, Second from the right)

Ms. Nodoka Chiba (Yamada Lab)

Yokohama Business Grand Prix with proposed dietary guidance service

Right: Ms. Chiba

From International Student

Shiela Marie Gines SELISANA

Being in Japan and pursuing doctoral studies in Tokyo Tech, one of the best universities in the world, make me feel like I'm living the dream. Without a doubt, Japan is one of the top leaders in the field of science and technology with its state-of-the-art facilities and high-caliber scientists. Japan is also highly recommended for travel enthusiasts like me due to many picturesque places, with each season offering a different scenery.

I have been affiliated with Tokyo Tech for 1.5 years now. I first entered Tokyo Tech as a non-degree research student last October 2019. Half a year later, I started my doctoral studies in Kajiwara-Orihara Laboratory. I skipped the MS program at Tokyo Tech because I already got my Masters of Science degree in Microbiology from my home country, the Philippines. My research work revolves around *Candida auris*, a fungal pathogen designated as a global public health threat by the Centers for Disease Control

and Prevention, and its interaction with the innate immune system. Specifically, I am looking at the changes in the exposure of pathogen-associated molecular patterns in the cell surface of *Candida* and its influence on the activities of macrophages such as phagocytosis. A thorough understanding of host-pathogen interaction is indispensable. The results of my research will shed light on the dynamics of β-glucan exposure in *C. auris* which could help researchers understand better the immune response against the multidrug-resistant *C. auris*. Ultimately, this research could help in developing novel strategies in treating *C. auris* infections.

Kajiwara-Orihara Laboratory is quite diverse in terms of specific research topics but the general research themes of our laboratory are immunology, chronobiology, medical microbiology, and molecular biotechnology. I am very grateful to my advisers, Prof. Susumu Kajiwara and Prof. Kanami Orihara, for all the support and guidance in my research work. Also, I am highly indebted to Monbukagakusho (MEXT) for the scholarship that helps me sustain my life and studies in Japan.

Editor's Note

Looking back the year of 2020, it was truly a year of Covid-19. The "State of Emergency" were twice announced; first between April 7th and May 25th, and second, between January 8th and March 21st in Tokyo area. As you all know, the daily life, studies and research of both the students and the faculties were heavily damaged. Thanks to the efforts and struggles by the people on the campus, the best possible countermeasures were able to be taken. However, we all felt that all the possible "goodies" of the university that we had formerly taken for granted, were swiftly swept away. We are still not so optimistic on how the situation could be in a year from now when we are again editing this news-letter, and whether the Covid is gone by the time when the vaccine prevails.

Nonetheless, we thank all the contributors who have submitted the articles for this news-letter, despite this insecure situation, and are always proud of being able to introduce your activities.

We hope you all will have a bright and covid-less future.

(Takashi SUZUKI, editor-in-chief)