Contents

From the Dean

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

Mitsuo SEKINE
Dean, Graduate School of Bioscience and Biotechnology

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

Change is afoot! Under the leadership of the university president, efforts are underway at Tokyo Tech to reform the education system across the entire university.

The Ookayama and Suzukakedai campuses are currently home to weekly meetings and constant intradepartmental discussions on a variety of topics with the goal of drawing up a rough plan by June. Momentum for this major, once-in-a-generation reform suddenly gained pace last fall, and the Graduate School of Bioscience and Biotechnology is striving to find the best path forward. This includes establishing a vision of future collaboration with the 10-or so bio-related faculty members in the Interdisciplinary Graduate School of Science and Engineering. Under the new policy, all majors and courses to date are to be replaced by an integrated master's degree system whereby the undergraduate and master's courses of the School and Graduate School of Bioscience and Biotechnology will be unified. Undergraduate courses from similar disciplines will be combined, and an efficient course format will be introduced. A three-digit course numbering system similar to that used at the Massachusetts Institute of Technology will be applied, in which courses are identified by a number between 100 and 699, covering basic first-year courses through to specialized master's degree level courses. The concepts of "year" and "repeat year" will thereby become obsolete. A definitive plan has yet to be finalized, but the idea is that incoming students will be able to refer to a standard course program and select the courses they wish to study, after which they will be assigned to a research laboratory based on performance evaluations. All this reform activity will reach its peak in the coming few months, which explains my hectic daily schedule!

I expect you all have fond memories of the Ookayama and Suzukakedai campuses. As part of the University's campus renovation scheme, both campuses are undergoing a face lift. Notably, at the Suzukakedai Campus the simple looking laboratory blocks have been improved their appearance, and ivy has been planted along the route from the entrance gate to Suzukake Hall, giving it somewhat the air of a private institute. Moreover, the retention pond near the Univ.CO-OP Store has been covered and wood chips put down to convert it to a public space (see photograph). Thanks to this, for the last three years there has been ample room to hold the Suzukake Festival and other events in this area.

These improvements notwithstanding, the other day, I visited the Chiba Institute of Technology's Tsudanuma Campus and was amazed at the transformation: buildings that previously resembled a factory site have been replaced with modern, 20-story buildings similar to our J2J3 block. It's going to take a little more time until Suzukakedai has the character of a private institute. Homecoming Day provides an excellent opportunity for alumni to visit both the Ookayama and Suzukakedai campuses; please come and see the changes for yourselves. I look forward to seeing you there.

On Retirement

My studying abroad

Fumio ARISAKA
Professor
Department of Life Sciences

I was asked by the editor of this News Letter to send you a message as a retiring member of the faculty. The retirement age at Tokyo Institute of Technology is 65 and those who turn to 65 are to retire towards the end of March in that academic year.

I came to TIT in 1990 as an associate professor from Hokkaido University and since then I have been teaching and doing research for 23 years on Suzukakedai campus. Many of you, I think, came to TIT as a Ph.D. student after finishing master course in your country. Actually, I did the same. After I finished my Master at the University of Tokyo, I went to the U.S. as a JSPS exchange student for Ph.D.. Studying abroad was my dream since I was a high school student and besides, I thought I would improve my background better. Also, I knew younger is better to learn a foreign language.

You may think that if the level of science in your field is the same in your country and abroad, it is not necessary to go abroad. That is yes and no. Of course, I do not think everyone should go abroad. In fact, I admire some scientists who stay in his/her own country and develop a unique science. However, going abroad is, in general, very beneficial. The most important is that you experience different tradition of science and culture in foreign countries. You may think that scientific way of thinking and how to proceed in science must be common throughout the world. It is more or less true, but not quite. Each country in Europe and in America has its own tradition and there are subtle differences of the approach and the way of thinking. Studying in foreign laboratories widens your view and makes your thinking more flexible. In more practical aspect, it is good and pleasure to have foreign friends.

I hope you have a pleasant memory in Japan and hope you come back to Japan from time to time for collaboration or to exchange information and friendship.

I am retiring from TIT, but will remember all those whom I encountered in Japan.

On Retirement

My farewell from O-okayama Campus

Yukihisa HAMAGUCHI
Professor
Department of Bioengineering

I was employed as a research associate of Faculty of Science in 1972, and was a member of Biological Laboratory. For more than 40 years, I have given freshman an education about biology in lecture. There was some trouble in the experiment entitled as “the response of the sensitive plant, *Mimosa pudica*”. After plants were carefully grown up for half an year, they did not respond any more to the stimuli soon after the beginning of the lecture because of short day-length in autumn.

My affiliation changed from Faculty of Science to Faculty of Bisoscience and Biotechnology in 1996, after a while, was a member of Department of Bioengineering in the graduate school, and then I have been a member of the latter faculty for 18 years. During this period, students in my laboratory increased gradually and so I felt busy.

My laboratory was situated in O-okayama Campus meanwhile even though my affiliation changed. Thanks to kind assistance of the staff of the Faculty in order that I overcame the inconvenience of going and returning from O-okayama to Suzukakedai Campus.

My research field is developmental physiology, especially elucidation of the mechanisms of formation and disappearance of motile apparatus and determination of division plane at cell division. During research, routine work is to observe the cell by microscopy. Using a polarization microscope, I can observe cytoskeletal structures, and I determined the number of microtubules in the cross section of the mitotic spindle and the change of total length of these microtubules during cell division. Recently, by fluorescence microscopy, various structures in the cell become visible. Especially, using green fluorescent protein and super-resolution fluorescence microscopes, the observation becomes at the level of molecules. In the meantime of such a developing stage of research technique, I regret that I should be away from the research, and, however, my post-retirement pleasure might keep watch elucidating these mechanisms in near future.

On Retirement

Time: a biological perspective

Tatsuo MOTOKAWA
Professor
Department of Biological Sciences

The alumni who graduated from Titech 20 years ago had a meeting on 16th Nov. , 2013. I was asked to give a talk on that occasion. My talk was about time. I chose this topic because the forties is perhaps the most busy life stage in which we have to stand in the front row in business and research, and because we first feel senescence in forties.

I am going to retire this March. The editor of this journal asked me to deliver some messages on this occasion. This essay is the report of the talk. I will tell you the plan I am going to do after the retirement in the last section.

We can go faster by cars. We can calculate and get information faster by computers. I regard them as the time-accelerators. They are found everywhere. Planes, cellular phones, lines of factories, microwaves, electric washing machines, for example, are all time-accelerators. These accelerators are driven by energy. Thus the conclusion I draw is that we are pushing time to go faster by energy with the use of these accelerators. Living in these busy days, I really feel that our time is accelerating. This is, however, contrary to the widely accepted image of time that is governed by the absolute time of classical physics. The absolute time flows with a constant speed in everything; time never changes in speed and direction.

1. Biological time

In biology, however, we have a different image of time. The pace of the heartbeat varies with animals. In mammals, the time needed for one heartbeat is longer in bigger animals. We have the following empirical equation for: $T=0.25M^{0.25}$, in which T is the time for one heartbeat in second and M is the body mass in kg. The time is proportional to the 1/4th power of body mass. This relation is called the “one-fourth power rule” and is found in various phenomena related to time in animals. For example, the period of breezing, the period of peristalsis of intestines, the time of one blood circulation through the body, the gestation period, the time needed to mature, and the life span. The time of elephants goes slowly while the time of mice goes fast: the hearts of mice beat faster, mice breathe faster, grow faster and die faster. The biological time is not at all the same in all animals as in the case of absolute time. There appears, however, a common constant number. Because every time-related event is proportional to $M^{1/4}$, a common number 1.5 billion appears when the life span is divided by a single heartbeat time of that animal. Both mice and elephants die when their hearts have beaten up 1.5 billion heartbeats.

The 1/4th relation is also found in the energy consumption of animals. The body-mass specific energy consumption of mammals (E in W/kg) is described by the following empirical equation: $E=4.1M^{-1/4}$.

The two equations above mentioned lead to the apparent relation that the time of animals is inversely proportional to the energy consumption. In other words, as the reciprocal of time could be regarded as the speed of time, time goes faster with the use of energy.

2. Our dairy life looked through biological time

The time of our dairy life also accelerates with the use of machines that consume energy. The modern living is governed by business. Business is literally very busy. I regard that business is the activity in which we raise money through accelerating time: by acceleration, we can make more products and collect wider information in the same period of time measured by clocks, and thus we can earn more money. In business, energy is converted to time that is then converted to money. Consumption in economy is the reverse process. We pay money to buy energy that is used to

operate time accelerators. We can visit more scenic place in the same period of physical time by cars that are driven by energy; in housekeeping we can earn more free time with the use of microwaves and washing machines. The money of consumers is converted to energy and then to time.

Engineers are working hard to produce faster machines. The alumni of Titech are the front-runners in this activity. Thanks to their efforts we are enjoying the convenient lives. “Convenient” means that we can get anything, irrespective of materials and information, as soon as possible when we want them. “The faster the better” has been the motto of engineers. However, we have to reconsider this motto. We individual Japanese consume 30 times larger energy than that our body consumes. As the ancient people consumed little extra energy other than the bodily use, their pace of living was perhaps similar to the pace of the body itself. But if the speed of social time is proportional to energy consumption, the pace of the modern dairy living is possibly by 30 times faster than the pace of the body. Can our bodies catch up with such a fast pace? I suspect that the bodies of modern people are unhappy: they are suffering the gap between the time of the body and the time of the social life. We cannot feel happy if our bodies are unhappy.

3. Is longer the better?

I regard that the modern people purchase time by energy. There are two ways to buy. One is to use time-accelerators to get free time, on which I have been discussed. The other way is to elongate our life span. The life span of Jomon people, who lived 15000-3000 yrs ago in Japan, was only 31 yrs. The life span just after the World War II was about 50 yrs. Now we are enjoying the long life of over 80 yrs, owing to the development of medical technology, hygiene, plenty supply of food, air conditioners, and so on. All these are dependent on the modern technologies that consume considerable amount of energy that requires considerable amount of money to get. The life span has strong correlation with GDP. Thus we are purchasing extra long time by energy. “The longer the better” has been our motto.

The senescence creeps upon us at the forties and fifties: we care about our hair; we need reading glasses; menopause occurs around 50. Our heat beats 1.5 billion times at the age of 42. Our life span in the wild seems to be 40-50yrs. The present longevity is the result of the victory of technology. There is, however, a dark side of this victory. Japan is suffering the debts derive from medical expenses and pensions for aged generations.

I regard that one of the most prominent characteristics of organisms is to exist for a considerable period. The first organism appeared on Earth 3.5 billion yrs ago. Scientists believe that all the extant organisms are the descendants of the common ancestor, which implies that the organisms have continued existing throughout the long history of 3.5 billion yrs. They have survived the harsh events such as the snowball earth and the giant impact. Organisms must own durable bodies that can withstand such hardness. Our body is complicate yet ordered. How can we construct a long lasting structure with such complicatedness and order?

Let us use buildings as an example to illustrate this problem. If we make the building that never got broken down, it will last forever. We cannot, however, make such things because of the second law of thermodynamics. Another way is to keep on repairing the building. This is a practical way. The typical example is found in Horyuji temple, the oldest wooden building in the world, boasting its history of 1300 yrs. Horyuji today is a mosaic of old parts and new parts that has been repaired. We

have to be very cautious in using such buildings because the old parts are susceptible to break. Therefore we cannot expect such a building to fulfill the same function as that when it played at the time of construction. Horyuji now is an almost retired temple: its main role is to be worshiped as the World Heritage.

The Horyuji-way, however, seems not to be suitable for organisms because organisms have to be always in active service. The Horyuji way is that in which the original shape of the building is maintained, and some of the original materials are maintained, but most of the original functions were lost.

Is there any way that maintains the function of buildings? Yes there is. Ise Jingu Shrine is the answer. It is rebuilt as the exact copy of the original every 20 yrs. Last year was the year of Shikinen Sengu, in which the new copy was built next to the older one and we ask goddess Amateras to move to the new building. Ise Jingu has the history of 1300 yrs of continued rebuilding. In Ise-Jingu way the original shape and function have been maintained but the original construction materials are completely lost. Everlasting youth is the prime virtue in Shinto. Ise Jingu has kept its youth by repetitive thorough renewal of materials.

Organisms adopt Ise-Jingu way. They make their copies, namely offsprings, by reproduction. The parents continue to live as sons and daughters, and then as grandsons and granddaughters. One renewal needs considerable amount of energy. Thus energy consumption is proportional to the rate of renewal, from which, I believe, the relation between time and energy has derived.

In most organisms, however, offsprings are a little different form their parents because they adopt sexual reproduction. Parents mix their genes that are the information how to build the body. Sexual reproduction is the means to survive in changing environments. We can live well in this environment. But environments often change. We are not sure whether we can still survive in the new environment. Therefore parents produce offsprings a little different form themselves hoping that some of them may survive after environmental changes. This strategy has been a great success: organisms have continued surviving through 3.5 billion yrs. I regard that the continuation of life through generations is the prime virtue in organisms.

I am going to retire this March. As a zoologist I feel rather guilty if I were to spend all the rest of my life indulging in entertaining myself. Just live long is to steal the resources that the next generation should inherit and is to leave large debts, which is the behavior against the prime virtue in organisms.

I am planning to visit elementary schools to give classes after retirement because such activities help the next generation. My essay on the shape of organisms has been adopted in an elementary-school textbook of Japanese language. I am preparing classes to teach biology by singing. I have already made several songs on the shape of organisms.

From New Staff

Toward biomaterials with serendipitous functions

Atsuishi MRUYAMA
Professor
Department of Biomolecular Engineering

After spending nine years at Kyushu University, I returned to this school in April 2013. I have studied polymeric biomaterials such as cellular specific materials, materials for drug delivery systems and bio-sensing. While studying cationic polymers for gene delivery carriers my colleagues and I found that a cationic copolymer activates strand exchange reactions of nucleic acids much stronger than we speculated. The finding was hardly accepted in related academic societies. Our papers were rejected several times because of irrational and or prejudiced opinions from reviewers. At that time some professors in this school gave me thoughtful advices that stimulated further my research activity in Kyushu University. I deeply appreciated their kindness.

Recently, I expanded my study to peptide and lipids. Though needs-oriented studies or studies aiming a clear goal has been requested from society, I would like to enjoy seeds-oriented study. Unexpected phenomena could take place at interfaces between artificial materials and biocomponents at molecular, cellular and tissue levels. I wish to share serendipitous finding with my students.

From New Staff

Toward development of functional molecules capable for regulation of biological reactions

Akihiro OHKUBO
Associate Professor
Department of Life Science

Recent progress in the nucleic acids research is remarkable and chemically modified nucleic acids, especially oligonucleotides, with various functions have been developed so far. These days, these molecules are used as drugs for gene regulation and probes for gene analysis in molecular biology and medical research fields. It is essential to develop novel artificial nucleic acids for the next generation of nucleic acid chemistry.

We have reported the new approaches for synthesis of modified DNA or RNA molecules by using our best knowledge based on organic chemistry, and new artificial nucleic acid probes which can bind to the target compounds accurately and strongly. At the present, we try to develop the functional molecules which can regulate the various biological reactions such as DNA replication,

pre-mRNA splicing, and genetic recombination. In the future we would like to develop a novel strategy which can cure incurable genetic diseases.

From New Staff

Takashi HIRASAWA
Associate Professor
Department of Bioengineering

I joined as an associate professor of Department of Bioengineering on September 2013.

Microbial cells have been utilized for production of useful materials as cell factories because of their high growth rate and metabolic activity. I have studied the metabolic engineering researches for microorganisms; in particular breeding of useful microorganisms by using “omics” analyses. Recently, we are able to manipulate the biological networks in microbial cells drastically based on the concept of synthetic biology. I will aim to develop the breeding methodology toward efficient bioproduction using microbial cells based on the systems biology and synthetic biology and the bioproduction process of useful materials. In bioproduction using microbial cells, understanding the metabolic regulation mechanism is also important. Therefore, I will also aim to analyze the metabolic regulation mechanisms of the microbial cells based on genetics and molecular biology.

From New Staff

Greetings

Takeshi HATA
Associate Professor
Department of Biomolecular Engineering

After I had graduated this department in 1995, I moved to interdisciplinary graduate school of science and engineering in this university, Kyoto University, and Mitsubishi Pharma Corporation. In 2005, I came back to this department as an assistant professor and promoted as an associate professor in 2013. My specialty is synthetic organic chemistry and I have been studying that development of environment-friendly synthetic methodology and its synthetic application to bioactive compounds like natural products or drugs. As not only the observation or analysis of substances in nature but also their artificial applications are important from the scientific and technical point of view, I will expand my research through “Monozukuri” (making products) of synthetic organic chemistry.

In 2012, I received “Incentive Award in Synthetic Organic Chemistry” from the Society of Synthetic Organic Chemistry and “Challenging

Research Award" from Titech (I already wrote about the latter award in No.15 of this news letter.) for my projects. The former award is honored to encourage young researchers of organic chemistry in Japan. I will strive to do my best with these awards and continue to work harder with my students.

Events

ACLS International Summer School

Takashi SUZUKI
Associate Professor
Department of Biological Sciences

The Education Academy of Computational Life Sciences (ACLS), which started in 2012, wished to hold the 2nd international Summer School somewhere abroad, after the first success in Shonan village, Japan last year. Among several candidates, we managed to realize the summer school in Imperial College London, UK in mid Sept 2013, thanks to a great help of host faculties. Usual summer schools, especially in overseas, mean to develop specific skills and knowledge through a series of lectures and practical courses. In contrast, our summer school consists of a group work (GW) session, in which the participants, for instance, come up with an ideas of imaginary experimental design or a business model, as well as some lectures and poster presentation. A concept of the integration between computational and biological sciences runs through the backbone of the summer school. Since a fifth of the students participated come from abroad, the Japanese student would have a great opportunity to brush up their English communication ability through GW session, discussion after lectures and various international activities. The ACLS International Summer School in London set up a great environment for the Titech students so that they had to soak themselves in English without any escape.

Great achievements that were appreciated in this summer school were, first of all, the well-organized superb program that all participants greatly enjoyed with. This was a wonderful fruit that was borne by the great efforts from the organizing committee which consists of ACLS faculties and students. Especially the assigned task for the GW was well constructed; to come up with the imaginary scientific research paper that could be published in the top journal 10 or 20 years later; the field of research has to be within an interdisciplinary area between computational and life sciences; the theoretical basis has to be cited from the posters that had been presented previously in the poster session. The students had to come up with ideas, improve them, wrap up and present their short papers within 24 hours after they had been told about the task. During the final presentation, there were lots of discussion on the "dream" papers, such as "DORAEMON suit"; a futuristic outfit that can collect all necessary physiological and clinical data during daily life, or "Constructing human organs by

3D printer.”. After all, the best papers awards were given to the paper dealing with “Self-reproducing Bioreactor: synthesizing complex organic compounds with a synthetic genome” and “Combatting Climate Change-Driven Pest Migration using Transgenics”. Both papers not only developed solid and futuristic research with a quality, but also well-absorbed the ideas from the topics on the posters.

Second achievement was that the English communication skills among Titech students enormously improved. This is because the ACLS offers Titech students small-class English courses, and the accumulation of daily efforts started to pay. During intercultural programs and dinners, as well as lectures and GW session, more Titech students were confident in communicating with overseas students than the last summer school a year ago. When I was a student, Japanese Yen became much stronger rapidly, which made us possible to travel or study abroad; but most of us paid ourselves. A fortunate era has come in which the students can take opportunities to go abroad utilizing government-supported programs such as this. I could not help pondering over the time when Souseki Natsume (A great Japanese writer in 19th century) sent by the government to study in London, looking at Titech students happily chatting with European students.

Awards

Science and Technology Commendation by the Minister of Education, Culture, Sports, Science and Technology

Hiroshi IWASAKI
Professor
Department of Biological Sciences

In April 2013, I received the Science and Technology Commendation from the Minister of Education, Culture, Sports, Science and Technology. The commendation was for "Research on the molecular mechanisms of DNA homologous recombination." It is important to state that this was not a consequence of my efforts alone, but was also a reward for the cumulative work of the many mentors, colleagues, friends and students with whom I have had the honor to study under and work with over the past 30 years. In this sense, I gladly accept this prize in their names also.

I went to graduate school to study DNA metabolism. When I started working, I was very surprised that there were still many unsolved problems in the field of DNA replication, although

the textbooks at that time would have led one to believe that the subject was already very well understood and old-hat. Particularly, the mechanisms of DNA recombination and repair were incredibly poorly understood. I became addicted to research almost immediately, and experienced tremendous excitement, which I felt must have been akin to that felt by my processors at the dawn of molecular genetics.

I sometimes feel surprised that the molecular genetics of DNA metabolism is considered in some quarters to be old-fashioned. Nothing could be further from the truth. Many important questions still remain to be solved in the 3R field (DNA replication, recombination and repair). Indeed, I believe that 3R is still a very intellectually challenging field for students wishing to pursue a career in scientific research. Among life science subjects, it is the one that ensures continuity of life (or heredity) and as a corollary, the one that underlies many human diseases, heredity or otherwise. A field cannot be conquered by one person alone, but requires that everyone pull together, including students whose bright new minds I feel will illuminate hitherto unresolved issues in this field and yield many surprises. For my part, I would like to continue working on the molecular mechanisms involving the "cut" and "past" of DNA. So, young people, why don't we do 3R research together? "*Kenkyu zanmai* (research samadhi or absorption in research) is not so bad!

Awards

MEXT Young Scientist Initiative Award 2013

Masato NIKAIDO
Assistant Professor
Department of Biological Sciences

It is my great pleasure that I was honored with the young Scientist Initiative Award in 2013 from the Ministry of Education, Culture, Sports, and Technology – Japan (MEXT) for my achievement in the study of evolutionary biology. The title of my research for the award is "The understanding of the mechanism of adaptive evolution in vertebrates at the molecular level". From the beginning of my research at 1997, I have been focusing on the adaptive evolution of animals. Especially, the mechanism of morphological diversification in higher vertebrates through adaptive evolution is of my primary interest because the earth is full of funny and interest guys in terms of their appearance (phenotypes). The goal of my research is to link such interesting phenotypes to genotypes by using the Darwin's theory of natural selection at the DNA level.

Around 2000, I have published several important papers about the molecular phylogeny of mammals; 1. the phylogenetic position of hippopotamuses, 2. the monophyly of the toothed whales and 3. the phylogenetic relationship of bats within mammals. The above papers attracted attention of many taxonomists in the world and have been widely cited in the major journals. At present, I moved my research to the evolution of cichlids and coelacanths (these groups are also very important in the field of evolutionary biology as the textbook examples of adaptive radiation and living fossil, respectively). I

hope we found many interesting data and publish more papers about the groups.

On the final note, I deeply respect one phrase by an authority in the evolutionary biology –Theodosius Dobzhansky–, “Nothing in biology make sense except in the light of evolution”. I totally agree with the idea. Actually, we could not understand anything in biology including medicine, developmental biology, ecology, conservation, and biotechnology without the concept of evolution. So I always keep in mind to think about biological phenomenon from the view point of evolution. Let’s Enjoy and Respect Evolution!

Awards

Challenging Research Award

Nobuhiro NAKAMURA
Associate Professor
Department of Biological Sciences

Dear Colleagues:

In 2013, I received the 12th Challenging Research Award for my research project entitled “Roles of a new type of connexin in cardiomyocyte differentiation”. When I started my laboratory in 2010, I took over several research projects from Professor Shigehisa Hirose, a former professor of Department of Biological Sciences. One of them has been conducted mainly by his lab members Dr. Sultana Naznin and Dr. Kakon Nag, who discovered a mutant zebrafish named *ftk* with abnormal heart development and identified the connexin 36.7 gene (which encodes a channel-like protein) as a cause of this abnormality. Cardiomyocytes have a parallel-aligned array of myofibrils that allow for muscle contraction. In the cardiomyocytes of *ftk*, myofibril organization is disturbed such that the myofibril bundles are oriented randomly. They also have shown that this disorganization is caused by down-regulation of the Nkx2.5 transcription factor, a key regulator of cardiomyocyte differentiation. After their findings have been published in 2008, the two talented researchers moved to Canada, leaving an important question unanswered: how does connexin 36.7 control Nkx2.5 expression and myofibril organization? The aim of my research project is to address this challenging issue. Luckily, Dr. Naznin came back to Tokyo Tech and joined my laboratory as a JSPS research fellow on November 2012. Actually, I am a molecular and cellular biologist and am not familiar with the field of developmental biology. It is good opportunity for me to broaden my vision and learn more.

Student Achievements

Tokyo Tech Students Win at iGEM Two Years in a Row

Shinya Suzuki
3rd-year
Biological information
Department of Biotechnology

The Tokyo Tech team project was chosen as the Best Information Processing Project at iGEM 2013,

the International Genetically Engineered Machine Competition World Championship Jamboree, held at MIT on November 1-4, 2013. There were 204 participating teams this year from renowned universities such as MIT, Imperial College London and Tsinghua University. iGEM is a worldwide, undergraduate synthetic biology competition in which student teams are given a kit of standard biological parts, called BioBricks, and compete by designing and building a new biological system using these parts and other parts they design themselves.

The Tokyo Tech team was comprised of 13 students from the School of Bioscience and Biotechnology currently enrolled in the Creative Design for Bioscience and Biotechnology II course, and one student from the School of Engineering. For the sake of propagating the importance of synthetic biology, the team decided to tackle the network programming of artificial genetic circuits by drawing an analogy between the life of a ninja, a Japanese covert agent during the feudal age, and the *E.coli* bacterium. In addition, they synthesized several plant hormones that increase plant growth and worked this into their analogy as the latter years of a now retired ninja.

The Tokyo Tech team advanced to the World Championship Jamboree after winning a gold in the iGEM 2013 Regional Jamboree-Asia held on October 4-6 at the Chinese University of Hong Kong. This was the seventh consecutive win of a gold medal for Tokyo Tech at the regionals. Of the 204 participating teams worldwide, only four universities, Tokyo Tech, UC Berkeley, the University of Edinburgh and the University of Freiburg, can boast this record.

At the iGEM 2013 World Championship Jamboree in November, the iGEM Foundation presented World Championship Awards in eight categories in both the *Undergraduate* and the newly created *Overgraduate* sections. Tokyo Tech students won the Best Information Processing Project for the second year in a row in the *Undergraduate* section. This is the third time that the Institute was awarded the Best Information Processing Project since 2010. Tokyo Tech is the only university in Japan that has won iGEM's World Championship Award so far, which bespeaks the internationally-acclaimed ability of our students. Additionally, Tokyo Tech is the only university in the world that has won the World Championship Award three times and a gold medal for seven consecutive years at the regionals.

List of Participating Students

Shinya Suzuki	3rd-year, Biological Information, Department of Biotechnology,
Ken Saito	3rd-year, Biomolecular Engineering, Department of Biotechnology,
Naoki Watarai	3rd-year, Biological Information, Department of Bioscience,
Emma Hatanaka	3rd-year, Biological Information, Department of Bioscience,
Yuta Wakabayashi	3rd-year, Biological Information, Department of Biotechnology,
Masanori Kawabata	3rd-year, Department of Electrical Engineering and Bioscience,
Tatsuhiro Isozaki	2nd-year, Department of Biotechnology,
Ryota Fujiwara	2nd-year, Department of Bioscience,
Shunta Suzuki	3rd-year, Bioengineering, Department of Biotechnology,

Student Achievements

Student team wins a Gold in Project Awards at BIOMOD and another 2 awards

Takeya Sho
3rd-year,
Biomolecular Engineering
Department of Biotechnology

BIOMOD is a bio-molecular design competition in which undergraduate students engineer biomolecular systems on the nano/micrometer scale over the summer, and then compete with international teams in presenting their research results at the Jamboree the following November. Now in its third year, the BIOMOD 2013 Jamboree was held on November 2-3 at Harvard University. No restrictions are placed on design systems and the presentations included various projects such as nanosized 3D-structures, nanosized biomolecular motor systems, biomolecular computers and biomolecular robots created with DNA, RNA, protein and other materials.
This year, 27 teams from nine countries took part in the BIOMOD 2013 Jamboree, among them renowned universities such as Harvard University, the Massachusetts Institute of Technology (MIT), Columbia University, the Dresden University of Technology, the University of Tokyo, and Tohoku University. From Japan, six teams from five universities participated in BIOMOD.

With the use of DNA nanotechnology, the team presented two functional subsystems of their cosmetics-oriented biomolecular system: UV-Tuning Nano-Parasol and Controllable Optical Makeup. In the UV-Tuning Nano-Parasol subsystem, a cellular-scale sunshade system autonomously adjusts to maintain the level of suntan desired according to a predetermined user-defined threshold of allowable UV exposure. In the Controllable Optical Makeup subsystem, users can select and easily change a variety of structural colors according to their needs and preferences. Generally, research on high-functional biomolecular systems is usually associated with medical applications such as drug delivery systems. However, Team Platanus Symphony presented an innovative concept by applying their research to the field of cosmetics in order to enhance people's lives and enrich cultural experiences through various molecular controls.

As a result, Team Platanus Symphony won three prizes: a Gold in Project Awards, 3rd place in the Best YouTube video, and Best T-shirt. In order to accomplish this feat, the students needed to excel in all elements, which include computer molecular design, prediction with mathematical models, system construction based on experiments, logical project documentation and the giving of an exceptional presentation in English. The three prizes symbolize Tokyo Tech's globally-acclaimed student competence as well as show strong international recognition of the team's innovative ideas in this academic field.

＜Participating Students＞

Takeya Sho	3rd-year, Biomolecular Engineering, Department of Biotechnology,
Taku Ueki	3rd-year, Biological Information, Department of Biotechnology,
Honami Sakaizawa	3rd-year, Biomolecular Engineering, Department of Biotechnology,

Tadashi Shiozawa	3rd-year, Biomolecular Engineering, Department of Biotechnology,
Noriaki Shimamoto	3rd-year, Bioengineering, Department of Biotechnology,
Toshihiro Hayashi	3rd-year, Biomolecular Engineering, Department of Biotechnology,
Asuka Masui	3rd-year, Biomolecular Engineering, Department of Biotechnology,
Nao Yamamoto	3rd-year, Biological Information, Department of Biotechnology,
Atsushi Kayama	3rd-year, Department of Mechanical and Intelligent Systems Engineering,

From Foreign Students

Pursuing dreams

Donna Maretta Ariestanti
3rd year student, Doctoral program
Department of Biological Sciences

As a child who has grown up in a family of teachers, I have developed a long-standing love for education especially science since my early childhood and have long wished to make my own achievements in the field of science. To become a researcher and also a lecturer in my country, Indonesia, have always been my long-cherished aspirations, and decided to pursue these dreams.

I always believe that my country has so many talented human resources, yet an immense gap exists between Indonesia and the advanced countries in terms of teaching and research. For this reason, I have decided that I would like to continue my postgraduate program in one of the advanced countries, and Japan was my next destination.

About 5 years ago, road to my dream finally began to gradually open. I had the opportunity to become a postgraduate student in Tokyo Tech. I was hoping that as one of the most prestigious universities in Japan, Tokyo Tech could educate me in the most updated theory and enhance my research capacity, ultimately helping me make my own achievements in science field. So for me, that moment was like a dream come true.

Now I'm researching about Ig-hepta, a member of the G-protein-coupled receptor (GPCR) family that was found in our lab. I'm very interested in studying about GPCRs because they play a major role in signal transduction and are targets of many therapeutic drugs. I want to be part of this innovative breakthrough, and eventually introduce this topic to the young generation in Indonesia.

I consider it almost a courtesy to spread our science knowledge to the society, tell them about what we are doing and why it is interesting. I want to be a motivator for the young people and the society to love science. I want people to be inspired by science. I want children to want to be scientists. And I want the public to think our work is important and worthwhile. Toward this ideal, I will improve my capability both in science and communication with a passionate heart.

From Foreign Students

College Life in Tokyo Tech

Tanasak Kaew
1th year student, Graduate school
Department of Life Science

Three months have passed since I arrived here at Japan to continue my study at graduate level. Every day here is kind of new adventure and big challenge for me. Eating and cooking Japanese foods, especially sushi and ramen, is one of the activities that always make me happy and smiling. I am also impressed by the magnificence of Japan's traditional shrines and temples. Thanks to the excellent railway system here for its convenience, I am able to travel to many interesting places while spending a little time. Because I had studied Japanese language before coming here, the language barrier seems not to be as big problem as I thought to communicate with people and to be familiar with other Japanese cultures. For the academic life, my research focus is molecular design and organic synthesis of functional biomolecules as therapeutic agents to be integrated into drug delivery system. When I started my laboratory work, everything seems to be quite difficult because, apart from having good knowledge of organic chemistry, it requires patience and elaborate way to perform each experimental process. I am now gaining experience from my labmates and may I use the space here to say thank you to them, "arigatouuuu". Most important thing, I have to say a big thank to all Sensei for giving me the opportunity to study here and always providing me kind supports and constructive comments. From now on, every minute that I spend here at Tokyo Tech will be dedicated to my study and research. Just like a snail that climbs a tree, I will make some small progress every day. Even though I walk slowly, I promise I will never go backward.

From Foreign Students

Reminiscences of the past 3 years

KWEK Jasmine
3rd year undergraduate student
School of Bioscience and Biotechnology

It has been 3 years since I entered Tokyo Tech. I still remembered how I was so lost and confused when I first entered Tokyo Tech. Although I joined the Japanese preparatory course in Osaka University for a year before I came over, it was still overwhelming that all the classes were in Japanese and how everyone around me was speaking only Japanese. I was scared, I felt alone, I wanted to go home. But fortunately for me, my Japanese friends were really friendly and they helped me a lot with lessons, note-taking and also included me in their little groups. I felt welcomed and that was what allowed me to carry on.

Also, I am really glad that I made the decision to join the Kendo club in year 1. As it is a bukatsu, I was able to have first-hand experience of how it is like in a bukatsu and I am able to learn manners of the Japanese society. Training was tiring and it was

hard to keep up with the rest, but by persevering and going on with the training made me stronger physically and even mentally after 2 and a half years.

Three years later, I am now a third year student and a member of the URABE HATA lab. I am very thankful that the professors and seniors around me are always so patient with me even though I am still bad at Japanese. I am also very glad that I was given the chance to choose the lab that I really have interest in.

I cannot say that I am already familiar with everything around me, but I feel that I know more about the society, the culture and I have come to embrace all the differences between Japan and my hometown. Getting past the period of culture shock was hard, but I am glad I had friends and classmates around me, so that I can enjoy school life in Tokyo Tech.

I would really like to thank all the professors who have been patient with my bad Japanese, my classmates from school of bioscience and bioengineering, members of the Kendo club as well as members from the URABE HATA lab.

Editor's Note

We are pleased to send you News Letter No.16 with the help of members of the committee of Biotitech News Letters and the alumini/alumae of Fuclty of Bioscience and Biotechnlogy in Tokyo Insititute of Technology.

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

Bio Tokyo Tech Alumni News Letter
Editor-in-Chief
Noriyuki Asakura
Department of Bioengineering
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