Contents

Message from the Dean

Professor Mitsuo SEKINE
Dean, Graduate School of Bioscience and Biotechnology

On April 1 last year, I was unexpectedly appointed as Dean of the Graduate School of Bioscience and Biotechnology. This appointment came soon after the Great East Japan Earthquake on March 11, as consequently I found myself somewhat flustered dealing with unfamiliar duties and having to deal with a mound of unanticipated, urgent issues in a very short period of time, from immediate university responses and earthquake recovery support efforts to canceling graduation and entrance ceremonies, revising the curriculum schedule for the new year, and implementing electricity-conserving measures. Professor KITAZUME, the previous Dean, had told me to be prepared for the more than 300 meetings I would need to attend annually. Although I had accumulated a certain amount of experience through undergraduate, graduate school, and university administrative meetings, recently I realized that I was in fact attending far more than 300 meetings annually, and I keenly felt the need for reforms to reduce the number of meetings. Since further meetings are required to reduce the number of meetings, I am becoming painfully aware that nothing will be changed just by complaining.

During all this, the Graduate School of Bioscience and Biotechnology has been steadily implementing various educational and research programs. One program in particular, the "Program for Leading Graduate Schools"－a major educational project (approximately 3 billion yen over 7 years!) whose application I had been preparing since my appointment as Dean－was approved last year. The application for this program was jointly submitted by the Graduate School of Bioscience and Biotechnology together with the Graduate School of Information Science and Engineering and the Interdisciplinary Graduate School of Science and Engineering, with an involvement ratio of 4:1:1. Intended as a program for nurturing bioscience doctoral students who are able to understand the new field of information science, this program is also designed to broaden the perspective of doctoral students in the Graduate School of Bioscience and Biotechnology and foster human resources desired by the industrial world. Professor Makio TOKUNAGA of the Dept. of Biological Information is Deputy Program Coordinator.

On a personal note, last spring I was honored to receive the Chemical Society of Japan's CJS Award. In the past I had been too overwhelmed with research and miscellaneous duties to even apply for any awards, but since this award would also mark a milestone in my life I decided to apply and somehow was selected as last year's winner. I am very grateful to the laboratory staff (Associate Professor Kohji SEIO, Assistant Professor Akihiro OHKUBO, and Assistant Professor (special-appointment) Hirosuke TSUNODA) who made it possible for me to receive this award. My research has also been achieving groundbreaking results, and so my life as a researcher has also been progressing smoothly. While I have expectations for the future development of this research, since my appointment as Dean I have unfortunately had to neglect my supervisory duties on a daily basis, and faced with this reality, I am now seeing the excellence of my laboratory students.

In the future, I intend to undertake preparations in earnest for reorganization of the Graduate School of Bioscience and Biotechnology and the long-pending shift of the Graduate School to the Ookayama Campus. Events are also planned for the 20th anniversary of the establishment of the Graduate School of Bioscience and Biotechnology on November 11 this year. I look forward to meeting everyone again at that time.

On Retirement

On my retirement

Professor
Toshihiro AKAIKE
Dept. of Biomolecular Engineering

At the end of March this year I will be retiring at age 65. It has been 22 years since I left my previous position at the Faculty of Engineering, Tokyo University of Agriculture and Technology, to take up my appointment at Tokyo Tech's newly established School of Bioscience and Biotechnology in 1990. My involvement in the bioscience and biotechnology (biomedical) field began in April 1975, when I joined a medical education and research institution (Department of Surgical Science, Heart Institute of Japan, Tokyo Women's Medical University) with the intention of applying engineering and materials science to this completely different field after receiving my doctorate from the Graduate School of Engineering, The University of Tokyo (synthetic chemistry). Since then I have spent 10 years at the Tokyo University of Agriculture and Technology and 22 years at Tokyo Tech pouring virtually all of my energy into establishing and expanding bio-materials research in Japan. Having said that, since becoming involved while a student at the University of Tokyo in the student movement known as the "student rebellion" (serving twice as Chairman of the Applied Chemistry Graduate School Community Association, the largest such association), although my fighting spirit was strong, I was very much an optimist and hands-off kind of person, and so I took things extremely easy in my university life. I am very proud that, since my time at the Heart Institute of Japan, as a biomedical "research supervisor" in the fields of artificial organs, bioartificial livers, drug (DNA, RNA) delivery systems, and regenerative medicine, I have had the opportunity to nurture super professors Kazunori KATAOKA of the University of Tokyo (medicine/ engineering) and Mitsuo OKANO of the Tokyo Women's Medical University (advanced bioscience) and nearly 100 others, including more than 10 former international students in my laboratory who are now active as professors in China, Korea, and other overseas countries.

This does not mean that I have not sad memories or regrets. In particular, I was grief-stricken by the loss of laboratory staffer Megumi KUNO, with whom I had worked for some 25 years since my Tokyo University of Agriculture and Technology days and who passed away last January from cancer, and of Teppei MURAKAMI, who showed great promise for the future from the day he joined my laboratory and who died in a car accident in 2004.

At all events, through both joy and sorrow I can say that I have spent an extremely fulfilling 22 years at Tokyo Tech. It is my sincere hope that Graduate School (and School) of Bioscience and Biotechnology continue to maintain the unique standpoint with which they were established and continue to expand the future.

New Staff

Integrative cell biology based on the evolution

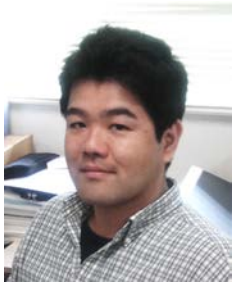
Professor
Kan TANAKA
Dept. of Biological Sciences

Mitochondria and chloroplasts are basic constituents of eukaryotes, and originated from ancient endosymbiotic events by bacteria. Since these organelles are composing a basic framework of eukaryotes, eukaryotes should be considered as evolved by these bacterial endosymbioses. On the other hand, prokaryotes like bacteria are fundamental units of life, and thus the understanding of bacteria should be essential for the understanding of cells in general. We have been working on the fundamental frameworks of cells using *E. coli*, cyanobacteria, algae and plants, based on their evolutional contexts, and the elucidation of regulatory aspects of the growth and the metabolism should have major impacts on biotechnological applications as well. We deal with divergent research subjects including transcriptional regulation, metabolic regulation and cell cycle, and hope to construct the integrative cell biology field.

New Staff

Greeting on the occasion of my new appointment

Associate Professor
Hitoshi NAKATOGAWA
Dept. 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? Our group is working on molecular mechanisms of autophagosome formation in an elegant model organism, the budding yeast *Saccharomyces cerevisiae*, using various techniques. We will welcome anyone who wants to enjoy basic science and is interested in our research.

New Staff

Focusing on the mystery of oxidative stress damage associated with reactive oxygen species

Professor
Masahiro KOHNO
Dept. of Bioengineering

In April of last year, I took up the position of professor of the Advanced Free Radical Technology and Life Science in the Department of Bioengineering. For eight years, until March 31, 2011, I was the professor in charge of academic-industrial alliance projects under the New Industry

Creation Hatchery Center, Tohoku University. In those projects, I have worked on the development of new healthcare technology relating to the diagnosis/treatment/prevention of inflammatory diseases, including the development of a diagnostic device for cancers and allergies, the treatment of ringworms, and a study on the practical use of medical device sterilization systems.

Our current research field is biochemistry. We are studying to identify the mechanism of oxidative stress damage associated with reactive oxygen species by introducing bioinstrumentation equipments for genomics, proteomics, metabolomics, etc. Nevertheless, there are a lot of mysteries to unravel to comprehend the whole picture, and the behavior of reactive oxygen in the living body has not yet been understood. Therefore, it is extremely fundamental and essential to focus on the mystery of oxidative stress damage associated with reactive oxygen species in order to understand the homeostatic bioreaction. I am hoping that in the future the result of this project will contribute to the wellness of the aging society by providing useful diagnosis, treatment, and prevention of various lifestyle-related diseases such as diabetes and chronic kidney disease.

New Staff

Elucidation of reaction mechanism of reactive oxygen species and free radicals in the living organs

Professor
Toshihiko OZAWA
Dept. of Bioengineering

I received the new position as a professor of the Medical and Biological Engineering Creation in the

Department of Bioengineering from May 1 2011. Now I am also a full professor at the Yokohama College of Pharmacy. Until March 31 2007, I worked as an Executive Director of National Institute of Radiological Sciences (NIRS).

Here is my background. I graduated with a degree in pharmaceutical sciences from the University of Tokyo. In 1974, I received my Ph.D. degree from the University of Tokyo and then, moved to NIRS as a researcher. I performed my postdoctoral work with Dr. James P. Collman at Stanford University before becoming a Senior Researcher at NIRS. I was then a Section Head Director and in 2001, I assumed the position of Vice President of NIRS. In 2002, I became an Executive Director, because NIRS changed to Agency from National Institute.

At the University of Tokyo, my research focused on free radicals in aqueous solutions. I detected a lot of new free radicals such as SO_3^-, SO_2^-, SO_4^-, ClO_2, etc. and investigated their reactivity in an aqueous solution. At NIRS, I studied the detection of reactive oxygen species (ROS) and their reactivity against the living body. At present, I continue to study the mechanism of oxidation disorder injury with regard to ROS, because several problems about ROS have not yet been elucidated. The results of our research project will help in the prevention and the treatment of various diseases caused by ROS, and also the prevention of the lifestyle-related diseases in the near future. Further, I hope our results may contribute to the community, because of realizing the new industrial creation.

New Staff

Greeting on the occasion of my new appointment

Professor
Hiroyuki YANAI
Dept. of Bioengineering

In July last year, I took up the position of professor in the School of Bioscience and Biotechnology, Tokyo Tech. I was involved in the healthcare technology policy, R&D, and the regulatory review and standardization of medical devices, etc., at the Ministry of Health and Welfare (currently the Ministry of Health, Labour and Welfare), the Foundation: the Japan Association for the Advancement of Medical Equipment, the Jishinkai Hospital, the Pharmaceuticals and Medical Devices Agency, etc.

Regretfully, we do not yet have any original medical devices created in Japan. One half of the current Japanese medical device market is taken up by foreign products. Considering this poor state of the industry, I have promoted the following research projects to date in order to break the current stagnation and stimulate the strategic and efficient development and promotion of healthcare technologies in Japan.

1. Technology assessment during the developmental stage of the medical devices
2. Translational research for clinical trials
3. Investigations and research for global market strategies
4. Study on healthcare systems and economy in foreign countries
5. Study on medical device regulations in foreign countries

To my great fortune, Tokyo Tech has recently established a Center for Clinical Application and Assessment of Medical Devices in Organization for Life Design and Engineering. I would therefore like to build upon my past research achievements and conduct the technology assessment and others from the developmental stage. It would be my greatest honor if I could contribute to a genesis of the first original Japanese medical device into the world from Tokyo Tech.

Events

Establishment of the Akaike Journal Award

Professor
Toshihiro AKAIKE
Dept. of Biomolecular Engineering

Since my wife's father passed away five years ago, it has been her wish that a portion of her inheritance, albeit small, could be donated to Tokyo Tech, to which I owe so much in my daily lives. After consulting numerous times and thinking the matter over by myself sometimes and wondering what best to do, I have decided to donate funds for the purpose of

(1) Fostering a spirit of challenge and encouraging motivation to present original research papers amongst young researchers in the Graduate School of Bioscience and Biotechnology, a typical interdisciplinary research institution, of whom Tokyo Tech is proud; and

(2) Adding the catalyst of invigoration to the "internationalization" route, which has been a super slogan for opening up the future perspective for Japan–no, Tokyo Tech – and especially international

exchange with China, which holds overwhelmingly high relative weight.

I decided on this course of action in the hope of contributing−albeit in a small way − to important support activities promoting the concrete revelation of these two important future visions for Tokyo Tech, as well as honoring and pleasing a dearly departed person who also served as a university professor.

Since in the past there have been instances of individuals providing support and scholarships for international students, my wife requested that first of all for Item (1) a journal award be established. It is my sincere hope that more and more young researchers will submit manuscripts to high impact journals in the bioscience and biotechnology fields such as *Nature, Science, Cell* and other related journals, as well as *Angewante Chemie*, *JACS*, and *Biomaterials*, and that more and more of these manuscripts are accepted for publication.

Events

Global-COE special event "Welcome! Alumni"

Associate Professor
Yuki YAMAGUCHI
Dept. of Biological Information

The Graduate School of Bioscience and Biotechnology has been supported by the Global COE program since 2007, and as part of the program, we have held alumni seminar series entitled "Yokoso Senpai (Welcome! Alumni)" every year. In 2011, the last year of the program, five alumni gathered and gave a talk to students and faculty members on Friday, December 16th at Suzukake Hall. The speakers talked about the days of their student lives, their carrier paths, and their current jobs, and after the talks, we hosted a panel discussion on "PhD: what education and qualification bring about."

(1) Experiments everyday
Rei Katogi (PhD FY2004, now at Shinchosha Publishing Company Limited)

(2) Creation of precious things
Kosuke Nishio (PhD FY2007, now at Terumo Corporation)

(3) Role of PhD graduates in pharmaceutical R&D
Naoto Inukai (PhD FY2003, now at Takeda Pharmaceutical Company Limited)

(4) Singapore, Germany, and Taiwan: academic carrier path in the overseas
Yuki Nakamura (PhD FY2006, now at Academia Sinica, Taiwan)

(5) Mission to the unknown with engineer's perspective: biosphere under the seabed
Yuki Morono (PhD FY2003, now at Kochi Institute for Core Sample Research, JAMSTEC)

Events

Electricity conservation efforts following the Great East Japan Earthquake

Associate Professor
Nobuhiro HAYASHI
Dept. of Life Science

Unparalleled in history, the Great East Japan earthquake changed our world, and in order to respond to this change, we face the necessity of changing the structure of our society. Under these circumstances, the energy problem is one of the most important and urgent issues needing to be addressed. The Graduate School of Bioscience and Biotechnology has also been promoting efforts to conserve electricity.

Following the accident at the nuclear power plant that was caused by the earthquake and tsunami, the utmost efforts were made to handle the situation in the midst of a strong sense of danger. However, in the response at this time, activities at the Graduate School ground to a halt as we further stumbled around in the dark and experienced safety problems, and so we needed to create a new system in preparation for recommencement of activities. Later, the electricity conserving level following immediately after the earthquake disaster was set as the maximum possible electricity conservation level (Level 3) for each research laboratory and department.

The changes to the electricity supply situation caused by the nuclear power plant accident were not problems that could be expected to be resolved in a matter of time. Accordingly, system for conserving electricity needed to be created that was not temporary but sustainable. Below is an outline of the electricity conservation efforts undertaken by the Graduate School in the summer of 2011.

1. Creation of a manual of electricity conservation measures tailored to the Graduate School of Bioscience and Biotechnology's actual situation: While a manual of electricity conservation measures for the university overall was distributed, additional and supplementary materials to enable responses more tailored to the Graduate School's situation were prepared.

2. Enhancement of electricity conservation systems under normal conditions: All locations in the B1 and B2 wings were inspected to confirm that basic electricity conserving measures were being implemented and interview surveys were conducted regarding efforts aimed at responding to the actual situation in each location. Furthermore, measures to reduce electricity consumption in shared spaces (reducing the number of lights in hallways and elevator lobbies; switching off toilet seat heaters, etc.) were also implemented.

3. Proposal and implementation of electricity conservation measures for each laboratory and department: Each laboratory and department was required to formulate phased electricity conservation measures to respond to the electricity consumption situation at different times. That is to say, (1) under normal circumstances and (2) when electricity consumption exceeds 80% of the allowable amount (Level 1); and (3) when electricity consumption exceeds 85% of the allowable amount (Level 2). Furthermore, (4) the maximum possible response immediately following an earthquake disaster was made Level 3.

4. Implementation of electricity conservation drills: In accordance with the issue of electricity conservation warnings, the measures formulated in 3. above was implemented in phases as the electricity conservation level was raised. Furthermore, monitoring was also conducted to check how much electricity consumption was curbed by implementation of these measures. The results proved that (1) the amount of electricity used at normal times was kept below the upper limit of the allowable amount; and (2) with the implementation of Level 1, electricity usage could be controlled by up to a further 60% (see figure).

5. Consideration of rotational summer holidays: Surveys were conducted in each laboratory regarding the hours/period staff would work in

the case that rotational summer holidays were carried out and a schedule for implementation drawn up. Although it was thought that mandatory implementation of rotational holidays would be necessary if the electricity supply situation were tight, fortunately it was possible to avoid this. However, in order to decrease the risk even a little, each laboratory was requested to voluntarily take rotational holidays according to the schedule that had been drawn up, thus decentralizing summer holidays.

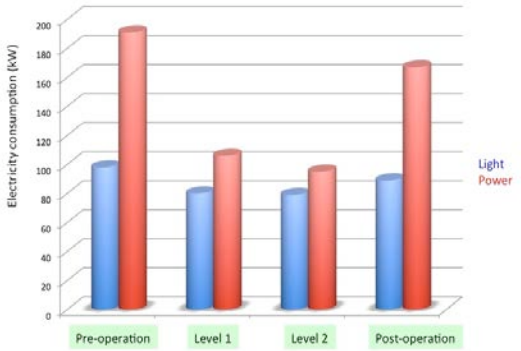


Fig. : Transition of electricity consumption at power saving drill

Here I have provided an overview of the electricity conservation efforts of the Graduate School of Bioscience and Biotechnology and at the time these were being carried out, not only was I extremely surprised by the unexpectedly large results achieved by each person's efforts but at the same time I was also tremendously encouraged. Efforts in areas where we have no previous experience will continue further in the future. I strongly hope that each person will in the future continue efforts regarding the changed social situation following the earthquake, including electricity conservation, in the awareness and spirit that you are deciding your own destiny.

Awards

Siro Fujino Prize from Tokyo Tech

Associate Professor
Kohji SEIO
Dept. of Life Science

I received the Siro Fujino Prize from Tokyo Tech for my project. I am developing new artificial nucleic acids capable of precise molecular recognition. Artificial nucleic acids are widely used as materials for gene-detecting probes and nucleic acid drugs. I hope my project will contribute to the progress of these technologies.

Finally, I would like to express my sincerest gratitude to Professor Mitsuo SEKINE and the staff in the lab for their supports. I would also like to express my gratitude to all the students involved in this project for their devoted and fruitful collaboration.

Awards

Shionogi Award from Synthetic Organic Chemistry

Assistant Professor
Akihiro OHKUBO
Dept. of Life Science

I received the Shionogi Award from Synthetic Organic Chemistry for my project. This award aims to encourage new and original studies in the field of synthetic organic chemistry and provides grants for projects' seeds.

The title of my project for this award

was "Development of new artificial nucleic acids capable of moving to nuclei and forming the DNA triplexes". The properties of these artificial nucleic acids would provide a new insight into gene therapy and gene analysis. I hope my project will contribute to the progress of nucleic acid drugs. I could effectively pursue my project thanks to this grant, and the results of this project were recently published in *Organic Letters* (published by the American Chemical Society) and *Chemical Communications* (published by the Royal Society of Chemistry).

Finally, I would like to express my sincerest gratitude to Professor Mitsuo SEKINE and Associate Professor Kohji SEIO for their supports.

Awards

Young Scientist Initiative Award, SESJ: mechanisms of vertebrate limb development and evolution

Associate Professor
Mikiko TAKANA
Dept. of Biological Sciences

This award was given from the Society for Evolutionary Studies, Japan in 2010 for our achievements in the field of evolutionary studies. I greatly appreciate to all the collaborating researchers who supported my work. I hope to this distinction in my future research endeavors by continuing to work toward understanding the body plan of vertebrates.

We have been studying the problem of how vertebrates establish their body plan and have used limb formation as an experimental model. Humans have two pairs of limbs (arms and legs) along the side of the body, and these limbs evolved from paired fins (pectoral and pelvic) of ancestral fishes. However, fossil evidence shows that most primitive vertebrates lacked any paired fins. Comparative analyses among various vertebrates that occupy key phylogenetic positions are very useful for determining how vertebrates acquired paired fins and subsequently modified their shape into limbs during evolution. Therefore, our lab studies the developmental mechanisms involved in the initiation and patterning of paired appendages among different taxa, including lampreys, sharks, teleost fishes, and chickens. To understand the mechanisms of body plan establishment, we conduct analyses at the molecular, cellular, and histological levels. Revealing the body plan of animals is a formidable task, but it is an important evolutionary issue. Come join our enthusiastic and stimulating research group and make your own contribution towards elucidating what drives the body plan of animals.

Awards

American Physiological Society New Investigator Award

Assistant Professor
Akira KATO
Dept. of Biological Sciences

In 2011, I was honored with the American Physiological Society (APS)'s Comparative and Evolutionary Physiology (CEP) Section New Investigator Award. APS was founded in 1887 and now has more than 10,000 members. The New Investigator Award recognizes one of its members not above the rank of Assistant Professor, who has made outstanding contributions in the fields

of physiology such as cell and molecular physiology, endocrinology and metabolism, comparative and evolutionary physiology, renal physiology, and so on. Every year, one member from each of the twelve APS sections is selected, based on the contribution of their publications to physiology along with other achievements (grant funding, peer review activities, etc.).

I was awarded for my research on the "Analysis of ion transporters responsible for adaptation of fishes to fresh water and seawater". The successes of the genome projects of teleost fishes (torafugu, spotted green pufferfish, zebrafish, medaka, and three-spined stickleback) enable us to know sequences, numbers, and compositions of genes for pumps, channels, transporters, hormones, receptors, etc. within their genomes. If the changes of expression levels of those genes in response to environmental water are exhaustively analyzed, we can identify candidate genes that are responsible for environmental acclimation and adaptation. Under this strategy, in 2003, I focused on torafugu (tiger puffer, *Takifugu rubripes*) and the closely related species mefugu (river puffer, *Takifugu obscures*) as an animal model of body fluid homeostasis and environmental adaptation. Torafugu is essentially a seawater fish that cannot live in freshwater more than several days. In contrast, mefugu is a euryhaline fish that can live in freshwater, seawater, and brackish water for more than several months. With a strong support of Professor Shigehisa HIROSE (Dept. of Biological Sciences) and Hiroyuki DOI (fish section chief of Shimonoseki Marine Science Museum, Japan), we got healthy mefugu and started the research project. Shimonoseki is nicknamed the "Fugu Capital" and has the largest market of fugu. In laboratory of Professor HIROSE, a team of Dr. Tsutomu NAKADA, Dr. Hiroyuki KURITA, Dr. Kakon NAG, Takayuki MURO (former graduate students), and I prepared lists of candidate genes from fugu genome database, compared the expression levels of hormone receptors and ion transporters in the gill, intestine, and kidney among torafugu in seawater, seawater-acclimated mefugu, and freshwater-acclimated mefugu, and selected genes which are upregulated during acclimation to seawater or freshwater. To analyze the activity of ion transporters, I visited laboratory of Associate Professor Michael F. ROMERO (Mayo Clinic College of Medicine, USA). With a strong support of Associate Professor ROMERO and Dr. Min-Hwang CHANG in his lab, we measured the activities of fugu transporters by using *Xenopus* oocyte electrophysiology, and that enabled us to show thermodynamically reasonable models of epithelial ion transport. I thank all collaborators and the CEP section of APS that highlighted the importance of our study on pufferfishes.

Awards

Seiichi Tejima Research Award from Tokyo Tech: discovering a molecular target for thalidomide teratogenicity

Professor
Hiroshi HANDA
Dept. of Biological Information

Thalidomide was first marketed in 1956 as a sedative drug, but its use in pregnant women caused birth defects in the fetus so it

was withdrawn from the market in 1961. Thalidomide was subsequently discovered to have useful effects against inflammation and cancer, so it was relaunched onto the market after a 30-year absence. The story of thalidomide is an extremely rare case. Until recently, almost nothing was known about the mechanisms behind the drug's main effects and side effects.

Our research mottoes are "Science: Individuality and Pride" and "Technology development is vital for progress in life science." We have independently developed latex (SG) beads and magnetic (FG) beads. Using SG/FG beads with drugs or other compounds immobilized onto the bead surface, we were able to perform affinity purification of target proteins for these compounds from protein libraries. The protein affinity purification was a one-step process and generated highly purified proteins at high yields. This is a revolutionary technology that makes a previously impossible method feasible.

Using this bead technology, we were the first group in the world to show that thalidomide targets the protein cereblon (CRBN). Our research also showed that CRBN acts as the substrate receptor of the E3 ubiquitin ligase complex and that thalidomide binding to CRBN inhibits ubiquitin ligase activity. In animal experiments on zebrafish embryos treated with thalidomide, birth defects occurred in the pectoral fin, which is equivalent to the upper limbs in humans, and in the otic vesicle, which is equivalent to the ear. Furthermore, we discovered similar birth defects when CRBN was knocked down, demonstrating the strong relationship between the two. In an experiment to prove beyond doubt that thalidomide targets CRBN, we created a CRBN mutant that does not bind to thalidomide. When this mutant was expressed in zebrafish embryos, thalidomide did not cause birth defects. Our research with fertilized chicken eggs, which have been regularly used in research into thalidomide birth defects, also showed that this CRBN mutant inhibits thalidomide birth defects. This research proved that CRBN is the true target for thalidomide and is the cause of thalidomide birth defects.

The results of our research were published as a research article in the March 2010 issue of the US journal, *Science*. There was a significant worldwide response to this publication. Our research was widely reported around the world, for example by the New York Times and the BBC, and this has led to us receiving the Seiichi Tejima Research Award.

Recently, we have discovered that as well as being involved with birth defects as a side effect of thalidomide administration, CRBN is also involved in one key action of thalidomide, namely its therapeutic effect against multiple myeloma, a difficult-to-treat cancer. Cancer research around the world is now starting to target E3 ubiquitin ligases including CRBN.

Awards

Best Presentation Award in Japanese Society for Molecular Imaging

Assistant Professor
Tetsuya KADONOSONO
Dept. of Biomolecular Engineering

At the 6th Annual Meeting of Japanese Society for Molecular Imaging, I received the best presentation award for our research entitled "*In vivo* imaging of HIF-active tumors by HOL transgenic mice".

Hypoxia-inducible factors (HIFs) are transcription factors that are activated

by hypoxia, oncogene activation, enhanced proliferation signals, and so on, and a number of genes induced by HIF are critically involved in malignancy of cancer cells. Therefore, *in vivo* imaging of HIF-active cancer cells is very important for developing anti-cancer drugs and treatment strategies. In this study, we established transgenic mice that could detect HIF-active cells using bioluminescence imaging and could detect carcinogenesis and tumor progression *in vivo*. These results strongly suggest that HIF activity is closely associated with cancer formation. Taken together, transgenic mice presented here would be useful as a mouse model for *in vivo* bioimaging to investigate the onset and progression of cancers. These results were published in *PLoS ONE* in 2011.

This award encouraged me to continue pursuing research in my field. Finally, I would like to express my sincerest gratitude to Professor Shinae KONDOH and also express my gratitude to all collaborators.

Students

Honor for being given the Chorafas Award

Jun MIFUNE
(2011 Graduate, Doctoral Course)
Dept. of Bioengineering

Hello, everyone. Recently, my Ph.D. thesis 'Bacterial synthesis of biodegradable polyesters and control of monomer composition by metabolic engineering' was chosen for the Chorafas Award. I am extremely honored to receive this award. I think the reason I was given such an award could be due to meeting with distinguished people who always spend their time contributing to research.

I continued on to doctoral studies simply because I like to do research, which I was really interested in more than anything. By continuing my study, I would also love to get the chance to live and do research in foreign countries. Although it is somewhat more difficult for Ph.D. holders to get jobs in Japan compared to students with masters, I was strongly attracted to doctoral studies because there are more chances to live and do research abroad, something I always wanted. Actually, in international conferences, I could discuss with researchers of various backgrounds (major) and from various countries, and got the chance to do research at a laboratory in New Zealand while doing a home-stay. Above all, the most precious thing I experienced is that I met people who taught me that even with insufficient English communicating skill, a passionate and strong will can be reflected in actions. I could come across many people from beyond borders and in various fields and could know fresh perspectives and sensitivity.

Under the supervision of my professor, who really thinks of his students and is always passionate about research, and due to many kind people in my previous lab, I was really happy during the five years of my research life there. It is very important to have interest in my own research. More than that, I also feel that the people with whom I work play a significant role in motivating me and thus affecting my achievement.

At present, I am working as a researcher in Kyowa-Hakko Bio Co. Ltd. In reversal from the position to teach juniors, I get spurred and encouraged from my supervisors and senior researchers every day. I often feel worried because I make mistakes by thinking of my Ph.D. degree and feel the gap between senior workers with their masters, of the same age. In this case, I try to change the confusion to motivation by thinking that a Ph.D. degree is merely a license, and from now on, I shall accept my position and polish my skill to be a better researcher, keeping in mind the fact that I am still new to the company. On the other hand, there are more chances to communicate with my colleagues who have strong characters and also with many workers in various positions in laboratories and on the manufacturing floor. I am not good at getting along with people, but I enjoy being surrounded by many respectable people.

My goal is to be a person capable of bridging industry and academia (and government) by applying the experience I obtained during my doctoral course and from working in my present company. Although I am still a long way to accomplishing it, I will do my best, encouraged by this fantastic award. I was really supported by many people in my doctoral course. For everything I have received until now, I would like to return the favor in some form. Last, I wish to express my gratitude to readers and Dr. Dimitris Chorafas.

Students

International Graduate Forum in Tsinghua University

Kazuya TOYAMA
(2nd Year Student, Master's Course)
Dept. of Bioengineering

Last summer, I attended International Graduate Forum on Biotechnology, Bioengineering and Biomedical Science in Tsinghua University, Beijing. Here I would like to write about this symposium and my thoughts. This symposium was held in order to facilitate communication through presentations about research mainly by students in Tokyo Tech and Tsinghua University. Of course, the presentation was performed in English, and also in the form of oral presentation. As I am not good at English, the preparation and actual presentation was very hard, but I was able to learn a lot of things about the culture and academics.

On the first day of the program, lectures were given by professors, followed by presentations by students. Some undergraduate students in Tokyo Tech also came. I felt that the students of Tsinghua University had high skills of presentation, English, and also in their research. That evening, we had a party at a restaurant on the campus. I got the opportunity to communicate with Chinese students, and we enjoyed a great dinner (Peking duck!) while talking about our research and subcultures. On the second day, we visited the Great Wall of China and the Ming Tombs with the students of Tsinghua University. The campus of Tsinghua University was several times as large as Tokyo Tech, and the places we visited also impressed upon me China's scale and powerfulness. I realized that Japan is a small country and that a wider viewpoint seen from other countries is also important.

We were grateful to the students of Tsinghua University who guided the symposium. I am sure that these experiences can be applied to not only my research but also my following life.

Students

Success in iGEM by playing Rock-Paper-Scissors game

Alejandro Tsai
(3rd Year Student, Biomolecular Engineering Course)

iGEM (The International Genetically Engineered Machine Competition) is the most famous undergraduate Synthetic Biology competition in the world. It started in 2003 as an initiative from the Massachusetts Institute of Technology (MIT) to create a database of standardized genetic parts (called BioBricks) that could be fit together to create more complex systems in the same way bricks are used to build buildings. As the number of participant teams began to grow exponentially, the initiative became a competition in 2006, and the Tokyo Tech team, led by Associate Professor Daisuke KIGA and sponsored by the Art and Crafts Center, has taken part in the competition ever since. Among all participating teams (more than 160), Tokyo Tech is one of the five teams that has won the Gold Medal distinction for six years in a row, and last year it became the first team in Japan to win a "Track Prize".

Since 2011, the number of participating universities is so high that MIT cannot host all teams in its campus, which has led to the creation of regional jamborees. In spite of this increased competitiveness, Tokyo Tech's 2011 iGEM team managed to be one of the most outstanding teams during both the October regional iGEM Asia Jamboree (hosted at HKUST) and the November iGEM World Championship (hosted at MIT). In the former, our iGEM team members won a Gold Medal (as always) and the first Best Model prize ever won by a Japanese university. Naturally, the team's great performance got us a pass to the World Championship finals, where we did again an outstanding presentation that gain us an inclusion into the top 10% teams (best 16 out of 160 teams) and allowed us to take home the iGEMer's prize (which is the prize awarded by the votes of all other iGEM teams' members).

The team's project consisted in creating a complete Human-Bacteria rock-paper-scissors game in which humans and *E. coli* both play by submitting one of three different signaling molecules (each representing either of Rock, Paper, or Scissors) to a Judge *E. coli*, who can then indicate the winner of the game by expressing one of three different fluorescent proteins (each representing either human win, tie, or bacteria win). The way the RPS player *E. coli* selects its signaling molecule involved the creation of a randomizing system, which the team achieve by using a Cre-Lox based mechanism and, as an alternative method, a model based on differential equations (the same model was selected as Best Model in iGEM Asia). Furthermore, the team contributed to build new functional BioBricks, one of which is the logic AND-gate promoter

that the RPS Judge *E. coli* uses to decide whether humans win or lose the RPS game.

Overall, the iGEM experience this year was a great success, and also a precious opportunity for undergraduate students to meet and make friends with students of their same field from all over the world.

Students

Hands-on biology class at Morioka and Kamaishi cities

Shoya HIROSE
(4th Year Student,
Biological Information Course)

BioCreativeStaff, one of the clubs in Tokyo Tech, organized an event for increasing children's interest in learning biology, collaborating with Tokyo Tech undergraduates and personnel. This event was held at Morioka and Kamaishi cities in Iwate Prefecture on August 27th and 28th.

We, BioCreativeStaff, have frequently held kids-oriented science classes for enhancing interest in biology. To make the best use of such experience, we aimed to do something for sufferers in the 3.11 Japan earthquake, and came up with the idea to hold a scientific event including hands-on biology class and educative booths. The venue was "Morioka City Kodomo-Kagakukan", and we hosted four booths on both 27th and 28th.

We prepared four different booths : ① DNA card game, ② observation of extreme environment-resistant "water bear" under microscope, ③ board game on ecological succession, and ④ "secrets of flower fragrance" dealing with physiological effects by scents of flowers. In all exhibitions, we tried not to end up with mere explanation and prepared living materials or teaching materials such as board games so that children can learn through their real experience. It seems that our efforts were worthwhile; on the second day we had more than 100 visitors and staffs were all bustling around explaining their topic to children.

In the hands-on biology class, we did an hour-length experiment on hydra's predatory activity: we fed hydra and saw their response, and treated hydra with chemical compound, which triggers their predatory activity. On 27th, not only the children in vicinity but also children from Miyako city joined us after a long trip by bus. Fortunately, the children had shown interest and formerly contacted us wishing to join our class. The next day we went on a bus to Kamaishi city and did the same class in a public hall. The children were all enthusiastic watching hydra wriggling, and seemed to be having a great time on both days.

We received warm and continued support from number of people inside and outside the university throughout this event. Yamaguchi-sensei (teacher at Takizawa Daini Junior High School) showed deep appreciation for our project and gave us kind advice for the venue. Namioka-san (Manager at Kodomo-Kagakukan) and staff gave us a warm offer to use their museum and lots of assistance in the exhibition and the class. Municipal office and school officers in Morioka, Kamaishi, and Miyako cities greatly helped us with advertising our events to the children beforehand. The Tokyo Tech 130th Anniversary Foundation generously

provided us with financial support. Associate Professor Kazunori TACHIBANA (Dept. of Biological Information) kindly gave us the animals for the experiment, hydra. We are grateful to the aforementioned people and would not have been able to organize our event without their support. Lastly but most importantly, we would like to thank the children and their parents for coming over despite the tough situation they were in.

Finally, I would like to conclude this report with my personal impression. Through the children's intent look in the class, I once again realized that children's curiosity is powerful. It would be really nice if we could continue this kind of curiosity-enhancing event and I really hope that it'll be of some help to mend children's broken heart brought on by the disastrous earthquake.

Foreign Students

One year in Japan

Xu FENG
(2nd Year Student,
International Graduate Course)
Dept. of Life Science

One year has passed since I came to Japan last October. My interests in Japanese culture and life-style brought me here, and I still believe that it is the best choice. Since I came to Ichinose Lab, I have been deeply fascinated by the complicated structures and regulations in the brain. Our lab mainly focuses on the regulation of BH4, which is a cofactor in the biosynthesis pathway of dopamine. And at the present, my topic is some enzymes in the regeneration pathway of BH4. I am grateful to my professor, associate professor and all the lab members, who teach me and help me a lot in the lab; special thanks should go to the experimental mice, who made a great sacrifice to my study.

Besides daily life in the lab, I am also deeply impressed by the Japanese people and society, especially when the Tohoku earthquake and tsunami happened on March 11th. I was then in the Animal Center, and it was my first time to experience so serious disasters. After a short period of shock and panic, I quickly calmed down, because Japanese people behaved as usual and in a great order. When my parents and friends in China asked me whether it was safe to stay in Japan, I answered "yes" with much confidence. Pray for the sufferers and injured, pray for a better Japan.

Foreign Students

Hello everyone !

Ding QIONG
(1st Year Student,
International Graduate Course)
Dept. of Biological Sciences

I am an international graduate student from China, belonging to Okada-Kajikawa lab. I am very grateful for giving me this opportunity to share something in the Alumni News

Letter. As a first year student, I participate in a research concentrating on the mammalian brain evolution at molecular levels. By attending lectures, seminars and journal clubs, there are so many ways for me to enrich my knowledge of my field. Starting my graduate study in Tokyo Tech is not only the first step of my academic career, but also the beginning of my dream.

Starting a foreign life is not easy. But thanks to the warmhearted members of my lab, I could soon adapt myself to the new life. They are always ready to give me advices, on the problems both in my study and life. I truly admire their superior research ability and their charming personality. There is no way for me to express all my gratitude to them.

I came to Tokyo Tech at April, right after the tragedy occurred in northeast Japan. I was deeply moved and inspired by the indomitable courage and the splendid unity spirit of people in Japan. The smile on their faces taught me that, one should never stop celebrating the life and pursuing the dream, no matter what kind of difficulties in front of you.

Editors' Note

For the Graduate School of Bioscience and Biotechnology, too, it has been a year that cannot be discussed without referring to the Great East Japan Earthquake, which occurred immediately before the start of the fiscal year on March 11, 2011. As the Dean mentions at the beginning, the entrance ceremony was cancelled, and classes and student experiments were conducted during the Golden Week holidays in April-May and on Saturdays in order to keep down the consumption of electricity in the middle of summer in classes and end-of-semester examinations. This newsletter includes articles about the electricity conservation measures implemented by the Graduate School last summer as well as the "home-delivery" classes conducted by students of this Graduate School in the earthquake disaster zone. Articles by international students also tell of the authors' impressions of the country of Japan that they gain through the experience of this earthquake.

This summer there is also expected to be an electricity shortage. However, these days I strongly feel that it is our duty to do our very best to ensure that the level of educational and research activities provided by the Graduate School of Bioscience and Biotechnology in no way declines, despite this difficult situation.

Bio Tokyo Tech *Alumni News Letter*
Editor-in-Chief
Masayuki KOMADA
Dept. of Biological Sciences
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