Contents

Dean's Message

A New Era: Our Initiatives as a Designated National University

Hisakazu MIHARA
Professor, and Dean of the School of Life Science and Technology

2019 is well underway. This will be the final year of the *Heisei* era, and the first year of a new one, the *Reiwa* era.

Since the School of Bioscience and Biotechnology. was established in 1990, this year will mark our thirtieth anniversary, having more or less traced the thirty years of the Heisei era. Those who first graduated from the undergraduate program in our department are also now into their fifties. The thirty years of the Heisei period, markedly different from the Showa era, have seen the rapid progress of the shift to an information society and the accompanying phenomenon of globalization. In the sciences, Heisei was an age of interdisciplinary fusion, an era when chemists advanced the fusion of chemistry and biology using the methods of molecular biology and cell engineering. Moreover, the development of genomics has contributed dramatically to the informatization of biotechnology. In the new era to come, as well, the creation of international knowledge through developments in the life sciences promises to be increasingly valuable. This will also engender a foundation for the creation of new industries, and it also promises to be an era when knowldge in the life sciences becomes more closely linked to industry and society. To that end, it will be important for the young researchers who are to play a leading role in the next generation not only to build "bonding" relationships inside their own organizations and fields, but also from there to establish "bridging" environments conducive to the construction of broad-based collaborative relationships that extend beyond international and disciplinary boundaries.

In 2018, the Tokyo Institute of Technology was approved as one of Japan's "*Designated National Universities.*" The Designated National University Corporation System is an initiative whereby Japan's Ministry of Education, Culture, Sports, Science and Technology, in an effort to spur the creation of innovation and significantly improve the level of education and research at Japanese universities, designates national university corporations expected to develop their education and research activities at the highest global standards to a considerable extent. Following the nationwide selection of the University of Tokyo, Kyoto University, Tohoku University, and Nagoya University, our own University and subsequently Osaka University were chosen, so that the total number of universities designated as national universities is now six.

In April 2018, Professor Kazuya Masu was chosen to succeed Professor Yoshinao Mishima as University President, ushering in a new university executive and marking the start of our activities as a Designated National University. Our Designated National University concept, as well as aiming "to explore new possibilities in science and technology and open up a new era through dialogue with society," consists of initiatives intended to achieve our long-term goal of becoming "the world's paramount science and technology-oriented university." The specific details of our initiatives have been formulated in relation to five outcomes listed below that pertain to education, research, social partnerships, and management. Each initiative will be promoted while linking them together in an organic fashion. In doing so, it is our aim to contribute to the society that surrounds our school—and by extension all of human society—through such means as producing talented personnel through more sophisticated education and research activities and finding solutions to social problems by giving the outcomes of our research back to society, thereby sharing in and helping to realize an affluent future society.

The five outcomes I refer to are (1) reinforced student-centered learning and diversification of student and faculty population, (2) enhanced global recognition of Tokyo Tech research achievements, (3) opening up of new, interdisciplinary fields of research, (4) strengthened engagement through idea transfer from new fields, and (5) self-sustainability in education and research activities. As part of these activities, we have also established two new organizations, namely the Laboratory for Design of Social Innovation in Global Networks (DLab), which seeks to imagine a "different future" along with society, and the Organization for Fundamental Research, which aims to cultivate researchers who will be global leaders in their fields. For more details, please visit the University website (https://www.titech.ac.jp/english/about/president/message /newyear2019.html).

Thus, within the Tokyo Institute of Technology, which has undertaken these actions as a Designated National University, our objective as the School of Life Science and Technology is "to aim to become a hub for the collaborative creation of life innovation knowledge." Our intention is to implement world-class education and research to produce large numbers of exceptional life science and technology personnel, to become an international hub for life science and technological research, and to continue to contribute to the solution of various social problems, such as by solving problems associated with health, medicine, and the aging society and by creating environmentally friendly materials. In the twenty-first century, in particular, I believe that scientific and technological research aimed toward the realization of a "biotechnologically driven society" that does not rely on petroleum or other fossil fuels will be extremely important,

and our aim is for the School of Life Sciences and Technology to take up a central position in this endeavor.

I would like to offer my wishes for everyone's unflagging effort and development, that our new era should be wonderful for us all. As a final consideration, I should mention that the Life Science and Technology Alumni Association has become activated after an interval of almost ten years, and the 2019 Alumni Association is planning to hold a major reunion that will see the participation of alumni as well as former and current faculty members at our Ookayama Campus on Saturday, July 6. The Alumni Association has also launched their own website (http://www.bio.titech.ac.jp/english/). By all means, I hope that you will take a look and register for the association. In addition, the laboratories of the School of Life Science and Technology are always open to everyone. Once again, I would like to thank the Alumni Association and everyone else for your continued support and cooperation.

On Retirement

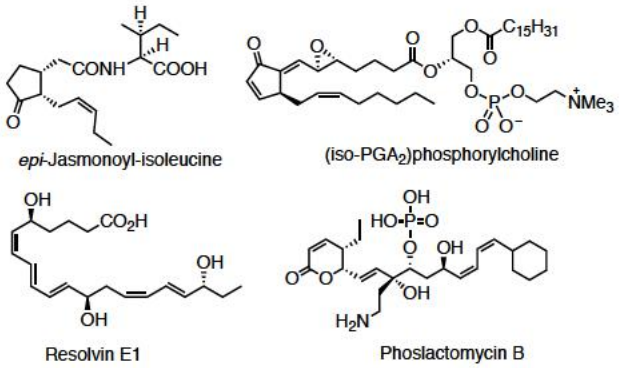
Yuichi KOBAYASHI
Professor

My research career started with Professor Fumie Sato, who invited me as an assistant professor in his lab at Tokyo Institute of Technology (Tokyo Tech). We directed our research to development of new reactions and their application in organic synthesis. Ten years later, we moved to a new biotechnological department in Tokyo Tech, and shifted our research to biochemistry based on organic synthesis. However, biochemical researches using compounds we synthesized required much time, and spent several years in vain. The unsuccessful results suggested that collaboration with biologists would be suited for me to contribute our research to biochemistry. At that moment I became an independent researcher.

Compounds with complex structures and biological properties are targets of organic synthesis. Selection of specific compounds on the basis of structure was an easy task for me, whereas selection based on biological properties that really attracts biochemists was made with advices from professors in the faculty members of bioscience and biotechnology. As a result, we have succeeded in synthesis of many compounds (some are shown below), and professors not only in this faculty but also in the world could obtain new biological results using our compounds. For example, the cis stereochemistry of the side chains in *epi*-jasmonoids was found to be important to activate the plant defensive systems, phoslactomycin B possessing amino and phosphoric acid moieties possesses

cytotoxic as well as antibacterial property, and metabolites of ω3-polyunsaturated fatty acids known as resolvins facilitated anti-inflammatory and pro-resolving studies at molecular levels.

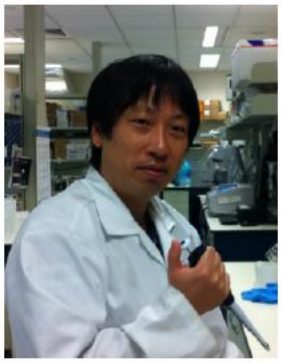
I sincerely acknowledge students, post-doctoral fellows, and staffs, who contributed to researches in my laboratory.



From New Staff

Technology to make invisible things visible

Tetsuya KITAGUCHI
Associate Professor



In April 2018, I joined Laboratory for Chemical and Life Science, Institute of Innovative Research, Tokyo Institute of Technology. I have studied in various cities such as Tokyo, Tsukuba, Wako, Maryland USA, Dortmund Germany, Kyoto, Wako, and Singapore. I have good memories in each places, and I look forward to the increase of memories in Suzukakedai.

My research area is "bioimaging". This is the technology to visualize and analyze the dynamics of molecules in living cells, tissues and whole bodies. At the beginning of my research, I visualized fixed cells by using immunohistochemistry and in situ hybridization. However, these methods could not visualize the dynamics of molecules in living cells over time, and there are a lot of complaints at that time. Fortunately, this is the time when live-cell imaging using fluorescent protein began, I adopted the technology quickly.

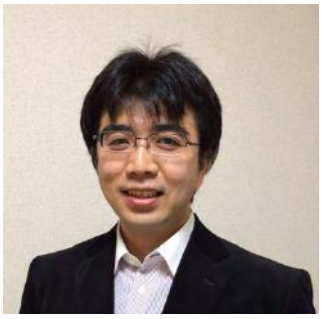
I have been developing various sensors based on multi-color florescent proteins for second messengers and molecules involved in energy metabolism so far, and will develop new sensors in Tokyo Institute of Technology because there are many molecules and phenomena that I still would like to visualize. Furthermore, I will also develop the technology to manipulate molecules and phenomena from the outside of the living cells. By using both technologies, we will be able to visualize and manipulate mutual and hierarchical interaction between multiple molecules for understanding cell physiology and pathology more in detail.

Finally, I will study with many students at Suzukakedai campus. Students have to learn to find and solve their own problems by themselves. Therefore, when students get stuck in research, I do not just teach the solution of

the problem, but show the attitude to think and explore together. I would like to support them to acquire the ability to overcome various difficulties with their own power.

Construction of artificial cells and artificial cell nuclei based on biophysics of biological soft matter

Masahiro TAKINOUE
Associate Professor



I have participated in Department of Life Science and Technology from August 2018. My major is biophysics. I have been studying in Suzukakedai campus since 2011, and therefore I have already interacted with many faculty members and students in Department of Life Science and Technology.

In my laboratory, we define “Life = Matter + Information”, that is, a life system is regarded as a matter system that possesses information and can manipulate the information by itself. I am interested in how to realize complex dynamical functions as life systems exhibit from matter. Specifically, we are constructing artificial cells using biological soft matter such as DNA/RNA, lipids, emulsions and gels. We are studying based on experimental methods for manipulating nano/micro-scale biological soft matter such as DNA nanotechnology, molecular robotics and microfluidics, and also mathematical methods about simulations of biomolecular reaction network, and coarse-grained molecular dynamics simulation of phase transition/phase separation phenomena of gels and droplets.

Recently, we achieved non-equilibrium open system reactors based on droplet microfluidics, and its application to nonlinear chemical oscillation reactions and cell culture technology. Also, we have constructed DNA microgels and microcapsules. We demonstrated that DNA microgels can be used as an artificial cytoskeleton for stabilization of artificial cells, and the reconstruction of a DNA network structure similar to cell nuclear chromatin structure and gel-droplet transition similar to the intracellular phase separation structure, which have recently received attention in cell biology. Based on these discoveries, we are now challenging the construction of an artificial cell nucleus as well as artificial cells. The fact that a system can be artificially created from biological soft matter indicates that biological soft matter intrinsically possesses such principles and properties. Thus, we think that the fact is very interesting not only in terms of application but also in basic science.

Because researchers from a wide range of fields such as biology, chemistry, physics, and computer science play an active role in Department of Life Science and Technology, I think that it would be highly appreciated that I could conduct research and educational

activities together with you. I am glad to make your acquaintance from now on.

Nexus of Nano, Bio and Electronics

Toshinori FUJIE
Associate Professor (Lecturer)

I was appointed as an Associate Professor (Lecturer) of the School of Life Science and Technology in November 2018 in the framework of Leading Initiative for Excellent Young Researchers (LEADER) by MEXT. This is the first time for me to have my own laboratory. From the end of the last year, with my students, we have been making a lot of efforts to lunch up the laboratory (e.g., painting the lab wall, moving research facilities from the previous institute, setting up common and experimental rooms, writing proposals for getting new budgets, and so on). Realizing the blooming of cherry blossom, we have enabled to initiate the research activity at last.

I have been working for innovative technologies for future medicine by making use of nanotechnology, handling one-millionth scale of millimeters. In particular, I have focused on the biomedical application of polymeric ultra-thin films (referred to as “nanosheets”) with unique dimensional structure close to the thinness of biological membranes. Such “ultra” thin and flexible nanosheets can be pasted inside the body without surgical suture or glue, therefore, applicable for wound dressing, anti-adhesion materials and drug release device.

Recently, I have also started to work for the development of flexible electronics and cell transplantation substrates by integrating nanosheets into printing technologies, which can be equipped onto skin and organs. Currently, my laboratory focuses on unique properties and functions of soft materials, originated from their dimensional structure like nanosheets. Then, I would like to apply these findings for monitoring and directing biological functions towards minimally invasive diagnostics and therapeutics. So far, I have several experiences of collaboration with life science and biomedical researchers. Please feel free to ask me if there are some problems in engineering biomaterials and devices.

Lastly, I really appreciate for strong support and kind advice from faculty members and staffs of our school upon launching my laboratory. I am very excited and looking forward to working with you.

Research on chemistry of life

Toshiaki KAMACHI
Professor

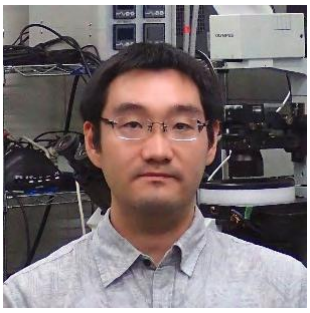
I was appointed as professor in December 2018. I majored biotechnology at Department of Bioengineering because it was a new department and the academic concept was pursuing further studies in the applied and fundamental aspects of biotechnology based on chemistry. After graduation form Department of Biotechnology as a doctor, I became Assistant Professor in Tokyo Institute of Technology. I promoted Associate Professor and moved to Nagoya University as a member of faculty exchange for three years before coming back to Tokyo Institute of Technology.

I major in bioinorganic chemistry. My research interests are focused on the investigation of reaction mechanism of metalloenzymes and application of them. I am also interested in a bioimaging, especially oxygen concentration imaging inside single cell under confocal microscope. In the oxygen imaging, metalloporphyrins are used for sensing molecules. So elucidation and application of the role of metal ions in biology are the main theme in my laboratory.

Finally I wish to contribute to the development of biotechnology field in Tokyo Institute of Technology by pursuing the research on bioinorganic chemistry.

Live-cell single-molecule fluorescence imaging

Yuma ITO
Assistant Professor



I was appointed as an assistant professor in the Tokunaga lab at the School of Life Science and Technology in March 2018. I previously worked in the Tokunaga lab as a research fellow, then as a specially appointed assistant professor for developing single-molecule fluorescence microscopy. Especially, focusing on the dynamics of biomolecules in living cells, I developed an observation system and analysis method to quantify the molecular dynamics at the single-molecule level. Single-molecule fluorescence imaging is a cutting-edge technology that aims at understanding biological processes by imaging individual molecules with fluorescence microscopy and related technologies. Single-molecule imaging is now used in various biological applications such as localization based super-resolution microscopy (PALM/STORM) and DNA sequencing. As recent studies of phase separation suggest, the dynamics of individual

biomolecules in living cells are also increasingly important. To extract new quantitative information about biological phenomena, I am now trying to establish new methods for analyzing single-molecule behaviors using technologies in molecular and cellular biology, optics and imaging analysis. Although single-molecule imaging has become affordable for many researchers thanks to highly sensitive cameras and bright dyes, further development requires steady improvements in each part of the system. By taking advantage of the manufacturing environment at Tokyo Tech, I hope to visualize molecular behaviors that conventional techniques are unable to resolve. I would appreciate your continued support.

Command atomic interactions with radio-frequency pulses!

Takayuki KAMIHARA
Assistant Professor

I was appointed as an assistant professor in Ishii lab in April 2018. After I received my Ph.D. degree from Kyoto University, I worked for NMR facility at RIKEN Yokohama as a postdoc. My research interests have mainly been in the development of techniques to improve sensitivity in solid-state NMR spectroscopy since I was a Ph.D. student.

In the NMR spectroscopy, we can pick up desired information as NMR signals by manipulating various interactions involved in the target nuclei with radio-frequency (RF) pulse trains. I calculate Hamiltonians modulated by RF irradiation, and then design and demonstrate new pulse trains for further efficiency.

Solid-state NMR is applicable even to insoluble and aggregated samples; this also gives further information, which is lost in solution-state NMR. Although too long experimental time owing to bad sensitivity used to be a bottleneck in solid-state NMR, recent dramatic development in both software and hardware expands the opportunities. I also aim to create a novel method to be a standard in solid-state NMR.

As you may have guessed, my background is in physical chemistry; as for biology, I have just begun to learn. Ishii lab also has just established here in Tokyo Tech.

Thank you in advance for your cooperation.

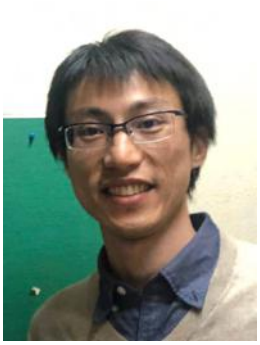
Functional synthetic molecules that mimic biomolecules

Kohei SATO
Assistant Professor

I was appointed as an assistant professor at the Tokyo Institute of Technology in April, 2018. I completed my PhD at the University of Tokyo in March, 2014, and then carried out postdoctoral research at Northwestern University until February, 2018. My research field includes natural product chemistry, organic synthesis, supramolecular chemistry, materials science and regenerative medicine. In Kinbara lab, I have been developing artificial molecules that mimic structures and functions of proteins found in nature. It is my great honor to be part of this prestigious department, and I am looking forward to collaborate with you.

Development of new chemical biology tools

Takayuki MIKI
Assistant Professor



In April 2018, I became an assistant professor at Mihara Laboratory, School of Life Science and Technology. I got a Ph. D from Prof. Hamachi laboratory in the Department of Synthetic Chemistry and Biological Chemistry at Kyoto University in March 2016, and worked for JSR Corporation from April 2016 to March 2018. In the doctor course, I have developed new chemical modification reactions of proteins applicable to molecular biology tools. One of them is the development of "conditional proteomics" that selectively labels and identifies proteins in a specific environment. We focused on zinc ions, which are believed to act as signal molecules in living context, and developed a zinc responsive reagent that is designed organic-chemically. We modified proteins under zinc rich local space in living cell by the reagent, and identified them by mass spectrometry, and revealed the composition of unknown zinc storage vesicles. In JSR company, I handled polymer composite materials, and engaged in basic research of rubber such as viscoelasticity

and structural analysis. My research way is to experience wide fields and to explore new research area. I will conduct innovative and interesting research with free ideas. Anyway, I also like to talk while drinking beer, and now I drink with someone at least once a week. I like to talk with the same generation (young) enthusiastic teacher, let talk and drink alcohol!

Scholarship students with Honorary Professor Yoshinori Ohsumi (fourth from left) and President Kazuya Masu (fifth from left)

Events

First awards ceremony for the Yoshinori Ohsumi Scholarship

Office of Public Engagement

The first awards ceremony for the Yoshinori Ohsumi Scholarship was held at the 70th Anniversary Auditorium on the Ookayama Campus on May 26, 2018. The scholarship was established for students enrolling in the bachelor's degree program at Tokyo Tech from 2018 onwards.

The ceremony was held prior to a special lecture by Honorary Professor Yoshinori Ohsumi on the same day, as part of Homecoming Day 2018. Five scholarship students who enrolled in the bachelor's degree program in April 2018 were presented with certificates for academic excellence by President Kazuya Masu.

The Yoshinori Ohsumi Fund was established in January 2017, after the professor, who was awarded the Nobel Prize in Physiology or Medicine in 2016, donated a large portion of his prize money.

Professor Ohsumi addressed the awardees by saying, "Congratulations to all the scholarship students. When I enrolled at university, I was impressed that students came from all over the country. Starting out at university is a very important time in your life. Rubbing shoulders with people from various backgrounds is a valuable experience during your time in higher education. We set up this scholarship fund in the hopes of increasing the number of students from rural areas who aspire to study here, which will in turn help revitalize the university. I hope you try a bunch of different things, associate with many people, and have a wonderful student life at Tokyo Tech."

This is the first time that the scholarship has called for applications, and a number of recommendations have been submitted by high schools, etc.* from all over Japan. From among these, five students who are successfully admitted to Tokyo Tech will be provided with a scholarship of 50,000 yen per month, in

principle, for four years (the standard duration of study) or less.**

* Excluding high schools, etc. located in Saitama, Chiba, Tokyo, and Kanagawa.
** When a student advances to the master's degree program at Tokyo Tech and satisfies the requirements, the student will, on a request basis, continuously receive the scholarship for two years (the standard duration of study) or less.

Honorary Professor Yoshinori Ohsumi delivering his message

The scholarship application will be open in September every year. For details, visit the following web page. We look forward to receiving recommendations for candidates from high school teachers and others.

Open Campus 2018 for high school and prospective students

Takashi SUZUKI
Associate Professor

The 5th Open Campus (OC) was held on Friday, August 10th, 2018. Over a couple of years, The Tokyo Tech OC has been established as an essential asset for high school and prospective students who are interested in our University. Using the summer break, as many as 12,000 students participated in this event, which is equivalent to the last year participants. While we were anxious about the unbearable heat which is quite common during this season, luckily enough, the weather was somehow cloudy, which helped the participants to go around and explore the campus.

For the first time, we had explanatory session of the new scheme for the entrance exam and our school, which will happen in the next year. We had four lectures this year, given by Professors, Junji Hirota, Tomoko Matsuda, Shinichiro Fuse and Kan Tanaka. Compared to the last year, there were a little bit more of vacant seats, however, the response from the audience was very positive, and I am sure they have learnt both the width and the depth of the exciting research done in our school.

Sample Lecture

Other events include (1) Consultations for the entrance exam, including the transfer admission exam from technical colleges, (2) Poster presentations from all laboratories, open labs to visit the real labs in Ookayama and Midorigaoka campus, and an informal salon for

discussion with (under)graduate students and professors, (3) Hands-on corner to get in touch with real experiments, and (4) Video presentation to introduce our school.

Since about a half of our students have participated in the open campus event, I felt even more that the open campus has become the greatest opportunity for us to directly tell the candidates not only the entrance exam scheme, but also to convey the strength and charms of our University and the school.

The next OC will be held on Saturday, August 10th, 2019. Since it is on the weekend, we are expecting more visitors than this time. I hope an exciting and prosperous OC under the next OC leader of our school, Nobuaki Shiraki.

Poster Presentation

The 6th Bioscience and Biotechnology International Symposium

Takashi HIRASAWA
Associate Professor
Takuji YAMADA
Associate Professor

The 7th Bioscience and Biotechnology International Symposium was held on Jan 10th of 2019, at Suzukake-Hall in Suzukake-dai campus. This year, the title of the symposium was &Microbes :Microbial Research as Scientific Links", focusing on microbial associated science, where we had two invited speakers were from abroad, three domestic invited speakers, and one invited speakers from Tokyo Tech. All the speakers gave excellent lectures on various aspects of microbial science, including fundamental basis to applied technology.

Two foreign speakers, Dr. Shota Atsumi (University of California Davis, USA) and Dr. Jihyun F. Kim (Yonsei univ, Korea) gave lecture on their pioneering work on the metabolic engineering and bioproduction of useful materials using cyanobacteria, and on genome analysis by long-term evolutionary experiments for E. coli respectively.

The domestic speakers, Prof. Masayuki Suetsugu (Rikkyo Univ.) introduced researches on chromosome replication in bacteria and a novel DNA assembly technology, and Prof. Kim Yun-gi (Keio Univ.) introduced research on cross-talk between host and intestinal microbiome in health and disease . Dr. Ken Takai (JAMSTEC) gave us a very exciting introduction on the extreme environmental conditions that can inhabit microorganisms. Prof. Yamamoto, from Tokyo Tech, introduced research on isolating new peptides from lactic acid bacteria.

The contents of in this symposium are highly diverse, and clearly shows that microbial research spread various research fields. Microbial research is expected to become more and more active in basic life

sciences, applied research, and even in market development beyond the academic field. The hot research introductions of the speakers may have inspired the researchers as well as the students.

The number of registered participants are 366, as many as those for the past six symposiums. We also had many participants in the reception. The organizing committee considers to continue this symposium so as to offer opportunities for young researchers and students to be exposed to cutting edge researches and world-leading researchers.

Awards

2018 Terry Galliard Medal

Hiroyuki OHTA
Professor

(from left) Prof. Ljerka Kunst, Ohta, symposium chairperson Prof. Ikuo Nishida

The Terry Galliard Medal is the most prestigious award presented to plant lipid researchers at the International Symposium on Plant Lipids, which began in 1974. The award was established in 1994, one year after the passing of Terry Galliard, the founder of the symposium. Twelve researchers have received this award in the past. I am honored to be the second Japanese national to do so after Professor Emeritus Norio Murata from the National Institute for Basic Biology, who received it 24 years ago.

This award is the result of 27 years of joint research with past and present students and colleagues at Tokyo Tech, particularly Associate Professor Mie Shimojima, who was one of the first students under my supervision and who continues to work with me to this day. It brings me great pride and joy to have conducted such internationally acclaimed

research with the outstanding students of Tokyo Tech.

Tokyo Tech Challenging Research Award

"Generation of bispecific small target-binding protein and its application to cancer treatment"

Tetsuya KADONOSONO

Assistant Professor

It is a gre at honor to receive 2018 Tokyo Tech Challenging Research Award. I greatly appreciate to Prof. Dr. Shinae Kondoh, Dr. Takahiro Kuchimaru, the lab members, and collaborators for their suggestions and contributions.

Monoclonal antibodies (mAbs) with high target specificity and binding affinities have received considerable attention as promising drugs for cancer and autoimmune diseases. However, mAbs have a large molecular size and complicated structure, leading to low tissue penetration and high manufacturing costs. To solve these problems, we have established an *in silico* computational method to design antibody mimetic small proteins with comparable affinity to antibodies. Based on this technique, we are working on the generation of bispecific small target-binding protein that induce anti-tumor immunity *in vivo*. Our approach may open a new avenue to develop practical molecular-targeting and imaging molecules for clinical use.

Tokyo Tech Challenging Research Award

"Electrochemical Antibody Modification and Application to Antibody-Drug Conjugation"

Shinichi SATO

Assistant Professor

It is an honor for me to receive 2018 Tokyo Tech Challenging Research Award. The award title is "Electrochemical Antibody Modification and Application to Antibody-Drug Conjugation". Antibody-Drug Conjugate (ADC) is one of the most attractive next-generation antibody drugs. So far, research has been actively conducted on the development of linker structures between antibody and drug, but there is a lack of methodology regarding the "conjugation method" between "antibody" and "linker". In this study, we developed the conjugation method of tyrosine residue at specific sites in the antibody structure using electrochemical

radical control techniques. I would like to thank to the laboratory members and collaborators who contributed to this research and Prof. Hiroyuki Nakamura for his guidance.

35th Inoue Research Award for Young Scientists

Takayuki MIKI

Assistant Professor

In the doctoral course, I have applied chemical modification reactions of proteins to molecular biological tools. One of them is the development of a “conditional proteomics method” that identifies proteins in a specific environment (e.g., high concentration of zinc ion). In detail, we developed a zinc-responsive reactive group and selectively and comprehensively labeled proteins under zinc-rich conditions in living cells. The identification of these proteins revealed the characteristics of the unknown zinc storage vesicle. I am deeply grateful to my mentor, Prof. Hamachi Itaru, and to all the members, especially the members who had close discussions while drinking beer). My research locations moved from Kyoto University to JSR Corporation and, to Tokyo Institute of Technology.

I’m looking forward to exploring unknown research fields.

Chorafas Foundation Awards

Kentaro ITO

(2018 guraduate, PhD)

I am very grateful to receive the Award of the D.N. Chorafas Foundation. I would like to express my appreciation to professor Hiroshi Iwasaki and my collaborators.

Homologous recombination plays important roles in generating genetic diversity and maintaining genome integrity. The central step of homologous recombination is the DNA homology searching reaction mediated by Rad51 recombinase. In my Ph.D. course, where I aimed to understand the reaction mechanism of Rad51-driven homology searching, I learned genetical, biochemical and biophysical approaches and had many chances to work with experts of each approach. Finally, I have succeeded in observing the homology search in real-time and analyzing the reaction mechanisms kinetically.

I fortunately have the opportunity to continue my research in Iwasaki lab. I will work hard to uncover the mechanisms of homology search in detail using Rad51 mutant proteins and also the regulation mechanisms of Rad51 by its accessory factors.

The 3rd Ohsumi Journal Award

Tsubasa SEKIGUCHI

It is honor for me to receive the 3rd Ohsumi Journal Award for my research paper. The theme had been studied by previous students in Fujii Lab and the idea of awarded paper was designed by Assoc. Prof. Shun-ichi Ishiuchi from a few years ago. I was relieved this research could be concluded as the paper, received high evaluation.

Functions for proteins are relation to their structures. Molecular recognition of a neurotransmitter and a receptor protein is one of the functions for proteins. It is linked to “key and lock” because of high molecular selectivity. In this paper, we proposed a new methodology (“Bottom-up” approach) and verified in experiment to understand the origin of this molecular selectivity. Generally, a complex of a receptor and a ligand has been studied by crystal structure analysis. The complex of a proper ligand and the receptor can be understood in this analysis but, it is difficult to understand a non-proper ligand complex because of the crystal structure cannot be obtained. It is, thus, remained why other molecules are not be recognized, in other words, the origin of the molecular selectivity. To elucidate that, we considered that the complex of a partial peptide which it is the binding motif of the receptor, and the neurotransmitter was taken out in the gas phase, and the laser spectroscopy was applied. In this result, we found the possibility to understand the molecular selectivity in the receptor protein by using the partial peptide.

Finally, I would be grateful that Prof. Masaaki Fujii and his Lab members was able to receive the Ohsumi Journal Award thanks to cheer up my research.

Students’Achievement

Tokyo Tech team extends medal record at iGEM 2018

Hajime FUJITA
3rd-year, School of Life Science and Technology

Tokyo Tech team won the bronze medal at the iGEM competition (the International Genetically Engineered Machine Competition). Tokyo Tech has won the award for the 12th consecutive year, which is the world record.

The iGEM competition is the international synthetic biology competition which is composed of students from high schools, undergraduates and over graduates competing for their projects with their novelty and feasibility. Each team combines genetic parts called BioBrick to design and construct the new artificial life system.

This year, 11 members joined the team and presented their research results on the oral presentation and the poster session.

Since last year, Tokyo Tech team has started to consider the possibility of application of the project. We struggled to develop the process of making products last year, but our challenge led us achieve the better

experimental environment and the wider range of experiments we could try. This year, we worked on the construction of the Dengue virus detection kit and epidemic state prediction model. Moreover, we held a lecture and a workshop for high school students to make the better understanding of infectious diseases like Dengue.

Throughout the whole year activity, we made countless mistakes, but we should learned something from every mistake. Though there's no guarantee that this experience can leads us to success, we carry on and don't let it end in a mistake. Please give us continuous support.

✓ Student Members

Hajime Fujita (3rd-year, School of Life Science and Technology)
Ryoga Misu (3rd-year, School of Life Science and Technology)
Koutaro Miyamoto (3rd-year, School of Life Science and Technology)
Hayato Ito (3rd-year, School of Life Science and Technology)
Eriko Deguchi (3rd-year, School of Life Science and Technology)
Nattanon Tharachai (3rd-year, School of Engineering)
Moe Takahashi (2rd-year, School of Life Science and Technology)
Soh Tsuruta (2rd-year, School of Life Science and Technology)
Kazuya Isawa (2rd-year, School of Computing)
Takato Saito (1st-year, 7th Academic Group)

✓ Instructors

Yoh-ichi Tagawa (School of Life Science and Technology)
Nobuhiro Hayashi (School of Life Science and Technology)
Masayuki Yamamura (School of Computing)
Hiroyuki Ohta (School of Life Science and Technology)
Akifumi Nishida (Yamamura Lab, Department of Computer Science, School of Computing)
Shyoya Yasuda (Yamamura Lab, Department of Computer Science, School of Computing)
Robert F. Whittier （Juntendo University）

✓ Campus Support

Global Resources Development Promotion Project
Tokyo Institute of Technology Revitalization Aizawa Foundation
Tokyo Tech Alumni Association
Tokyo Tech Alumni Association Kanagawa Branch
Bio Creation Design Room

✓ External Support

Integrated DNA Technologies (IDT)
Cosmo Bio Co., Ltd
Promega Corporation
Leave a Nest Co., ltd.
Japan Student Services Organization (JASSO)

✓ Web Page

iGEM Headquarter
http://2018.igem.org/Main_Page
iGEM Tokyo Tech 2018 “Finding Flavi”
http://2018.igem.org/Team:Tokyo_Tech

Symposium "Gene from the news"

Moe TAKAHASHI
2rd-year, School of Life Science and Technology

On Saturday, March 9, the iGEM Team sponsored symposium for junior high and high school students "Gene from the news" was held.

This symposium focused on the techniques of "gene editing" and "gene analysis" that have gradually come to be seen on television etc., with the aim of disseminating the correct knowledge and awareness of ethical issues. We also invited Mikihito Tanaka, an associate professor at Waseda University's graduate school who is an ethics expert, as a guest speaker and he talked about the perspective of science from a position that is not tied to humanities and sciences. Fifteen people, mainly high school students, participated on the day, and it was a success.

At the symposium, first of all, after getting an example of gene editing applied to animals etc., we asked them to discuss how to use gene editing technology freely in group work. There, there are usage methods to human's body themselves such as strengthening of muscle and memory up and UV protection, usage methods for enriching life such as whole fatty tuna or agricultural products without pesticides, romance such as resurrection of dinosaur and reproduction of anime character. A wide variety of ideas were presented. After that, I told that designer baby and gene editing to human fertilized eggs were the problem, and I asked them to think again whether their ideas had any problems. Active discussions are held there as well. “The gap between rich and poor will be expanded by people with money giving priority to technology.” “The glasses industry will be destroyed if there are no people with poor eyes.” “A person is himself. You can use it because you can make decisions, but it is a pity to use it for animals.” And so on, not only ethical but also economic consequences.

Discussions between participants

The lecturer brought up issues on the bioethics.

Also, in parallel with the group work, we conducted experiments to examine the aldehyde dehydrogenase 2 activity of the participants, so that they could feel familiarity with genetic testing.

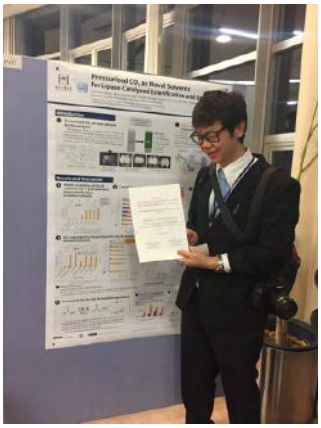

Explanation of the practice by an iGEM member

Because there were a lot of active participants at this symposium, the discussion was a lot of excitement. But, even if the debate is an important one, it is not always the case that the debate is always active. How to make important discussions active is particularly important when carrying out scientific researches, and it is necessary to think and practice what to do for that purpose. This is also true for in-team discussions, so by participating in iGEM, all team members would like to think about this.

From Foreign Student

The 20th Biocatalysis Symposium of Japan, The Best Poster Award

Henry Suryadinata



It is my humblest pleasure to have the opportunity to write on this honorable newsletter. I would like to thank you my advisor Professor Tomoko Matsuda for her endless supports; and my favorite mentor, Dr. Hai Nam Hoang for his passionate advices and inspirations; as well as all members of Matsuda Lab and Life Science and Technology Department.

Research has made me realize how vast and magnificent the potentials of our nature is-one example is enzyme. I was not amazed by enzyme until I came to Japan and learned it at school. Here in Matsuda Lab, we are conducting researches on environmental-friendly enzyme reactions. One of the theme that I am engaging with is enzyme behavior inside carbon dioxide-based solvents. Currently, we are trying to provide a new

solution for global warming by how to use carbon dioxide effectively for enzyme reaction. There are several benefits of using carbon dioxide for enzyme reaction. Being novel non-polar solvent, carbon dioxide can dissolve organic compound and is easy to separate after use. In fact, we also found that carbon dioxide solvent may 'expand' enzyme pocket. As in *Candida antarctica* Lipase-B (CAL-B), there were some limitation on pocket size that results in no reaction for large, sterically-hindered substrates. However, by changing the solvent to carbon dioxide, we successfully performed the impossible reactions, and at the same time, reduced the organic solvent usage.

Enzyme potentials are limitless. There are still many enzyme possibilities yet to be discovered, environmental problems to be solved, and chemistry challenge to be tackled. As a researcher-in-training, I really hope that my efforts can make impacts and contributions to our future world.

Once again, thank you for the opportunity and best wishes for all of us.