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## ***From the Dean***

### **Changes to the Graduate School of Bioscience and Biotechnology and recent Suzukakedai campus appearance**

Mitsuo SEKINE  
Dean, Graduate School of Bioscience and  
Biotechnology

Message to alumni from Professor Mitsuo Sekine, Dean of the Graduate School of Bioscience and Technology:

Hello everyone. I hope this message finds you all well. At the moment, the Graduate School of Bioscience and Biotechnology is welcoming a succession of new professors and researchers that are being appointed and a number of new research projects are just getting started, in part because so many people from the first and second wave of the baby boom generation are now retiring. As the head of the graduate school, I am working hard each day to try and provide the best possible research environment for all the new arrivals.

An unbelievable incident of accounting fraud, which originated in the Graduate School of Bioscience and Biotechnology last year, is having strong repercussions on a wide variety of the school's activities, both inside and outside the university. In light of this, I am firmly committed to doing everything possible to ensure that such an incident does not happen again.

This year will be my fourth as head of the graduate school, so I only have about half a year of my term left to serve. In order to help establish our school as a new major research center of bioscience and biotechnology, the

Graduate School of Bioscience and Biotechnology decided to hold an international conference once a year, starting from the year before last. The theme of the first conference was, "Bimolecular assemblies from nano to micro"; the second conference was on, "The nucleic acid world; interfaces between biology and chemistry"; and the third one was entitled, "Innovative approaches to biological systems: light, motion, and small molecules". These international conferences provide opportunities for all Graduate School of Bioscience and Biotechnology researchers to freely exchange information and ideas across the boundaries of their particular disciplines, as well as to actively communicate the fruits of their research work throughout Japan and the international scientific community.

At the same time, this year we started to invite some of the world's leading researchers to come and give lecture meetings to present their groundbreaking research findings. For the first meeting, we called on Dr. Katsuhiko Mikoshiba of RIKEN. Dr. Mikoshiba spoke in his passionate style for two and a half hours, and it was marvelous to observe how intently staff and students of the school listened to his talk. Not a single person dozed off. Additionally, before the lecture, some of the young researchers of our schools were given the chance to make short presentations on their latest research findings to Dr. Mikoshiba. For these young researchers, the opportunity for a frank discussion with a distinguished scientist such as Dr. Mikoshiba was a very stimulating and precious experience.

In concluding this note, I would like to express my hope that all of our school alumni are working fruitfully in their careers, and I would very much like to see all of you participate actively in our Homecoming Day at the Suzukakedai Campus Festival (Suzukake Festival), which we started two years ago. This

event provides a forum for relaxed and enjoyable interactions with the current staff and students of the Graduate School of Bioscience and Biotechnology, so please head to the campus for some interesting chats about the past or present—or whatever else interests you—and help us make this initiative a great success.



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## ***On Retirement***

### **Very busy last remaining days**

Mitsuo SEKINE  
Professor  
Department of Life Science



I am a little bit hesitating to write this

message. Although the official retirement is waiting for me six months later, I have been working hard as a staff of the meeting related to basic concepts for the innovative educational reform of Tokyo Tech, which has already been held 36 times by strong leadership of President Yoshinao Mishima until now, to discuss an ideal education system, proposing a variety of new systems such as unified education of undergraduate and graduate (Master Course) schools, classes in English for Master Course students, quarter system, change of Academic Groups (Rui) to Schools (Gakuin), class of biology compulsory for all the first year students. Actually, I cannot find any free time to look back over my old days and chances to write my studies and summarize my research life. The formal greeting toward the last day for my mandatory retirement will be expressed on my last lecture, which will be planed on March 21, 2015 (Vernal Equinox Holiday). I have still now no feeling to face to the soon coming retirement.

## *From New Staff*

### **On my appointment to the Professorship**

Yuki YAMAGUCHI

Professor

Department of Biological Information



I am an alumnus of Bioscience and Biotechnology who entered the 7th Academic Group of Tokyo Tech in April 1991 for the first time since its establishment. After having earned a PhD from the then Department of Biotechnology in March 1999, I worked as a post-doctoral fellow and as a researcher of the JST's PRESTO program. In January 2002, I started working as an Assistant Professor at the laboratory of the then Professor Hiroshi Handa. After promotion to Associate Professor, I was appointed full Professor in July 2013, taking over the laboratory from Prof. Handa. With the strength of Handa lab such as biochemistry and the sense of application inherited, I am in the process of further refinement and revision of research by adding new colors to the tradition.

The research interests of my lab are (1) control mechanisms of genome expression and (2) chemical biology using small-molecule compounds. Concerning the first point, I have been promoting collaborative research on the

mechanism of transcription and chromatin as a Project Leader of the Grants-in-Aid for Scientific Research on Innovative Areas "Transcription Cycle" since 2012 (see <http://transcriptioncycle.org>).

My former classmates at Tokyo Tech include Takeshi Hata (Associate Professor, Graduate School of Bioscience and Biotechnology) and Masakazu Mie (Associate Professor, Interdisciplinary Graduate School of Science and Engineering). Together with my colleagues, I will continue to perform sincere, dedicated services for Tokyo Tech.

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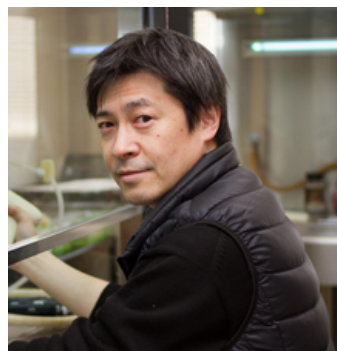
## *From New Staff*

### **Cell biology meets Cushing's disease**

Masayuki Komada

Professor

Department of Biological Sciences



I started my career in Tokyo Tech in 2001 as an associate professor in the Department of Biological Sciences, and was promoted to a full professor in the same department in April, 2014. I have been studying basic cell biology to understand what happens in mammalian cells at molecular levels when they exhibit a variety of activities. At the same time, I have thought that the scientific mission of our Faculty of Bioscience and Biotechnology should differ

from that of Faculty of Science in other universities and that the difference confers the identity on our faculty. Therefore, I have always been keeping in mind how to develop our findings of basic science to public welfare, and dreaming that someday our outcome leads to the understanding of molecular mechanisms of disease pathogenesis and development of drugs for diseases.

Fortunately, we have recently and successfully expanded our cell biological research to the discovery of the causative gene (deubiquitinating enzyme *USP8*) for Cushing's disease and the molecular mechanism of the pathogenesis of the disease. Cushing's disease is a rare and intractable disease caused by hyper-secretion of adrenocorticotropin from pituitary tumors and leading to multiple conditions including characteristic obesity, diabetes, hypertension, osteoporosis, etc. in the patients. Except for the removal of pituitary tumors which requires high neurosurgical skills, there has been no effective way of treatment of the disease. Our findings suggested that Cushing's disease can be cured by inhibiting the *USP8* activity, raising the possibility that *USP8* inhibitors can be applied to anti-Cushing's disease drugs. To test this possibility, we are starting to screen small molecule inhibitors for *USP8*. It will be my great pleasure if an effective anti-Cushing's disease drug is developed based on our basic biological findings and saves Cushing's disease patients in the future, and if I can share the fulfillment with young students.

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## *From New Staff*

### Greetings

Hiroshi KIMURA

Professor

Department of Biological Sciences



I was just appointed as a new faculty member at the Department of Biological Sciences. I was born and grown up in Hokkaido, north part of Japan, and obtained PhD from Hokkaido University, being a local-oriented person. However, since I went to Oxford University as a pot-doc for 6 years, I have been a rather wanderer. I came back to Japan on 2002 at Tokyo Medical and Dental University taking an assistant professorship, but soon moved to Kyoto in 2003 and then to Osaka in 2007. Now I joined to Tokyo Tech, which is a new frontier for me and this move somewhat makes me refreshing and encouraging to do better science and education in a nice environment. I am particularly interested in undergraduate education, as young students should have possibilities. I have been working on the function and structure of

chromatin, chromosome, and cell nucleus throughout my career. My recent interest is to understand the function of histone modifications in transcriptional regulation using our original live cell imaging techniques. As tracking histone modifications in living organisms has now become possible, my dream is to visualize all the process of transcriptional activation and chromatin regulation in specific gene loci during animal development. Although my research is so basic, I believe the fundamental mechanism elucidated from the basic research should have impacts into broad areas and be useful for application-oriented studies. I would expect lots of collaborations with people with different expertise in Tokyo Tech towards to novel discoveries.

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## *From New Staff*

### **Deciphering the functions of uncultivable microorganisms**

Yuichi HONGO

Professor

Department of Biological Sciences



I have moved from RIKEN to TokyoTech as an associate professor in 2009 and have been promoted to a professor position in October

2014. I have been teaching mainly basic biology to the first-year undergraduate students, but this is not an easy task because most of TokyoTech students are less interested in biological sciences. I must continue to struggle to find a better way for their education.

My main research theme is elucidation of symbiotic systems among organisms. Particularly, I have been fascinated by the mutualism between termites and their gut microorganisms. Termites are social insects closely related to cockroaches. They eat only dead plant matter and are notorious as destructive pests of woody buildings. On the other hand, in natural habitats, they are one of the most important decomposers and are expected to contribute to the development of novel biofuel from woody biomass. Interestingly, their ability to efficiently degrade dead woods is not attributable to their own, but mostly to the activities of their diverse gut microorganisms, which are specific to termites.

In the past hundred years, many microbiologists tried to cultivate the termite gut symbionts, but most attempts were unsuccessful. Besides, the gut microbiota is too complex: it comprises several hundred uncultivable species, and the symbiotic gut protists (single-celled eukaryotes) themselves harbor symbiotic bacteria on their cell surface, within the cell, and often even within the nucleus. We are trying to disentangle this complicated multi-layered symbiotic system and elucidate the roles of individual members. We use culture-independent approaches, including single-cell analysis of uncultured microorganisms. To develop reliable single-cell technology, collaboration with experts of nanotechnology and informatics can be the key: TokyoTech should be the best place to create innovative way to decipher the hitherto uninvestigated dark matter.

## ***From New Staff***

### **Toward the understanding of the developmental biology and its application in regenerative medicine**

Akie KUME

Professor

Department of Biological Information



I have joined the Department of Biological Information from December 2014. During the past 13 years research works in Kumamoto University, our lab focused on the development of endodermal derived tissues, we established efficient in vitro systems for ES cells to differentiate into definitive endoderm and then specific lineages of pancreas, or to hepatic and intestinal lineages. At the time I started the in vitro differentiation system, ES cells had been used for genetic recombination and making mutant mice. The establishment of human ES cell lines opened the avenue for in vitro differentiation and then the establishment of iPS cells further urged the clinical application of the pluripotent stem cells.

In the past, I used *Xenopus* and studied the molecular mechanism underling early body formation, I understand the importance of developmental biology. I think that understand

the organogenesis and homeostasis of our body is important. Understanding the mechanism of how the stem cell system maintains and regenerate our body is our ultimate goal. For this purpose, we consider mouse and human ES/iPS cell as good models. We identify novel genes or pathways by microarray analysis of the differentiated cells. We perform large scale screening for low molecular compounds that promote differentiation. Up to date, we have been successful to identify novel genes and novel pathways that participate during differentiation of these organs. I wish to extend these studies and further promote the basic research and apply our finding for drug discovery and regenerative medicine. I think doing research is a wonderful and exciting experience. I wish to introduce these wonderful world of science and share my experience with the students.

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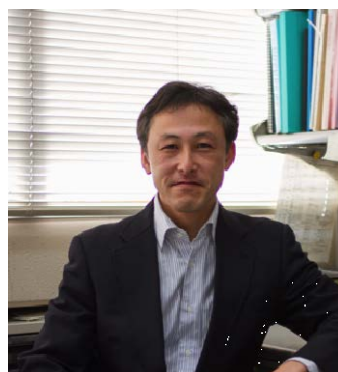
## ***From New Staff***

### **Toward the use of potentials of microbes**

Toshiaki FUKUI

Professor

Department of Bioengineering





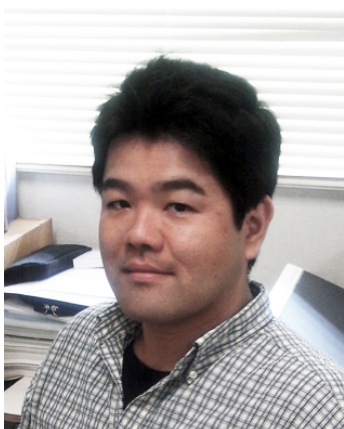
After spending 10 years at Department of Bioengineering in this school as an Associate Professor from 2014, I re-joined as a Professor in December 2014. Microorganisms are long on the Earth much earlier than human, and we now have only limited knowledge about the kinds and abilities of microorganisms. Our laboratory is focusing on hyperthermophiles which are one kind of extremophiles, and polyester-producing bacteria of which storage polyesters are expected as useful bioplastics, hoping to apply the potentials of microorganisms to improve the quality of our modern lives and natural environments.

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### *From New Staff*

#### **Toward the elucidation of the mechanism of autophagy, a 'self eating' system within the cell**

Hitoshi NAKATOGAWA  
Associate Professor  
Department of Biological Sciences



Most biological activities in cells involve well-balanced “synthesis” and “degradation” of cellular constituents. Autophagy, which means “self-eating” in Greek, is a massive degradation

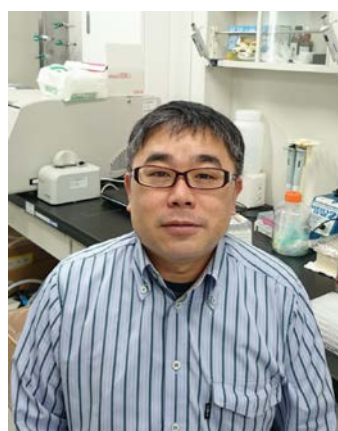
and recycling system highly conserved among eukaryotes that can break down not only cytoplasmic components such as proteins but also large structures such as whole organelles. The hallmark of autophagy is the formation of “autophagosomes”, membrane sacks that engulf material to be transported to and degraded in lysosomes or vacuoles. How does this dynamic membrane biogenesis take place? Where does the source of the membrane come from? How do cells recognize degradation targets in selective types of autophagy? Our group is working on molecular mechanisms of autophagosome formation using an elegant model organism, the budding yeast *Saccharomyces cerevisiae*. We will welcome anyone who wants to enjoy basic science.

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### *From New Staff*

#### **Listening to the microbes and bringing balance into human society**

Nobutaka NAKASHIMA  
Associate Professor  
Department of Biological Information



I have moved from National Institute of Advanced Industrial Science and Technology

on April 2014. My research is focused on microbial function and its utilization in industrial fields.

Various microbes live in soil, water, and air as well as inside the bodies of animals and plants. They should love the current environments and enjoy the comfortable lives. We, however, have poorly understood their lifestyles. For example, they frequently grow in microbial communities where each microbe interacts with others, and it is very difficult to isolate one microbe from others. Some researchers say that only few per cent of microbes on the earth has been isolated and cultured in laboratories. Also, some microbes live in the planktonic state whereas others live as sessile cells; although the majority in the environment is thought to be the latter state, they are preferentially cultured in planktonic states in laboratories.

I got started studying the lifestyles of microbes as communities. In one familiar example, we frequently find slimy structures appear on kitchen sink. This is biofilm that is made of variety of sessile microbes. We hate this biofilm, but they have significance to live there. Microbes also live in our bodies, and they create comfortable environments by coexisting with human cells and other microbes. Based-on knowledge obtained through these studies, I would like to develop techniques to combat unwanted microbes and microbial communities and that keep microbial flora in a favorable state.

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## *From New Staff*

### **Green chemistry using enzymes for organic synthesis**

Tomoko MATSUDA

Associate Professor

Department of Bioengineering



I got promoted to an associate professor of Department of Bioengineering on March 1, 2015. Now, I appreciate very much the opportunity of having worked with students and technicians in our lab, coworkers in Tokyo Institute of Technology, and friends and collaborators in other universities and companies. I truly feel grateful for them.

Our research is focused on the organic synthesis with enzymes, biocatalysis. Particularly, we study the enzymatic reaction in a non-aqueous solvent. Supercritical and liquid carbon dioxide has been used as a solvent and reactant of the enzymatic reaction to develop environmentally friendly organic synthetic method. We have achieved the waste-minimization in large-scale production of chiral compounds with a flow system using liquid carbon dioxide as a solvent and an immobilized lipase as a catalyst. Moreover, lipase catalyzed reactions were found to be

effectively enhanced using a liquid carbon dioxide medium when they were compared with those using organic solvents. Now, we are pursuing to elucidate the mechanism of the acceleration in enzymatic reactions caused by carbon dioxide.

By these studies of green chemistry using enzyme and carbon dioxide, we hope to fulfill the role of scientist to protect environments for the bright future.

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## *From New Staff*

### **Linking genomic and chemical information**

Masaaki KOTERA

Associate Professor

Department of Biological Sciences



My specialty has been in bioorganic chemistry (since undergraduate), enzymology (since master's student) and bioinformatics (since PhD student). The commonality lies in chemical transformation in living systems. Among the major biomolecules, DNA, RNA and proteins have been comprehensively analyzed (genome, transcriptome and proteome, respectively), but the methodology to link to the chemical information of small molecules (metabolome) is still undeveloped.

Enzyme Commission (EC) numbers, the world standard classification of enzymes that mediate chemical transformations in living systems, is also used in bioinformatics. However, it is a mixture of protein classification and reaction classification, and therefore contains many problems to link genomic and chemical information. I propose that the protein classification and reaction classification have to be considered separately in order to analyze their relationships. Although it is not difficult to come up this idea to my knowledge, there has been no study that implemented that idea.

Since I arrived at the current position in Tokyo Institute of Technology, I have further developed my study, linking genomic and chemical information, so that it scopes wide range of organisms such as the plants that synthesize various small molecules and the insects that use them. I offer my sincere thanks for this favorable environment, and at the same time, I am willing to help all faculty members and students with the best I can do.

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## *From New Staff*

### **Greetings from a newly joined staff**

Koji KANAMORI

Assistant Professor

Department of Life Science



I was assigned as an assistant professor in the Yuasa laboratory on Jun. 2015. I received my PhD in Sekine and Seio Laboratory in 2012, and then I had worked in Education Academy of Computational Life Sciences, Tokyo Tech, as an assistant professor. My major is bioorganic chemistry and I have studied functional fluorescent nucleic acid analogs for biological tools.

I am interested synthetic organic molecular, which have various interesting physical properties such as photophysical characters. I eager to challenge to create new interesting and exciting molecules.

Through my previous work in ACLS, I had many chances to participate in educational activities such as student experiment courses and student summer school with many professors and students, who have commuter science or life science backgrounds. Utilizing these experiences, I'll do my best with education and research in our faculty with enthusiasm.

## ***Research Activity***

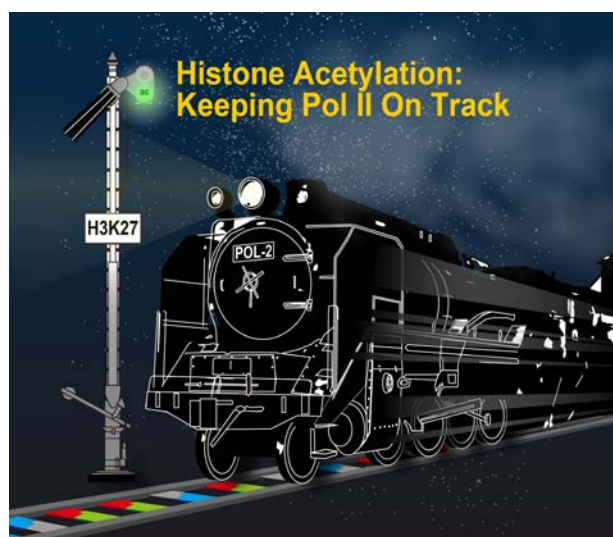
### **Regulation of RNA polymerase II activation by histone acetylation in single living cells**

(*Nature*, 516, 272–275, 2014)

Hiroshi KIMURA

Professor

Department of Biological Sciences



In eukaryotic gene regulation, histone H3 acetylation has been known to activate RNA polymerase II transcription. However, it remains unclear which step of transcription cycle is stimulated by histone acetylation in living cells. We have developed systems to track histone modifications in living cells and organisms using probes derived from specific antibodies. Here we have applied such technologies to track specifically phosphorylated RNA polymerase II molecules, which are formed during the initiation and elongation, on steroid hormone-inducible gene

array. By fitting live cell imaging data to mathematical models, we have revealed that histone H3 lysine 27 acetylation can stimulate downstream transcription kinetics by affecting two temporally separate events: the binding of transcriptional activators to chromatin and the transition of RNA polymerase II from the initiation to elongation. This notion was supported by genome-wide analysis using chromatin immunoprecipitation followed by sequencing. It is thus suggested that histone H3 lysine 27 acetylation leads to a robust and potentially tunable transcriptional response. It would be interesting to investigate how repressed genes that are associated with histone methylation become active during development in a future study.

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## Events

### 1st Top Leaders' Forum on Bioscience and Biotechnology

Junji HIROTA  
Associate Professor  
Department of Bioengineering

This past two decades, we have witnessed technological advances and remarkable progress in our knowledge of life science, including development of genetic engineering technology, completion of analysis of human genome, and regenerative medicine using technology of iPS cells. Looking ahead to the future life science research, we have launched the Top Leaders' Forum on Bioscience and Biotechnology, that is an occasional lecture series in which the Graduate School of Bioscience and Biotechnology in Tokyo Tech invites a distinguished scientist who has lead

the world in the life science field to share his/her view, idea and passion to science and to enlighten graduate students and young scientists.

The first memorable lecture was given by Professor Katsuhiko Mikoshiba (RIKEN Brain Science Institute) on May 28<sup>th</sup>, 2014. Prof. Mikoshiba, who currently studies how the brain develops, is a world-famous scientist for his discovery of the IP3 receptor in 1989, which was found to play an important role in various biological functions from the beginning of life to higher brain functions, such as fertilization, body development, and brain plasticity. For his notable achievements, Prof. Mikoshiba was bestowed with many awards including the Medal of Honor in Japan (2002), the Nobel Forum Lecture (2004), the Japan Academy Prize (2009), and the French Legion of Honor (2014).



In his lecture entitled “The Pursuing Truth in Life Science”, he first came up to students and spoke to them gently with importance of originality in science to lead the world. Then, the capacity audience got completely drawn to his talk with his tremendous and beautiful findings that uncovered many biological events in our body. The lecture was originally scheduled 90 minutes, but he could not stop talking and kindly extended the lecture for extra an hour, because he had so many data and

thoughts to teach and tell young promising scientists in Tokyo Tech. After the lecture, he said to me that he was so impressed that the audience of Tokyo Tech listened with great interest throughout the 2 and half hours lecture. Indeed, we were so impressed with his research in both quality and quantity. The second half of the lecture might be difficult for graduate students to understand. Nonetheless, I think they felt Mikoshiba's spirit and passion to science and found something important for their future. Finally, I would like to express my gratitude to my former supervisor, Prof. Mikoshiba for his fantastic lecture.

especially for graduate students, to experience an international symposium, presentation of top scientists, and scientific discussions.




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## Events

### The 3rd Bioscience and Biotechnology International Symposium

Shinji MASUDA  
Associate Professor  
Center for Biological Resources and  
Informatics

On January 14, 2015, the 3<sup>rd</sup> Bioscience & Biotechnology International Symposium was held at the Suzukake Hall in Suzukakedai campus. This symposium has been held once a year since 2013 to provide opportunities,

This year's symposium title is "Innovative approaches to biological systems: light, motion, and small molecules". It was intended to see current progresses of experimental technologies that should be important for next-generation life-science research. We invited two speakers from overseas countries, three speakers from Japanese university/institute outside of Tokyo Tech, and two speakers from our departments. In the first session, Professor Klaas J. Hellingwerf (University Amsterdam, The Netherlands) and Professor Hiroyuki Ohta (Tokyo Tech) presented their synthetic biology approach to design specialized microbial cells producing useful materials such as lactic acid and triacylglycerol. In the second session, Professor Jaebum Choo (Han Yan University, South Korea), Professor Hidehiko Nakagawa (Nagoya City University), and Professor Masaaki Wachi (Tokyo Tech) presented their chemical approaches for characterizing biological systems. In the last session, Professor Masanori Matsuzaki (National Institute for Basic Biology) and Professor Hiroyuki Noji (The University of Tokyo) presented their unique approaches to characterize cell function and/or single

molecule characterization with novel microscopy techniques.

Approximately 270 people attended to the symposium; most of them were also joined to the banquet after the symposium. We believe that all participants enjoyed the exciting talks and scientific discussions. The committee members will continue organizing the international symposium with keeping high scientific quality.



Midorigaoka Building No. 6 was designed by Prof. Shinichi Okuyama from the Department of Architecture and Building Engineering. In addition, various professors, not only from the same department but also from the Department of Civil Engineering, were involved in its construction. The first floor of the building provides a university-wide shared space, including Midorigaoka Hall, with a capacity of ~150 people and a lecture room that can be used for remote learning. It is easily accessed from Midorigaoka Station and will therefore be widely used for various seminars and symposia. In addition, there is also a relaxation space for staff and students from the Graduate School of Bioscience and Biotechnology, and also from other departments located closed by Midorigaoka. The second, third, and fourth floors house six laboratories of the Graduate School of Bioscience and Biotechnology, which have moved from the Suzukake-dai Campus.

## Events

### The opening ceremony of Midorigaoka Building No. 6

Hiroshi IWASAKI

Professor

Department of Biological Sciences

The opening ceremony of Midorigaoka Building No. 6 was held on April 25 (Friday), 2014, in the building's multipurpose reception space, Midorigaoka Hall.



At the ceremony, Prof. Mitsuo Sekine, Dean of the Graduate School of Bioscience and

Biotechnology, gave the opening address, and Prof. Mishima Yoshinao, President of Tokyo Tech, formally addressed the gathering. Finally, Mr. Honbo Fumio, Executive Director-Secretary General of Kuramae Industry Association, *Kuramae Kougyokai* (Tokyo Tech Alumni Association), gave a congratulatory address. Prof. Ken Kurokawa delivered a memorial lecture entitled "Present and future of meta-genomics".

After the ceremony, the reception party toasted Toshio Maruyama, Executive Vice President, in a celebratory atmosphere. Professors, students, and staff from six laboratories of the Graduate School of Bioscience and Biotechnology and professors from the Departments of Architecture and Building Engineering and Civil Engineering conversed with one another. There were ~50 participants at both the ceremony and reception party, both of which were a great success.

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## Events

### Summer Laboratory Course for High School Students

Shinae KONDOH  
Professor  
Department of Biomolecular Engineering

Graduate School of Bioscience and Biotechnology has been annually providing two-day Summer Laboratory Course for high school students. The 22th Course was held on 2014/7/31(Thu) and 8/1 (Fri). Forty one high school students including 19 girls attended the course and challenged two set of experiments, "Let's find out how to make cancer cells emit light", in which students learned a luciferase gene and bioluminescence, and "The

microscopic world of cells", in which they watched cell divide under the microscope. These experiments were instructed by Kondoh and Sogawa laboratory members, respectively. Because most of attendees had no experience in doing even simple experiments, the staffs and graduate students of Kondoh and Sogawa



laboratories had made a great effort to prepare a textbook, which described very basic information of the topics, simple instruction of laboratory equipment, and detailed experiment operation in order to help understanding of high school students for a limited time.



Although we prepared well, we had been worried about a case that they would not take an interest in our experiments. When the courses started, however, all of the students were eagerly involved in the experiments, asked many questions, and even looked into more about the topics. During the experiments



and discussion with high school students, the staffs and graduate students actually learned a lot from them. The two-day course had successfully proceeded and the attendees looked satisfactory. I thank all the staffs and graduate students for preparation and instructions of the course. I also thank the school staffs for great support in course administration.

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## Events

### Summer University-Wide Open Campus

Hiroyuki OHTA  
Associate Professor  
Department of Biological Sciences

As a trial, the Tokyo Institute of Technology (Tokyo Tech) held its university-wide open campus event in summer last year. In previous years, our university-wide open campus was held in autumn in conjunction with the campus festival (*kodaisai*). However, since this was the first time an open campus was held in the summer, we were uncertain how many visitors to expect. In the end, it was gratifying that more than 12,000 people chose to join us.

The School of Bioscience and Biotechnology (7th Academic Group) organized a wide range of activities for the open campus, focused in and around Midorigaoka Bldg. 6, which was just completed this fiscal year. These included explanatory meetings and consultation booths for the academic groups, lectures, campus presentations, and roundtable meetings led by current students, as well as laboratory tours, open laboratories, and a poster guide to labs at the Suzukakedai Campus.



Prof. Satoshi Nakamura, a councillor, was responsible for the explanatory meetings, while Prof. Hiroshi Iwasaki (head of the Department of Bioscience) and Prof. Yuki Yamaguchi (head of the Department of Biotechnology) were in charge of the consultation booths. These gatherings were held in Kuramae Hall and Centennial Hall, but all other activities were held in the new Midorigaoka Bldg. 6, where nine of the Graduate School of Bioscience and Biotechnology's research labs began operating this year.

Since Midorigaoka Bldg. 6 was just completed last spring, the laboratories have only recently relocated there from the Suzukakedai Campus. The poster exhibition guide to the labs located on the Suzukakedai Campus was open throughout the day in the small seminar multifunction room to the left of the Midorigaoka Bldg. 6 entrance.

At the far back of the first floor of the building is a seminar hall, Midorigaoka Hall, which accommodates about 100 people. There, Prof. Kondo gave a presentation on his research on the use of advanced imaging technology to visualize diseases, and Assoc. Prof. Yamada gave a lecture on metagenome analysis of human intestinal bacteria and its medical applications. The venues of all these activities were mostly full of visitors listening intently to all the presentations. Later, master's student Taku Nakayama gave a talk about life on campus, after which the visitors split into five

groups for roundtable meetings with current biosciences and biotechnology students.

In the roundtable meetings with those current students, there were many very enthusiastic questions of relevance from prospective students now preparing for entrance examinations, many of which could not have been asked during normal open campus events. The five students who led the roundtable meetings put a remarkably high level of effort into the meetings, and reported feeling very positive responses from the participating visitors.

After the morning and afternoon roundtable meetings ended, a tour of the research labs was arranged for interested visitors. For this tour, the visitors were split into groups and led around the research labs in Midorigaoka Bldg. 6. Since they had been given some explanatory materials regarding each of the labs in advance, they were much more able to understand what they observed on the tour.

Despite being the first ever summer open campus, the event attracted large numbers of visitors and the whole event turned out to be very lively and positive. With so many initial uncertainties, the organizers worked very hard in their preparations, and even though there was also some unexpected confusion on the day itself, the first ever summer open campus event was successful in providing valuable experiences to participants.

Since many labs are still located at the Suzukakedai Campus, it would currently be inadvisable to host an open campus for the whole school on the Okayama Campus. Nevertheless, we are looking forward to continuing with the event and to improving our offerings for visitors.



## Awards

### The CSJ Award for Creative Work

Hisakazu MIHARA

Professor

Department of Bioengineering



I received the Chemical Society of Japan (CSJ) Award for Creative Work on March 28, 2015. As a faculty member of the Graduate School of Bioscience and Biotechnology, I am very pleased to receive this prestigious prize. I feel I owe this honor entirely to the guidance and support of everyone at the graduate school, including all professors and seniors, as well as all the friends and colleagues I have worked together with on joint researches and in academic societies.

Naturally, I do not feel that the award is mine alone. Instead, I feel I am receiving it

merely as a representative for the achievements of all the people who have worked so diligently and persistently as part of Mihara Laboratory, including the (three) assistant professors, the postdoctoral researchers, and all the doctoral, master's, and undergraduate students.

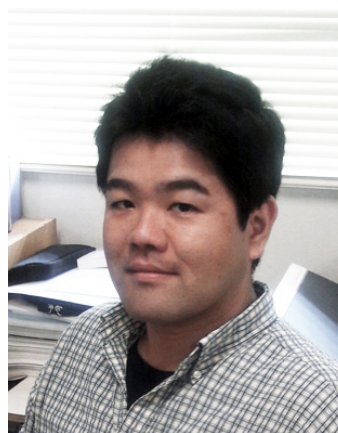
The award was in recognition of the study titled "Construction of Functional Peptides Based on De Novo Design Approaches." Since I completed my doctorate in 1986, my research has concentrated on designing peptides based on amino acid sequences in order to create various kinds of functional peptides. It is  $\alpha$ -helix and  $\beta$ -sheet structures that determine the molecular structures that functionally express peptides and proteins. The design strategy for these structures using artificial amino acid sequences is known as "de novo peptide design", and since about 1990, a great deal of research has been done in this area. This study focused on methods for designing secondary structures from  $\alpha$ -helices and  $\beta$ -sheets or combining them in order to design novel molecules, and then substituting amino acids to create peptide libraries from which highly functional peptides can be explored. Using this technique, the Mihara Laboratory has studied on the development of peptide biochips for use in protein and cell analysis and self-assembling peptides that can be utilized in regenerative medicine.

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## ***Awards***

**The Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology**  
**The Young Scientists' Prize**

Hitoshi NAKATOGAWA  
Associate Professor  
Department of Biological Sciences



This year, I was awarded The Young Scientists' Prize, The Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology, for our achievements in the molecular mechanism that drives autophagy. Autophagy is a bulk degradation/recycling system that takes place in the cells that make up our bodies. When autophagy is induced, degradation targets are sequestered by a lipid membrane sac called the autophagosome, and then transported to the lysosome or vacuole, a site for degradation. The autophagosomal membrane is formed through a very unique and dynamic process. Autophagy is the phenomenon that almost all eukaryotes are equipped with. Our research using the budding yeast *Saccharomyces cerevisiae*, an excellent model organism, resulted in important findings for understanding molecular mechanisms underlying autophagosome formation. Receiving this award, I would like to deeply appreciate my mentors and colleagues who helped me, and the students who participated in the research. There still remain lots of attractive questions in the mechanism of autophagy. I will continue to work hard in order to solve the mystery of autophagy.

fibrosis and muscular dystrophy.

The results of this project were recently published in *Organic Letters* (2012 and 2013, published by the American Chemical Society). I hope my project will contribute to the progress of nucleic acid drugs.

Finally, I would like to express my sincerest gratitude to our staffs and students for their supports.

## Awards

### Challenging Research Award from Tokyo Tech (2014)

Akihiro OHKUBO  
Associate Professor  
Department of Life Science



I received [the](#) Challenging Research Award from Tokyo Tech (2014) for my project. This award aims to encourage the challenging researches of young scientists.

The title of my project for this award was "Development of new gene therapy using artificial U1 snRNAs". The aim of my project is regulation of splicing reactions and cure of refractory genetic diseases, such as cystic

## Awards

### Challenging Research Award from Tokyo Tech (2014)

Shun-ichiro OGURA  
Associate Professor  
Department of Bioengineering



It is my great pleasure that I was honored with the 13th Challenging Research Award from Tokyo Tech for my research project entitled "Development of new tumor detection system using porphyrin after administration of aminolevulinic acid". I would like to thank my colleagues related to our projects. Let me introduce my research. One of the main purpose of our project is application in medical field. In tumor diagnostic field, early detection of tumor is fundamentally important. We

evaluated “porphyrin” as tumor markers that are detectable in blood or urine from patient. Porphyrin concentration in blood or urine was elevated by the administration of aminolevulinic acid, precursor of porphyrin. Moreover, since porphyrin is fluorescent compound, quite sensitive detection is possible by measuring fluorescence intensity. We hope to establish these basic techniques into medical fields.

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## *Student Achievements*

### **After a whirlwind tour, Obama leaves his footprints in the heart of young people**

Nao YAMAMOTO  
4th-year  
Department of Biological information

On the last leg of a whirlwind tour of Japan, U.S. President Barak Obama met with Japanese students. In the exchange forum held at Miraikan, I represented Tokyo Tech. Prior to the event, I had been chosen to be in charge of sections 2, where Honda’s humanlike robot ASIMO is in action. Fortunately, I had a chance to talk directly with the President. Though he is the U.S. Chief Executive, President Obama is so friendly. I grabbed this chance to recommend him to play soccer with ASIMO, though it was not in his schedule. He readily answered, “Sure,” and enjoyed kicking the ball with ASIMO. Toward the end, the President went out of his way to approach me to ask these questions: “What is your major?”, “What are you planning to do in the future?” and “Do you have a plan to study abroad?” Then, he

encouraged me to study in the U.S., making me all the more enthusiastic about exposing myself to the cutting-edge research environment. It was an amazing and unforgettable experience to look firsthand at how the world top leader speaks and behaves. I believe that active involvement into many programs provided by Tokyo Tech has led me to this valuable experience. To make my dream of studying abroad come true, I am firmly determined to dedicate myself to the pursuit of my research and mastery of English.

## *Student Achievements*

### **Tokyo Tech undergraduate Students Win at iGEM Three Years in a Row**

Yuta KINO  
3rd-year  
Biological information  
Department of Biotechnology



iGEM ( the International Genetically Engineered Machine Competition ) is a worldwide, undergraduate synthetic biology competition in which student teams are given a kit of standard biological parts, called BioBricks, and compete by designing and

building a new biological system using these parts and other parts they design themselves.

The Tokyo Tech team project was chosen as the Best Information Processing Project at iGEM 2014, held at MIT on October 30 - November 03, 2014. There were 245 participating teams this year from renowned universities such as MIT(USA), Imperial College London(UK) and Tsinghua University(China). The competition is divided into 15 projects, including 5 new projects added this year.

The Tokyo Tech team was consisted of 11 students from the School of Biotechnology and Bioscience, 2 students from School of Science, and 1 student from School of Engineering, currently enrolled in the Bio Creative Design II course.

The team built a genetic network modeled after the interaction among customers, companies, and banks and verified the results using simulation. The objectives of this project were to demonstrate the importance of synthetic biology to the general public and to develop teaching materials for enabling science students to gain a better understanding of economic systems. As a result of this project, Tokyo Tech won the prize for the Best Information Processing Project, one of the 15 available project divisions.

This year marked the third year in a row that Tokyo Tech team has won the Information Processing Project, which is a remarkable feat that had never happened in the 10-year history of this competition. These results demonstrated the outstanding abilities of Tokyo Tech students on an international stage. Tokyo Tech also extended its world record of consecutive gold medals to eight years since the inception of the medal system. Of the 245 teams, there are only three teams that hold this record for consecutive gold medals -- Tokyo Tech, the University of Edinburgh (UK), and the University of Freiburg (Germany).

#### List of Participating Students

Yuta Kino : 3rd-year, Biological Information, Department of Biotechnology, School of Bioscience and Biotechnology

Naoto Takahashi : 3rd-year, Biomolecular Engineering, Department of Biotechnology, School of Bioscience and Biotechnology

Yuya Nakamura : 3rd-year, Biological Information, Department of Biotechnology, School of Bioscience and Biotechnology

Shoko Suzuki : 3rd-year, Biological Information, Department of Biotechnology, School of Bioscience and Biotechnology

Keina Matsumura : 3rd-year, Biological Information, Department of Biotechnology, School of Bioscience and Biotechnology

Ayaka Murase : 3rd-year, Bioengineering, Department of Biotechnology, School of Bioscience and Biotechnology

Xinan Wang : 3rd-year, Bioengineering, Department of Biotechnology, School of Bioscience and Biotechnology

Takuya Kato : 3rd-year, Department of Physics, School of Science

Kai Ye : 3rd-year, Department of Information Science, School of Science

Paniti Achararit : 3rd-year, Department of Computer Science, School of Engineering

Riku Shinohara : 2nd-year, Department of Biotechnology, School of Bioscience and Biotechnology

Kodai Hibi : 2nd-year, Department of Bioscience, School of Bioscience and Biotechnology

Gyomon Ryu : 2nd-year, Department of Bioscience, School of Bioscience and Biotechnology

Miyabi Hishinuma : 2nd-year, Department of Bioscience, School of Bioscience and Biotechnology

## Student Achievements

### Chorafas Foundation Award

Yoshihiro IJIMA  
(2014 graduate, PhD)  
Department of Life Science



It is a great honor for me to receive the EPFL Dimitris N. Chorafas Foundation Award to my doctoral study, “Development of artificial nucleic acid probes discriminating among miRNA length variants”.

When I started my doctoral study, it has been suggested that the individual miRNA was co-exist with its length variant (isomiR), though there were no report about the detection method capable to discriminate among them. That was why I developed a new RT-PCR method using the chemically modified oligodeoxynucleotide primers.

This work was the world’s first report about the method to discriminate between the target miRNA and isomiR. It is expected that this research lead to better understanding of life phenomenon, gene therapy with minimum side effect, and accurate gene diagnosis in future.

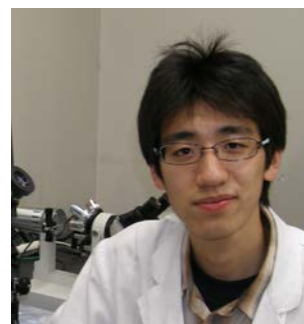
Now I concentrate hard on the further work as a postdoc researcher. I would like to develop the nucleic acid chemistry to contribute to the people's health in the future.

Lastly, I deeply appreciate all kindness and encouragement given by my mentors, Associate Prof. Kohji SEIO, Prof. Mitsuo SEKINE, Associate Prof. Akihiro OHKUBO, Assistant Prof. Yoshiaki MASAKI, and Assistant Prof. Takashi KANAMORI, and all my coworkers.

## Student Achievements

### Chorafas Foundation Award

Tetsuo IWATA  
(2014 graduate, Ph.D)  
Department of Bioengineering



I really appreciate that I am awarded the 2014 prize of the Dimitris N. Chorafas Foundation. I am truly glad since my research deserves the award.

My research is “Studies on the *cis*-element for mouse class I odorant receptor genes using the *Bacillus subtilis* genome vector system”. The *B. subtilis* genome vector system is a novel

cloning tool for large DNA fragments and has several attractive properties, such as a large cloning capacity of over 3 mega-base pairs, stable propagation of cloned DNA and amenability of various modification strategies using homologous recombination. However, manipulations and applications of this system have been under development. Therefore, I provided a complete genetic manipulation method for the *B. subtilis* genome vector system, and also demonstrated that this system was applicable to mouse transgenesis. In addition to the establishment of this system, I showed a first experimental evidence of a *cis*-acting element of a mouse class I odorant receptor gene. These achievements provide the practical applications of this system to the various life science researches.

I am one of the first students assigned to Hirota laboratory in Tokyo Institute of Technology. Therefore, there were many challenging tasks and needs for the start up of experimental environments. But, thanks to grate support from colleagues and collaborators, I totally feel having numerous valuable experiences. At present, I am engaged in improving the *B. subtilis* genome vector system and uncovering the molecular mechanisms underlying odorant receptor genes expression as a research fellow of Japan Society for the Promotion of Science. Finally, I would like to thank my supervisor, Dr. Junji Hirota, all collaborators including Dr. Shinya Kaneko, and the members in the Hirota laboratory.

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## ***From Foreign Students***

### **Foreign student life in Tokyo tech**

Phurt Harnvoravongchai  
3<sup>rd</sup> year student, Doctoral program  
Department of Bioengineering



I was wondering how foreign student life would be. Facing strange people, different language and culture, those things were coming to my head before I came here. But when I first landed here, nervousness was replaced with excitement. Everything was amazing, food was great, people were nice cultures were unique and charming. I found that learning Japanese language is quite tough but I am really lucky to have such a nice lab mates whose always listen to my poor Japanese with a lot of patient.

One thing I do really love is soccer. I was afraid at first that I would not be able to play soccer here because of language barrier and different in culture, but I was totally wrong. Japanese do love soccer and they always willing to let me play with them. My advisor, Fukui sensei, you will never believe that he is a really good player. He always score a lot when we played together, how awesome of my foreign student life here!

Well, let's talk about my research. I am studying sulfur-respiration mechanism in the one of hyperthermophilic archaea called *Thermococcus kodakarensis*. To figure out how this lovely tiny organism could survive under such a high temperature with sulfur is a magnificent understanding.

I would like to express my appreciation to my advisor, Prof. Fukui, and Assist. Prof. Orita. Thanks to my labmates and all of my friends to



make me have a wonderful time here.

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## *From Foreign Students*

### **Enjoy student's life and research in Tokyo Tech**

Nguyen Kha THE  
2nd year student, Graduate school  
Department of Biomolecular Engineering



It has been 2 years since I came to Japan to enter the graduate program in Tokyo Tech, but it just like yesterday. Before I came to Japan, I imagined the graduate study was boring with full of experiments and classes. However, from the last two years, I feel very happy and satisfied with colorful graduate study's life in Japan. The graduate program in Tokyo tech is quite diversity. It provides not only academic classes but also classes to support for improving communication skill such as Global communication class. I was very impressed in

the way the teacher managed and discussed with students in that class. Moreover, the Bioscience and Biotechnology school often celebrates symposiums for students to expose their research to other students and communicate about their research. The Tokyo Tech also often invites prestigious and famous professors in the world to give presentations and talks with students. That is really useful for me because I learned so much about academic knowledge and was inspired a lot by those great scientists. Besides studying in class, I spend most of my time for conducting my research in KONDOH sensei's laboratory to study cancer metastasis. Currently, I am studying and exploring the lung metastatic genes in osteosarcoma. I am really grateful all of members in KONDOH's laboratory because of their help and support for my research and daily life. Moreover, I am so happy to make friends in Japan and join various sport activities such as volley ball, table tennis, and soccer. Currently, I belong to one soccer club and play soccer every week, it is really interesting and helpful for me to relax and improve my health after doing experiments in laboratory. Finally, I would like to thank to my Professor KONDOH sensei and all friends in Japan who have helped me a lot in my study and daily life.

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#### **Editor's Note**

We are pleased to send you News Letter No.17 with the help of members of the committee of Biotitech News Letters and the alumini/alumae of Faculty of Bioscience and Biotechnology in Tokyo Institute of Technology.

We hope that this letter helps you grasp how our school is developing and growing for the future.

*Bio Tokyo Tech Alumni News Letter*  
Editor-in-Chief

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Takafumi UENO  
Department of Biomolecular engineering

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31, March, 2015