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## From the Dean

### On the end of the Graduate School's 20th anniversary

Mitsuo SEKINE  
Dean, Graduate School of Bioscience and  
Biotechnology

First of all, I would like to tell all alumni that this year marks the 20th anniversary of the

Graduate School of Bioscience and Biotechnology. To celebrate the anniversary, the Graduate School held memorial lectures, a ceremony, and a banquet on November 17, 2012. The memorial lectures were given by Professor Kentaro TANAKA of Nagoya University, a former member of the Okahata lab, and Emeritus Professor Tairo OSHIMA, the first Dean of the Graduate School. There was a striking contrast between their talks. Professor TANAKA's lecture was well received; he shared secret stories about his former supervisor from his graduate student days, as well as his ongoing cutting-edge

research. Professor OSHIMA gave a deeply affecting and unique lecture on the theme of “life and death.” He is still interested in the origin of life, and has made energetic efforts in this field even after he transferred to a corporation. His other topics included using the cows that were exposed to radiation after the Great East Japan Earthquake as compost. The ceremony was held afterwards. There, the new President MISHIMA and former President AIZAWA shared messages of encouragement and expectations to the Graduate School. At the banquet, Professor Shigehisa HIROSE and Emeritus Professor Takashi AKEHATA, the first Dean of the School of Bioscience and Biotechnology, reminisced about topics from the time the School and Graduate School were founded, including coordination within the university and negotiation with the MEXT. Although we did not invite alumni to this event because of the limited capacity of the venue, here I would like to report that such an event was conducted.



Nearly 22 years have passed since the creation of the School of Bioscience and Biotechnology, and almost 20 years since the establishment of the Graduate School. They were the first school and graduate school in the field of bioscience and biotechnology founded in Japan; this fact is remembered in history and remains unchanged. However, our mission is not to be content with the status quo, but rather to continuously develop to the future as a leader in the bioscience and biotechnology field. We are keenly aware that assistance from many graduates will be necessary to reach the goal. We hope that alumni working in the worlds of industry, academia, and government will not forget their alma mater, but provide the needs in each field to Tokyo Tech through various routes, so

that the Graduate School of Bioscience and Biotechnology can vigorously conduct research to transform these needs into solutions. I kindly ask for continuous support from our alumni.

## On Retirement

### Weather map on my face

Shigehisa HIROSE  
Professor

Department of Biological Sciences

In winter, atmospheric pressure is high to the west and low to the east, and minute vertical stripes appear on weather maps. The same phenomenon appears to occur on my brow. When I complained about a trivial matter to my



wife, she handed me a mirror and said, “Weather map on my face (high barometric pressure to the west and low pressure to the east with a vertical stripe pattern).” I hadn’t noticed that deep vertical stripes had been engraved between my eyebrows; these appeared even more distinct when we were quarreling. Since then, the phrase “weather map on my face” has become a magic word to calm down the situation in my household (unlike the winter weather). If my brow wrinkles indicated the amount of contributions I had made to the development of Bioscience and Biotechnology at Tokyo Tech, then I would bear these vertical stripes as a badge of pride. Unfortunately, that’s not the case—I keep asking myself, “When did you turn 65? What have you been doing?” With a bit of self-admonition, I would like to tell the following generations that time is a precious thing for a university. I truly feel that universities that waste time will be ruined first.

When Tokyo Tech was attempting to build the School of Bioscience and Biotechnology, MIT was considering withdrawing from bioengineering. The reason isn’t clear, but perhaps MIT couldn’t gather a sufficient number of excellent human resources. MIT is one of the world’s foremost universities in the biomedical field, but it changed its direction to a focus on the fundamental biology and medical science. In that sense, it was a real challenge for

Tokyo Tech to create the world's first School of Bioscience and Biotechnology and declare that it would contribute to society by creating new industries. However, now that 22 years have passed, it is impossible to say that things have gone entirely as we planned. Currently, biotechnology is completely inferior to "low tech" in cost, although it is environmentally more friendly. This situation is the same in every country, but we can't simply use that as an excuse. (Japan's refusal of GM food may have had an impact.) I experience heartfelt pain when I see students struggling to find jobs, and I am sorry that I have reached the age of retirement without being able to fulfill my promise of creating new industries.

I graduated from Tokyo Tech's Department of Chemistry and then became a postdoctoral fellow at Vanderbilt University's School of Medicine in the U.S. After moving to the University of Tsukuba, I returned to Tokyo Tech. During this time, I realized that I had absolutely no innate sense for practical applications, so I focused on the fundamentals. I am grateful that I have become able to undertake my true work of "reading the nature," even if only by small degrees. I would like for the future generations to take on the challenge of creating new industries.

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## On Retirement

### Marriage to diversity

Norihiro OKADA  
Professor  
Department of Biological Sciences



I came to Tokyo Tech when I was 44. So, when I reach the retirement age at the end of March of next year, I will have spent 22 years at this university. Here at Tokyo Tech, I was able to conduct joint research with experts in many different fields. Since

FY2002, supported by Grant-in-Aid for Scientific Research on Priority Areas "the Molecular mechanisms of speciation", I performed ecological surveys and sampling of cichlids at Lake Victoria in Tanzania. To that end, I organized a joint research group with ecologists Drs. Tetsu SATO and Shinji MIZOIRI and morphologist Dr. Mitsuto AIBARA. Because my specialty is molecular biology, it is safe to say that my methods and ways of thinking are the exact opposite of those in morphology and ecology, which are mainly focused on field research. It seems to me that starting joint research with people in different disciplines is like marriage. At first you know nothing, so you are a little excited and become completely absorbed. But as time passes, you start to notice differences in the ways of thinking. There are occasions in which you can't go along with the other person, but if you overcome the differences, you can learn many things and broaden your perspective. And because you gain a total understanding of his/her research interest, you feel a deep connection with the other person. Even if researchers in the same field come to understand each other, I think it's probably difficult for them to develop this level of kinship. Perhaps one factor is that researchers in the same field see each other as competitors. In joint research by people in different fields, on the other hand, there is a sense of common purpose and mission; each person serves as a representative of their respective fields, trying to create a new field together. During our cooperative research on cichlids, we successfully gathered nearly 20,000 cichlids from Lake Victoria, together with their ecological information. Thanks to the great contribution of Dr. Yohei TERAJ, a molecular biologist in my lab who analyzed these specimens, we proposed a new speciation mechanism driven by the adaptation of vision, called the "sensory drive" and published an Article in *Nature*, which was featured on the front cover.

Another major event to me was being able to do joint research through my long acquaintance with Professor Shigenori MARUYAMA of Tokyo Tech's Department of Earth and Planetary Sciences. He is well known in various realms. In the past, he was absorbed in elucidating continental migration based on geology. Meanwhile, we were working out a technique to analyze phylogeny based on the presence or absence of retroposons. When we used this method to investigate the divergence of the ancestor of Eutheria, our data indicated that



divergence occurred at roughly the same time for Boreoeutheria (originated in Eurasia), Afrotheria (originated in Africa), and Xenarthra (originated in South America). DNA data showed the possibility that the three continents of Eurasia, Africa, and South America also diverged at the same time. Since I knew that Professor MARUYAMA was an expert of continental division, I immediately proposed joint research to verify this possibility, which turned out to be very fruitful. According to the traditional continental division scenario, the three continents were not separated at the same time; rather, Eurasia and Gondwana separated between 148 and 138 million years ago, followed by the separation of Gondwana into Africa and South America 105 million years ago. These estimated ages are based on the magnetic lineation. Our research showed that this type of age estimation—the traditional method in geology—is not appropriate as a method for answering the question of when land mammals experienced geographical isolation. This was a major discovery for us biologists. And by using the latest drilling data under the guidance of Professor MARUYAMA, we reconstructed the period during which Africa and South America divided. The results indicated that the division of Gondwanaland was 120 million years ago—older than the traditionally accepted figure of 105 million years ago. From this data, we successfully presented a hypothesis in which the three continents of Eurasia, Africa, and South America were divided at around the same time roughly 120 million years ago, resulting in geographical isolation that split the ancestor of Eutheria into three. This was the first example throughout the world of submitting a new geological hypothesis based on DNA data (*PNAS*, Nishihara, Maruyama & Okada, 2009).

As described above, I can confidently say that incorporating other fields into your own research brings about successful outcomes. As I said, joint research is like marriage—first attraction is required. Then, the important points are how you produce this attraction from your own research, and whether you “propose” others when it comes. After the proposal, there is the joy (and endurance) of living together, and the awareness of being kindred souls is finally born, which is another way that joint research and marriage are alike.

## On Retirement

### Cultivating human resources

Naomi KITAMURA  
Professor

Department of Biological Sciences

The cultivation of human resources is one important mission for universities. Therefore, the mission of the Graduate School of Bioscience and Biotechnology is also to cultivate human resources—researchers and engineers wanted in the field of bioscience and biotechnology. I have been a faculty member of the Graduate School of Bioscience and Biotechnology for 18 years, where I have been involved in human resource cultivation through education of undergraduate and graduate students. During the 18 years, I have interacted with more than 1,000 students via lectures, hands-on training, and research guidance.



I believe I have thoroughly implemented the educational policy of fully mastering the fundamentals. First of all, in Freshman Seminar I for first-year students, I have used the example of anticancer drug development to stress the importance of fundamental knowledge in all fields of life sciences for drug discovery. I was in charge of the Molecular Biology and Molecular Genetics classes for second- and third-year students, where I always asked questions about fundamental knowledge. Most of the students who do poorly on their examinations when they are second-year students become able to answer in a way that shows the results of their studies when they are third-year students. In this way, I have been able to clearly see the growth of students. Of course, this is not the achievement of one person, but instead the results of the efforts made by all the teachers involved in undergraduate education.

Recently, many people are loudly saying that we must train global human resources. I believe the first step towards this goal is for students to become able to fully read exemplary research papers in English. During graduate school lectures, I picked up the latest important papers and explained in detail how to read them. I also assigned reports in

which students had to select and explain an important paper on their own; many students passed this assignment with flying colors. The next step is for students to master presentation skills and gain the ability to write logical sentences in English. I hope students will work diligently with the desire for constant improvement.

Research is a creative task in which wisdom is more important than knowledge. During my research guidance, I have continually emphasized the importance of logical ways of carrying out research, as well as ways of carrying out quantitative experiments. I think students will naturally find that their research produces results if they carry it out in this fashion. I have been able to notice whether or not students are being trained in the realm of research through their graduation research presentations, master's theses, and doctoral dissertations.

We may say that we are cultivating superior human resources with fundamental strengths and sending them into society. But this is nothing more than self-satisfaction if society does not actually evaluate these human resources highly. It seems that society evaluates the cultivation of human resources based on whether or not they are contributing to the progress of society. I earnestly hope that graduates of the School of Bioscience and Biotechnology and Graduate School of Bioscience and Biotechnology will use the fundamental skills they have learned in the School and Graduate School to take on many new challenges and make contributions to the advancement of society.

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## From New Staff

### Greetings

Takashi SUZUKI  
Associate Professor  
Department of Biological Sciences  
Core Division of Advanced Research

A year has passed since I started working at Tokyo Tech. I am studying on the neuronal circuit and synapse formation, using the master of model organisms, *Drosophila*. As well as continuing what have been studying, I am now exploring a new direction taking advantage of the stimulating environment of Tokyo Tech. I have smoothly

reset-up the laboratory, with a warm support by the neighbors and the university: for example, I was recently awarded the Challenging Research Award from Tokyo Tech.

Two years ago, when the Great East Japan earthquake took place, I was living in Germany. On the morning, I went to the medical room of the Institute to have an annual check-up. The doctor asked me whether Japan is OK, since he had just watched TV, telling that Japan just had had a gigantic earthquake. I remember I replied it should be fine, since Japanese were used to earthquake and *Tsunami*. People in Germany (including me) well remembered the Sumatra earthquake that happened several years before then, when the word *Tsunami* became famous among Europeans. Since *Tsunami* is a Japanese word, I assumed that Japanese are well prepared for *Tsunami*, which I realized afterwards was far, far too optimistic.

The reaction of the German society to the earthquake and the *Tsunami* was huge as well. My several acquaintances (not one!) asked me whether I had any relatives who wanted to escape to Germany since he has extra rooms to accommodate. Researchers in Germany also responded very swiftly and warmly. They offered Japanese researchers who had suffered from the *Tsunami* lab space and expenses to continue research activity in Germany. I felt even more enthusiasm than the Sumatra earthquake, the enthusiasm from the German society at both public and personal levels. Although I assume there were very few Japanese who left suffering neighbors and escaped to Germany, I was very grateful and amazed by the swiftness and the generosity that German people showed. I then wondered whether the Japanese society could respond in the same way, if the equivalent tragedy happened in Germany.

In the beginning of the last December, a gorgeous Christmas illumination appeared in front of Suzukakedai Station, which still continues flashing in mid-January. I am a little bit worried that Japanese already started to forget about the tragedy that made the world biting its nails.



## From New Staff

### Toward understanding of metabolic systems in human gut microbiome

Takuji YAMADA  
Associate Professor  
Department of Biological Information

Metagenomics is a powerful method to analyze genomic sequences derived directly from environmental samples such as soil, ocean or human gut etc. Using bioinformatics, our group focuses on identifying novel functionality of genes and proteins mainly from metagenomic data along the following lines:

- 1) Identify novel enzymatic proteins from variety of metagenomic data
- 2) Decipher microbial trophic chains in human gut and its effects to human hosts
- 3) Reveal bacterial co-operation and competition inside microbial communities

A part of metabolic ability of human gut microbiome, such as vitamin biosynthesis, has been uncovered recently. However, we still lack a complete understanding of metabolic systems in human gut. Toward navigating human gut microbiome to healthy states, we aim to understand the whole view of metabolism in human gut microbiome.



## From New Staff

### Biomaterial synthesis — lesson from the nature

Takafumi UENO  
Professor  
Department of Biomolecular Engineering

Nature makes biosupramolecules, such as virus and photosystem, by self-assembly of proteins, which can promote various biological reactions. It has been difficult to prepare synthetic molecules

with similar structures, functions and size (10-100 nm) by typical chemical technologies. My research group is developing new methods to synthesize supramolecular architectures using proteins. We have reported the construction of cage, needle, and framework-type structures with various proteins. The goal of our research is to establish the new interdisciplinary field, which encompasses the fields of material chemistry, protein engineering, and biology.



## Events

### A report on the 20th anniversary of *Seimei-Rikou*

Hideya YUASA  
Professor  
Department of Life Science

To celebrate the 20th anniversary of the Graduate School of Bioscience and Biotechnology or *Seimei-Rikou*, a ceremony was held on Nov 17th, 2012 at the Suzukake Hall in Suzukakedai Campus. As many as 145 people gathered from in and out of school even in the severe winter storm. The ceremony started with two keynote lectures followed by addresses from the distinguished people associated with *Seimei-Rikou*. The ceremony ended with an enjoyable party. To each participant was distributed a pamphlet encompassing 20 years of *Seimei-Rikou*.

The first lecture entitled “What I learned in *Seimei-Rikou*” was given by Professor Kentaro TANAKA at Nagoya University, who is also an alumnus of Department of Biotechnology. He started his lecture by pointing out that the original two departments of *Seimei-Rikou* were the first not written in kanji but in katakana. He also shared with us the secret stories when he was in Okahata lab. His current studies include the creation of functional self-organizing molecules, and he suggested that one of the ultimate goals of *Seimei-Rikou* was the application of these self-organizing molecules to living bodies.

The next speaker was Emeritus Professor Tairo



OSHIMA, who is a former Dean of *Seimei-Rikou* and the director of Institute of Environmental Microbiology, Kyowa Kako Co., Ltd. The title of his lecture was “The boundary between life and death: what has changed since I was in *Seimei-Rikou*,” and he talked about the efforts with his colleagues to found the new graduate school, his studies done after the retirement from Tokyo Tech, and messages to young scientists. As a humorous story, he confessed that he and his colleague boldly took off the signboard of the Natural Product Research Center, one of the preceding organizations, without permission at the foundation year of the School of *Seimei-Rikou*, which had been established two years in advance of the graduate school. He also talked about the current research activities including a timely, serious, and graphic story about a study of decomposing the cattle bodies that had been exposed with radioactive substances in Fukushima by using thermophilic bacteria. On the end of his talk, he questioned some puzzling facts regarding the origin of life that had been taken for granted and presented them as inspiring messages to young biologists: Why do all life employ 20 kinds of amino acids and four kinds of nucleic acids? Isn't it OK with smaller numbers? Why has the main component of the membrane lipid switched in a strange way during evolution and why doesn't nobody study on this? Is there a boundary between life and death? Since water bear (*kuma-mushi*) is anhydrobiotic, being capable of surviving desiccation, it may be possible for humans to acquire immortality.



After the lectures, the Dean, Professor Mitsuo

SEKINE gave a welcoming address to the audience, reporting the launch of Educational Academy of Computational Life Sciences (ACLS), a new funding program to foster the graduate students who want to study both computer and life sciences, and the acquisition of a large budget from the MEXT, and then asked the audience to raise the fund for *Seimei-Rikou* commemorating the 20th anniversary. The next speaker was the President Yoshinao MISHIMA, who emphasized the importance of showing the presence of *Seimei-Rikou* to realize the purpose of the newly established organization — Organization for Life Design and Engineering — in line with the national policy.

We then had Mr. Minoru KANEKO, a school inspector at MEXT, who gave an inspiring address on behalf of Ms. Kumiko BANDO, the Director-General of Higher Education Bureau. He said that the role of universities in the promotion of innovation in science and technology is getting more and more important after the earthquake/tsunami on Mar 11th, 2011 and expressed the hope that Tokyo Tech contributes to building a stable and robust nation. In the end of the ceremony, we welcomed Emeritus Professor Masuo AIZAWA, a former President of Tokyo Tech and a member of Council for Science and Technology Policy, who looked back the 20-year history of *Seimei-Rikou* and defined its establishment as a turning point of Tokyo Tech from an institute to a university. He inspired us by concluding that *Seimei-Rikou Gakubu*, the third undergraduate school of Tokyo Tech, is a frontier in Japan, having triggered the establishment of similar schools and departments throughout the country, and that we therefore should remember the frontier spirit on this occasion of the 20th anniversary and should bring about innovations as a representative university in Japan.



After the ceremony, we held a banquet to celebrate the 20th anniversary. After the opening address from a former Dean, Professor Shigehisa HIROSE, to welcome the guests, we asked the first Dean, Emeritus Professor Takashi AKEHATA, to propose a toast. The banquet proceeded in a friendly atmosphere, some chatting about the hardships in the time of foundation and others exchanging information between different scientific fields.

Last but not least, through the whole 20th anniversary events, we were able to look back the starting point and to look forward to the future of *Seimei-Rikou*. Here I would like to acknowledge the staff members and students who volunteered for the ceremony events.

## Events

### ACLS International Summer School

Hiroshi IWASAKI

Professor

Department of Biological Sciences

The Academy of Computational Life Sciences (ACLS), which is supported by the Program for Leading Graduate Schools from the Ministry of Education, Culture, Sports, Science and Technology, Japan, held its 1st international Summer school in Shonan Village Center (Hayama, Kanagawa, Japan) from the 3rd (Mon) to 5th (Wed) of September, 2012. In addition to 41 graduate students from Tokyo Tech, of which 29 were from Graduate School of Bioscience and Biotechnology, eight lecturers from home and abroad and 11 invited students from seven overseas universities [Univ. of Oxford (UK), Strasberg Univ. (France), Univ. of Science (Vietnam), Tsinghua Univ. (China), National Central Univ. (Taiwan), UCLA (USA) and Purdue Univ. (USA)] attended the summer school, where English was certainly the official language. Thus, it was truly “international”!

The outline of the three-day school was as follows: On day 1, the program consisted of a workshop on science writing, lectures on various topics of interest to the students, and a poster

session on the research work of the students in the evening. On day 2, the students carried out project works (see below) and had an social hour. On day 3, the students attended additional lectures and organized an award ceremony for the best project work. In addition, the students organized an excursion to Kamakura for the foreign students and lecturers. Thus, through a variety of interfaces, the students from home and abroad spent very productive three days interacting with and learning from each other. It is important to mention that almost all of the program was organized by the students from Tokyo Tech. Please also see a report by Motoki IMAMURA (Dept. of Biological Information) in the later section entitled “Student Achievements”.

The project work on day 2 was one of the main events and was organized and orchestrated by the students from Tokyo Tech on a voluntary basis. Each team consisted of four to five students from Tokyo Tech and at least one student from abroad.

The assignment was to envisage the startup of a venture business in one of the following domains, which were randomly assigned to each team; 1) medical service / drug development, 2) agriculture /



food production, and 3) environment / energy issues. The students discussed and decided what project best fitted the assignment for four hours and then presented the corresponding business plan using PowerPoint. The invited lecturers, the ACLS faculty members, and the students themselves voted for the best project and presentation. It was probably the first time for most students from Tokyo Tech to craft a business plan in biotechnology from a scratch using only English together with foreign students. They must have felt even more keenly the importance of “global communications.” Thus, this



summer school has provided an opportunity for the participants from Tokyo Tech to face the internationalization of science, which receives more attention as a critical factor for human progress.

## Awards

### Winning the Medal with Purple Ribbon and reaching the retirement age

Takeo KISHIMOTO

Professor

Department of Biological Information

I was awarded a Medal with Purple Ribbon in November 2011, nearly 1.5 years ago. I was given this award because of my contributions to cell biology. Of course, research on experimental biology cannot be carried out alone—first of all I would like to express my heartfelt gratitude to all the people who conducted research with me, from the laboratory staff to students.

Our main research interest is on the regulatory mechanisms of the oocyte cell cycle. An adult human individual is made up of dozens of trillions of cells. All of these cells come from one single cell — a fertilized egg — and have basically the same set of genes. So, considerably complex and precise mechanisms are likely to be involved in this process,

and the cell cycle is one such system, controlling cell replication. While the cell cycle is essentially controlled in a cell-autonomous manner, the cell cycle of an egg is controlled by extracellular stimuli such as hormones and fertilization. Our research has made it possible to clearly explain, to a certain degree, the mechanism connecting external stimuli to the intracellular cell cycle. I can say that this research has provided an up-to-date answer to the classic biological questions in oocyte maturation, fertilization, and the beginning of oocyte development.

Looking back, I took up my post at Tokyo Institute of Technology in December 1987, when the School of Bioscience and Biotechnology was in the planning stages. I was appointed after the retirement of Professor Yukio HIRAMOTO (who had reached the retirement age) from the Department of Biology in the School of Science.

Coincidentally, at the beginning of 1974 (almost 14 years before that point), when I was a graduate student in The University of Tokyo's Department of Animal Science, Graduate School of Science, I visited Professor HIRAMOTO's laboratory in Ookayama to receive instructions for the method of microinjection into egg cells. Thinking of how that visit provided directions for my research from that point up until today, it was a momentous day in my life. I was extremely honored to take up the post vacated by Professor HIRAMOTO. Professor HIRAMOTO was also given the Medal with Purple Ribbon slightly before he reached the retirement age (which was 60 at that time). He passed away last autumn on October 30, 2012 at the age of 86. Once again, I would like to express my sincere condolences on the passing of Professor HIRAMOTO.

Both before and after Professor HIRAMOTO, there has been a history of professors with distinguished academic careers in the biological sciences at Tokyo Tech, including Ryuichi YASUGI and Motonori HOSHI. Receiving the Medal with Purple Ribbon has reassured me somewhat because I definitely have the responsibility of carrying on the tradition of biology—not bio-something—at the School of Bioscience and Biotechnology. However, when I look at Tokyo Tech as a whole, this “tradition of biology” has an inescapably weak presence. The same thing applies even within the Graduate School of Bioscience and Biotechnology. How did this happen, and for what reasons?

One reason is likely the small number of people. But the most fundamental issue is the view on biology of Tokyo Tech, more specifically, of the people who pride themselves as being the mainstream at Tokyo Tech. I will reach the age of retirement this spring (in March 2013). My overall feeling about my more than 25 years of life at Tokyo Tech is that “useless biology” has been regarded as an accessory of “useful chemistry” at this school. Personally, my days have been full of sadness and mismatches. Yet, scholarship cannot exist without “useless” basic sciences, and universities are nothing but the places for scholarship. At this very moment, the Department of Earth and Planetary Sciences in the School of Science has been selected for the World Premier International Research Center Initiative (WPI), a world-class research base program. This department

was not regarded as the mainstream at Tokyo Tech, but is showing an important presence at Tokyo Tech. I believe that Tokyo Tech will be able to make a new, rapid progress when the promotion of biology becomes possible. This is my hope as I — one of the last founding professors of the School of Bioscience and Biotechnology — approach my retirement.



## Awards

### On winning the Kyoto Prize

Yoshinori OHSUMI

Professor

Department of Biological Sciences

Frontier Research Center



In April 2009, I became a Professor at the Frontier Research Center at the Suzukakedai Campus. In this truly wonderful research environment, I have been working on the compilation of autophagy research spanning 25 years.

On November 10, I was awarded the distinguished Kyoto Prize in Basic Sciences together with two other winners. This was the first time that this prize was given to a Japanese researcher in the field of life sciences since the late Dr. Yasutomi NISHIZUKA in 1992. Thinking of this, I sense the importance of this prize. During the Kyoto Prize week, there were many events including a welcome reception, dazzling award

ceremony, lectures for the general public, lectures for high school students, and more. It was one of the most memorable events of my life so far. Since I was given the opportunity to give a talk on my research at the Suzukakedai Campus on November 27, here I would like to focus on my personal feelings from the Kyoto Prize week.

Twenty-eight years ago, at the young age of 52, Kazuo INAMORI (the chairman emeritus of Kyocera Corporation) founded the Kyoto Prize as an international prize to honor the meritorious achievements of people who have made remarkable contributions to the development of science and civilization, as well as the mental deepening and enhancement of humankind. I directly heard about the philosophy and ideals behind this establishment from Mr. INAMORI, and I was greatly impressed by his clear vision. I think the Kyoto Prize is unique because it covers the fields such as ideologies, arts, and ethic that are not the subject of other major prizes.

When I was a doctoral student of the University of Tokyo, I carried out research for two years at Kyoto University's Department of Biophysics in the Division of Biological Sciences, directly after its establishment. During that time, I married one of my fellow graduate students and began a new, frugal life at Kitashirakawa, which is full of culture, history, and natural environment. I will never forget Kyoto because it is the place where I met wonderful people who are currently active on the front lines of the academic world, as well as many fantastic teachers.

From the taxi on the way to my hotel from Kyoto Station, I saw posters for the Kyoto Prize hanging here and there throughout the city; it was embarrassing to see such a large photograph of my own face. At the same time, I was impressed how the Kyoto Prize was so deeply rooted in this city. Despite the intense rain, the lectures for the general public were attended by 1,800 local men and women of all ages. I heard that many people look forward to participating in this event each year.

Kyoto houses many Buddhist temples and Shinto shrines, and is generally considered to be an old town where traditional culture and skills have been inherited. But I strongly felt that it also respects culture, science, and universities, and nurtures their developments. Today, as the Japanese society is being standardized and normalized, the Kyoto Prize week was a good opportunity for me to

contemplate many questions, such as how regional communities and universities wherein should be, and what corporations should be aiming for.

## Awards

### Challenging Research Award

Takeshi HATA  
Assistant Professor  
Department of Biomolecular Engineering

In 2012, I received the 11th Challenging Research Award for my research project. This award encourages young scientists of Tokyo Tech to promote innovative research. My research project is to develop new synthetic methods using the carbon–hydrogen (C–H) or silicon–hydrogen (Si–H) bond activation. If C–H bonds, which are ubiquitous in organic compounds, can be changed directly to C–C bonds, this would become one of the most valuable, straightforward, and sustainable methods for the synthesis of bioactive compounds such as natural products and drugs. As not only the observation or analysis of substances and phenomena in nature but also their artificial application and utilization are important from the scientific and technical point of view, I will challenge to synthesize various bioactive compounds by discovering novel molecular transformations.



## Student Achievements

### Best information processing project in iGEM

Xinran TAO  
(3rd year undergraduate student)  
Bioengineering Course

iGEM, or the International Genetically Engineered Machine Competition, is the most famous undergraduate Synthetic Biology competition in the world. It started in 2003 as an

initiative to create a database of standardized genetic parts (called BioBricks) that could be fit together to design and construct more complex new life systems in the same way bricks are used to build buildings. The results are judged by presentation. This year, the Asia Jamboree was held on October 5 to 7, and the World Championship on November 3 to 5. More than 190 teams from all over the world, including MIT, Harvard University, and the University of Cambridge, participated in this competition, and all the teams were divided into eight departments.

Tokyo Tech 2012 iGEM team is composed of eight students from the School of Bioscience and Biotechnology and one student from the School of Technology. The team's project was to recreate the story of "*Romeo and Juliet*" by Shakespeare vividly by using cell-to-cell communication between two types of *Escherichia coli*. The team generated a circuit involving the regulatory mechanism of positive feedback rather than commonly used negative feedback to control the fate of *E. coli* by signaling between two types of *E. coli*. Furthermore, the team was the first iGEM group ever to synthesize P(3HB) (a kind of bio-plastics) by using a new BioBrick part. P(3HB) served as a rose between Romeo and Juliet. Since 2011, the number of participating universities is so high that MIT cannot host all the teams in its campus, which has led to the creation of regional jamborees. In spite of the increased competitiveness, Tokyo Tech 2012 iGEM team was still one of the most outstanding teams both in the regional iGEM Asia Jamboree in October (hosted by the Hong Kong University of Science & Technology) and the iGEM World Championship in November (hosted by MIT). In the Asia Jamboree, our iGEM team won a Gold Medal (as always) and got a pass to the World Championship. In the World Championship, we did again an outstanding presentation and won the Best Information Processing Project Prize, beating both MIT and UC Berkeley.

This was the second time a Tokyo Tech iGEM team won the Best Information Processing Project following the 2010 event. We are the only Japanese team who has been awarded "Track Prize" in 2012, demonstrating the comprehensive strength of Tokyo Tech students in the world. In addition, among all participating teams (more than 190), Tokyo Tech is one of the four teams that have won Gold Medals for six years in a row.



Overall, the iGEM experience in 2012 was a great success. It is a precious opportunity for undergraduate students to study and communicate with students all over the world.



## Student Achievements

### Student team wins 3rd place at BIOMOD and another 4 awards

Kensuke HOSHI  
(3rd year undergraduate student)  
Biomolecular Engineering Course

At the International Bio-Molecular Design Competition (BIOMOD), the Tokyo Tech student team won a 3rd place at BIOMOD and another 4 awards.

An international competition for undergraduates, BIOMOD is often referred to as “Biological ROBOCON.” Students design biomolecular nano-structures made of DNA, RNA, protein, and so on, in order to add functions (characteristic movements, control of information, etc.). We competed in the field of ideas and innovations, and the level of achievement.

Student teams (consisting of 6 undergrads) kicked off their project in March and presented their achievements at Harvard university in the United States last November. The team focused on photo-responsive DNA and catalytic reactions. Abstract was as follows:

We propose an extremely high-speed, controllable and rail-free molecular vehicle, “Biomolecular Rocket.” The Biomolecular Rocket moves faster than a natural high-speed molecular motor, kinesin, by taking advantage of catalytic O<sub>2</sub> production that progresses anywhere in a dilute

H<sub>2</sub>O<sub>2</sub> solution. For increasing the emission of O<sub>2</sub> bubbles from the Biomolecular Rocket, we conjugated numerous catalytic engines to a micrometer-sized rocket body with the use of DNA. In addition, direction of the rail-free movement of the Biomolecular Rocket can be controlled, since we designed a photoresponsive DNA for allowing detachment of the engines from the body upon the UV light irradiation in a region-specific manner. The present study embodies the concept to utilize and control non-biological reactions by designing biomolecules for achieving novel functions implemented by synthetic molecular systems. We believe that our Biomolecular Rocket is a step toward advanced molecular robots that can move on long and rugged fields such as the inside of human body.

We won 5 awards as follows:

- Grand Prize, 3rd place
- Best Wiki, 3rd place
- Best YouTube video, 2nd place
- 2nd Annual MOLBOT Award
- Project Award, gold medal

The Tokyo Tech team members were as follows:

- Kensuke HOSHI (junior, Biomolecular Engineering Course)
- Yusuke ATSUMI (junior, Biological Information Course)
- Hitoyoshi YAMASHITA (sophomore, Biological Sciences Course)
- Risa MATSUDO (sophomore, Bioengineering Course)
- Yasuo BANSHO (sophomore, Bioengineering Course)
- Ken SAITO (sophomore, Bioengineering Course)

Mentors were as follows:

- Masahiro TAKINOUE, Associate Professor
- Ken KOMIYA, Assistant Professor
- Masayuki YAMAMURA, Professor
- Daisuke KIGA, Associate Professor
- Akihiko KONAGAYA, Professor

Sponsors were as follows:

- Grant-in-Aid for Scientific Research on Innovative Area “Molecular Robotics”
- Collaboration Center for Design and Manufacturing



## Student Achievements

### My impression of ACLS Summer School as a student committee leader

Motonori IMAMURA  
(3rd year graduate student)  
Department of Biological Information

The Education Academy of Computational Life Sciences (ACLS) held an international summer school at Shonan Village Center, Kanagawa on Sept. 3 to 5. I served as the committee leader. I would like to introduce the summer school and my impressions of it.



ACLS summer school is a place for computer and life science majors to study together. Also, it is a place for cultural exchange with visiting foreign students. Therefore, we decided on the catch phrase "Cross X Challenge". Across the cultures and the science fields: the challenge of new things. To achieve Cross X Challenge, many of activities are done in groups composed of foreign students, bio-related students and information related students. A unique feature of this summer school was that all announcement, proceedings, lectures and discussion were done in English. This was challenging for many students, and it was difficult for everyone to achieve this goal. But it was a good

motivation to use English.

In the group work session, we discussed how to start up a venture company based on one of the following themes, 1) medical service/ drug development, 2) agriculture/ food production, 3) environment/ energy issue. Even though it was a broad topic, we were able to create meaningful presentations on the topic. The process of brainstorming, summarizing and presentation in a short term was very useful experience. In addition to group work, the opportunity to exchange opinions through poster session and lectures by invited speakers and to learn about different cultures through sightseeing were also fruitful for me.

The reason for the success of this summer school was thorough preparation by committee members, teaching staff and office staff. Without their hard work, each session of the summer school would not have been as successful as it was. It was a great pleasure to work with these people, and it was a great experience for me. In addition, crossing the border between school years and countries was also a very good experience, and I would like to maintain the relationships I made.

The next summer school will be held in the UK. I hope we can achieve "Cross X Challenge" again next year.

## Student Achievements

### CHORAFAS Foundation Award

Takashi KANAMORI  
(2012 graduate, PhD)  
Department of Life Science

This is a great honor for me to receive the 2012 EPFL Dimitris N. CHORAFAS Foundation Award to my doctoral work. I would like to thank to my mentors, Associate Prof. Kohji SEIO, Profs. Mitsuo SEKINE and Oliver



SEITZ, and also to my colleagues. Now, I am working as Assistant Professor of Tokyo Institute of Technology, Education Academy of Computational

Life Sciences.

Lastly, I would like to introduce the message from Prof. Dimitris N. CHORAFAS. I would keep this message in my mind.

*“Work twelve hours per day in the first years and you will succeed. You must also have trust in yourself.”*

## Student Achievements

### Honor for being given the CHORAFAS Award

Takayuki ENOMOTO  
(2012 graduate, PhD)  
Department of Bioengineering

I received the 2012 EPFL Dimitris N. CHORAFAS Foundation Award to my doctoral thesis “Role of Bcl11b in the mouse vomeronasal system.” I was so surprised and was deeply honored to have been selected as a recipient of such a distinguished international award.

The vomeronasal system is one of the chemosensory systems for the detection of pheromones, which mediate the social and reproductive behaviors among conspecific individuals. Each of >200 different types of vomeronasal sensory neurons in the nose detects distinct pheromone molecules selectively and sensitively and transmits information to the brain. Such pheromonal information finally affects the emotion and the physiological state of the recipient. However, little is understood about the mechanisms regulating the differentiation and the functional maturity of vomeronasal sensory neurons, which function as pheromone sensor. In my doctoral thesis, I revealed that a transcription factor Bcl11b plays a key role in the cell-fate determination during the differentiation of vomeronasal sensory neurons. These results were published in *Journal of Neuroscience* in 2011.

Various experiences throughout my doctoral course were essential to my thinking and were a meaningful process in my life. Now, I



belong to Dainichiseika-Donated Chair of Research Division for Innovative Biomaterials in the Center for Biological Resources and Informatics at Tokyo Tech, and I am continuing researches on cell differentiation. In the future, I hope to develop ultrahigh-sensitive cell sensor for various pheromones and chemicals through understanding of the chemosensory system in animals.

Finally, I would like to express my sincerest gratitude to Associate Professor Junji HIROTA for supervising my doctorate thesis, the members of HIROTA lab, all the collaborators for supporting my research, and Dr. Dimitris N. CHORAFAS.

## From Foreign Students

### Life in Tokyo Tech

ZHAO Boqiang  
(3rd year graduate student, IGC)  
Department of Biological Sciences

Time flies.

I still remember the first day I came to Japan, just like yesterday, although it was already four years back. Two Japanese students, ASAKURA san and ISOGAWA san picked me up at Narita International Airport. At that time, I could not speak Japanese at all. So, the whole way from Narita Airport to Nagatsuta, I was just saying “*Daijobu*” again and again to the Japanese students although I could understand what they said or not.

And now I am already a 3rd year doctoral course student. In the past four years, I took a lot of lectures, learned to do many kinds of experiments, joined a summer school program in France, attended international academic meetings, and so on. But the most unforgettable thing, also the happiest thing I had, is that I could make some Japanese friends like ITO Yusuke san, TAKAHASHI Yuki san, AITA Yusuke san, ITO Kunitoshi san, KASAJIMA Ippei san, and so on. We together went to many beautiful places in Japan and enjoyed lots of delicious food. As a foreign student, life in Japan was lonely at the beginning, but because of my dear friends, I knew more about this society, the way Japanese people think and began to love this place.

Finally, I would like to give my thanks to all the people who helped me in Japan, and I hope all foreign students can have a good life here.





of the laboratory.



## From Foreign Students

### Life in laboratory

Sanghoon SIM  
(3rd year graduate student, IGC)  
Department of Biological Engineering

I am an international graduate student and a member of the ASAKURA lab since three years ago. I am studying redox proteins by electrochemical method because I wanted to study about structure and function of various proteins before I came to Japan. It is pleasant to understand, by new measurement techniques, proteins' new aspects that have not been obtained before.

I enjoy not only my academic life but also my laboratory life. Since I came to Japan three years ago, I have done some challenges with other members of the laboratory, such as two bicycle trips, two marathons. I tripped from Kanagawa to Chiba by bicycle in the spring of 2010 and tripped from Kanagawa to Utsunomiya by bicycle in the summer of 2010. It was so hard for me to ride a bicycle on the road heated by the sun that I suffered from heat illness. I also participated in Tokyo international marathon in 2011 and in Miura half-marathon in 2012. I felt like I reached my limit. Like the bicycle trips, it was so hard to me. But I cannot express the feeling I got from the achievement and how glad I was, when I finished the bicycle trip or marathon.

Likewise, I have gained many experiences through these challenges, which I could not have experienced in Korea. So I appreciate members of my laboratory who have shared joy and hard time. From now on, I want to obtain satisfaction from my study and to spend more great time with members

## From Foreign Students

### Let's enjoy

HOANG Thi Hong Ngoc  
(1st year graduate student, IGC)  
Department of Biomolecular Engineering

I am a Vietnamese student currently pursuing my academic research in Integrated Doctoral Education Program at KONDOH lab. Previously, I completed undergraduate education in University of Science - Vietnam National University, which is located in Ho Chi Minh, the most active city in my country. Together with KONDOH lab's members, I am studying the molecular mechanism, developing diagnostic probes as well as generating biological prodrugs to target cancers, especially hypoxic cancers. The kindness and great supports which I receive from my professor and lab mates have been making my personal and research lives much easier than I thought. I believe that the advanced course of Tokyo Tech will offer me an opportunity to fulfill my potential and to do research on the cutting edge of Bioscience and Biotechnology. Still several years more in Japan, I will enjoy my research life here, which will be one of the most valuable experiences in my life. Let's enjoy research, and enjoy Japan!



### **Editor's Note**

This fiscal year is likely to mark a turning point of the Graduate School. Twenty years has passed since its establishment, and we took place anniversary events last autumn, as Professors SEKINE and YUASA wrote. Moreover, many of the founding members of the Graduate School will retire in a year or two. In this newsletter, you can find strong, heartfelt messages from the professors reaching the retirement age this year. The rest of us need to make every effort so that people, on the 30th or 40th anniversary, will look back and say "From that moment on, the Graduate School started climbing up to a new level."

Although we did not pick it up in this issue due to the deadline, the 1st Tokyo Tech Bio International Symposium was held on January 30, 2013. Aimed at encouraging students and young staff scientists of the Graduate School through high-level scientific lectures, this symposium will be taken place periodically.

I would like to conclude this newsletter by thanking all the contributors and editorial members.

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Editor-in-Chief  
Yuki YAMAGUCHI  
Department of Biological Information  
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