Bio Tokyo Tech
News Letter No.9
Graduate School of Bioscience and Biotechnology
Tokyo Institute of Technology

Contents

Inauguration Address by Executive Vice President (for Planning)

Professor Ichiro OKURA

It is my sincere desire to do my utmost for the development of Tokyo Institute of Technology upon my appointment as Executive Vice President for Planning. For this, I would like to request the support of everyone present.

Please let me introduce myself. I entered Tokyo Institute of Technology in 1964. This year was a milestone. It was the year that the Shinkansen bullet train started to operate, and the Tokyo Olympic Games were held. The world around us had a bright and joyful atmosphere for the income-doubling plan made by the Ikeda Cabinet. At that time, TOKYO TECH had only the Science and Engineering Department. When I was a junior, it was divided into the Science Department and the Engineering Department. After graduating from the Chemical Engineering Course, Engineering Dept., I attended graduate school, being assigned to Professor Tominaga Keii's lab. I was studying complex catalysts. It

was the days of "university dispute." After completing the doctor course, I studied at Princeton University as a post doctorial for two years. After returning home, I served as assistant professor, associate professor, and then professor of the Faculty of Chemical Engineering. At the time of the foundation of Life Science Department, I transferred to Suzukakedai. This was about sixteen years ago. At that time, departments related to life science were limited to medical, pharmaceutical, and agricultural departments. However, since science departments and engineering departments dominated the researches related to the development of molecular biology and the effective utilization of biocatalyst in Europe and the U.S., movements to establish bio-related departments increased in universities, and so the Bioscience and Biotechnology Department was established in TOKYO TECH. The research content is biologically-relevant catalysts, in particular, biological elucidation and the production of useful compounds. As mentioned above, because I have almost never left TOKYO TECH, nor worked at a company, I would like to ask you for guidance.

The new system has started from October 24, 2007. I have been assigned to planning issues, and am responsible for the planning office, evaluation office, public relations (promotion) center, and cooperation with society center. They are slightly different from the existing organization. The latter two offices used to be the public relations and cooperation with society section. However, it has been changed into two separate centers.

Public relations (promotion) activities have been increasing year by year. This trend is not limited to TOKYO TECH. Recently, a two-page full spread ad in "the Asahi Shimbun," and an ad in "Nature" on which distinguished achievements are described stand out. It seems that TOKYO TECH's ad will soon show up on hanging posters in trains on the Tokyu lines.

The effects of publicity activities are said to be not very visible. I think it is important to sufficiently assess who the ad is aimed at in order to be effective. The target of PR activities on which we are going to focus from now on is the alumni/alumnae. Kenichi Iga, the new president of TOKYO TECH talked about "university capability" in his policy speech. "What is university capability?" This is an issue that has been discussed at the president's cabinet meeting for some time. Of course, universities have "education capability," and "research capability," etc. which can be termed totally as "university capability." However, a fairly large portion of a university capability lies in its alumni and alumnae. TOKYO TECH's alumni and alumnae are now playing an important role all over the world. There are some groups who organize an OB association overseas. There is a person who used to be a UNESCO intern is now playing a central role in his country. It is important to strengthen the connection between the alumni/alumnae and the university, and to perform PR activities aimed at the graduates. Enhancing this connection will lead to an increase in the chance that the graduates will drop in on TOKYO TECH. TOKYO TECH will mark its 130th anniversary in four years. Let us take this opportunity to consider planning something useful for the alumni/alumnae.

The other important aspect is collaboration with society. This collaboration includes the fostering of human resources helped by external people, and that of TOKYO TECH serving society outside the university. The former is to foster students with university-industry cooperation that depends largely on industry such as, internship, and courses and lectures by donation, etc. This is not limited to domestic companies, and we will ask foreign companies to cooperate with us. The latter applies to a one-day internship held by each department in its own way, however, I hope to control it as a program of the whole university, further vitalizing it.

As stated above, since I would especially like to promote PR activities and cooperation with society, I will greatly appreciate your continuing support.

A Message from the Dean of The School of Bioscience and Biotechology

Professor Shigehisa HIROSE

Dear All the Alumni and Alumnae:

How are you getting along? The Suzukakedai Campus is beautiful with a great view of the colorful autumn leaves. A walkway was built on Kato-yama as part of the campus improvements. The slope may be a little bit too steep for speculating, however, the place is perfect for feeling nature with your all senses, and for relaxing. Don't you think that a feeling of oneness with nature awakens our wildness which we are losing? Please take a walk around this place when you visit Suzukakedai Campus, your second native place. When you stroll down in the direction of the Integrated Research Institute adjacent to the guard station, you may remember the sweet aroma

around the liquid nitrogen tank on the way. I was recently told that the source of the fragrance is the fallen leaves of Cercidiphyllum japonicum, and so I will pass this on to you. There was also a happening that was particularly descriptive of the Suzukakedai campus. A walkingstick that is a master of mimicry has inhabited the foliage plant by a window of the office, providing us with conversation topics.

Our graduate school was awarded the Global COE (2007-2011) program following the 21st Century COE (2002-2006) program. It is an education program that centers on fostering young researchers of doctorate courses, but we have to keep in mind that excellent research is a premise for higher education. Since the crown of students' labors supported by the Global COE program will become the basis of applying for a next COE project, please endeavor for your junior fellows' good. We have published 23 papers in top journals such as Nature, Science, and Cell over the last five years. While keeping up the momentum, let us aim to do unique and original work representative of TOKYO TECH.

There was a major bio-related event in July. Bio Exhibition "Evolution of the Super Bio World" was held as a special exhibition at the Centennial Hall on the Ookayama Campus for ten days from July 19 to July 28, 2007. As well as introducing the stream and research performance of bioscience and biotechnology at this institute to general guests in a simplified manner, we set up a program to let elementary school and junior high school pupils become fascinated with bioscience and biotechnology. The event was very popular. For details, please see the 426th issue of Chronicle (the Nov. 2007 issue). You can also see them at our institute's Web site at:

(http://www.titech.ac.jp/publications/chro/chronicle-j.html.)

A symposium by Dr. Michael Nobel who is a visiting professor of the Frontier Research Center in this institute was held at Suzukake Hall on Wednesday, November 28. Dr. Nobel is a great grand nephew of the famous Alfred Nobel. He is a very friendly person, and he immediately put on a TOKYO TECH T-shirt that was presented to him at the reception. Along with his main subject on energy issues, his humane performance was very impressive. His visit was at a very short notice, and there was only two weeks of preparation time. However, it was a fruitful symposium thanks to Prof. Ishikawa's and Prof. Mihara's organizational abilities. Concerning the coelacanth which I told you about in the previous issue, full-scale dissection will start from December 22, and the sample for display will be completed in 2008.

The number of faculty members of the Global Edge Institute has increased to five persons, and three of them are from overseas, giving the institute an international flavor. Speaking of international flavor, the new International Graduate School has started from this year. For details, please see its overseer, Prof. Kajiwara's article. I would like to strive to meet the expectations of all the alumni/alumnae. Your warm continuing support in this matter would be highly appreciated.

STAFFS

Atomic Force Microscope

Professor Atsushi IKAI
(Department of Life Science)

Dear All:

Have you ever thought that you can touch individual atoms and molecules that make up your body? Our body is a collection of some trillions of cells that enclose within a thin layer of phospholipid bilayer thousands of different kinds of proteins as well as DNA, RNA and other low molecular weight molecules such as ATP. The cell membrane contains membrane proteins up to 50% in weight that work as, for example, channels, enzymes, receptors, etc. giving highly developed functions to the membrane. Atomic force microscope (AFM) allows you to touch individual protein molecules on the cell surface using a sharp needle that works as your finger tip.

The sharp needle of AFM is attached to a small spring so that, when the needle touches the cell surface, it would push up the spring slightly. This slight upward deflection of the spring is detected by the laser system called the optical lever. If the needle head has ligand molecules with specific affinity to a certain receptor on the cell surface, a non-covalent link is formed between the ligand and the receptor when the needle is brought into contact with the cell surface. Next, if you try to pull off the needle from the cell surface, you have to break the bond between them by applying a force through downward deflection of the spring. Thus, by monitoring positions where a finite separation force is detected, you can tell your friends, "Aha ! here I found the receptor!"

In such a way, it is now possible to map the presence and absence of specific kinds of receptors on the surface of live cells without damaging them. "Receptor mapping" in this fashion will be a useful

tool in cell biology in the near future because it is easy and damage free. Some of the membrane proteins are freely floating in the lipid bilayer while others are linked to the intracellular structures such as the cytoskeleton with varying degrees of affinity. We thought that pulling proteins with and without linkage to the cytoskeletal structure should give different responses to the AFM spring, and indeed, a clear difference was observed between the two cases. Thus, not only the species mapping is possible, but the linkage mapping is also possible by using mechanical measurement by AFM.

New International Graduate School of Bioscience and Biotechnology Has Just Started

Professor Susumu KAJIWARA
(Dean of International Graduate School of Bioscience and Biotechnology)

Dear All:

A program of the New International Graduate School has been started by the Graduate School of Bioscience and Biotechnology, the Tokyo Institute of Technology from October 2007. This program, "the International Graduate School of Bioscience and Biotechnology" is one of the unified master/doctor course education programs that is being undertaken by the entire Tokyo Tech.

Students in this international graduate course may obtain a master degree by going through an appropriate examination in 1.5 to 2 years after entering the course, automatically becoming doctoral students. And then, 2 to 2.5 years later, they gain their doctoral degree by presenting their dissertation. Therefore, students in this course are able to earn both a master's and a doctor's degree in as little as four years. As for the curriculum content, of course, all lectures and researches are given in English in the same way as the International Graduate School of Bioscience and Biotechnology. The course is established with some special classes, some of which are core curriculums. One of them is the internship class. In this class, students go to domestic corporations or institutes, going through training/doing research there for three to six months in order to learn not only a research area in a lab at the university, but knowledge and methods in a wide range of research fields. This class is mandatory.

In addition, we set up a cultivating creativity course as a new compulsory subject. In this lecture, students form a group with Japanese graduate students of Bioscience and Biotechnology Department, and contemplate a plan for new research and development in a field of biotechnology. By taking this course, students bring their own idea into shape, communicate with Japanese students in English, and hold a research/development presentation meeting at the end of its semester. By presenting the idea of each group in front of a lot of faculty members and students, improvement in presentation skills can be expected.

Moreover, for students who desire to learn the Japanese language, Japanese culture, and Japanese society, numerous Japanese language and Japanese culture courses have been newly established as elective subjects. At the Suzukakedai Campus, four Japanese language lectures are to be offered.

The enrollment of this course is limited to 10 students. Among them, seven students from Asia can be provided with scholarship and/or exemption from school fees as government-financed foreign students. In October this year, four Chinese, one South Korean, one Thai, and one Bangladeshi students became government-sponsored foreign students. If you, alumni/alumnae know of any students who are interested in Japan and in the Graduate School of the Bioscience and Bioengineering, TOKYO TECH, and who hope to study in Japan, I would like you to recommend to them that they participate in this new and attractive international graduate school program.

Students who entered the International Graduate School of Bioscience and Biotechnology in 2007

GLOBAL EDGE INSTITUTE

Mechanism Regulating the Activity of Different Calcium Channels

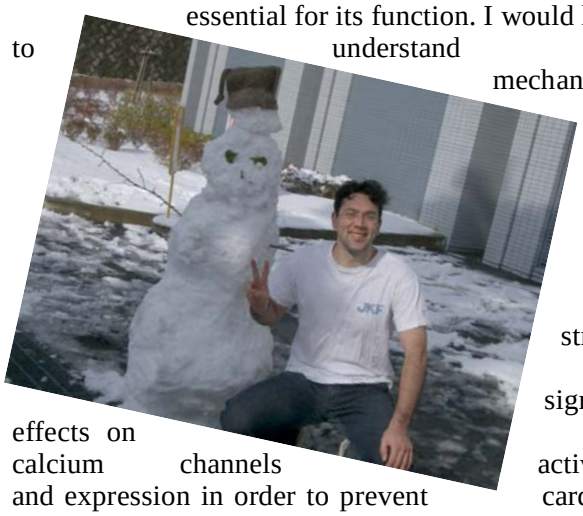
Dr. Andres Maturana
(Global Edge Institute)

Dear Colleagues:

My name is Andres Maturana. I came from Switzerland. I studied biology in the University of Geneva, where I got my PhD degree in 2002. In Geneva University, my research was focused on ion channels. I studied the regulation of calcium channels and their role in the initiation of transcription in excitable cells. I also studied the proton conduction across the plasma membrane through the NADPH oxidase. When I was a graduate student, I had the opportunity to meet Professor Shun'ichi Kuroda from the Institute of Scientific and Industrial Research of Osaka University. I told him that I was much interested in coming to Japan to make my post-doctoral experience. In 2003, I joined his group as a JSPS fellow for 2 years in Osaka University. After the JSPS fellowship term, I could extend my research in Osaka University until October 2006. My research was focused on neuronal development focusing on the axonal guidance and the role of scaffolding proteins in the cardiac cells.

I joined the Tokyo Institute of Technology in November 2006 as a tenure track assistant professor. I am very glad to have the opportunity to do my own researcher here in the Graduate school of Bioscience and Biotechnology.

I am particularly interested in the regulation of ion channels. Actually, I am studying the mechanism regulating the activity of different calcium channels in the heart, where they are essential for its function. I would like to understand the mechanism of stress signals effects on calcium channels activity and expression in order to prevent cardiac diseases. To study the activity of ion channels, I am using the Patch-clamp technique. The Patch-clamp allows you to measure directly the ions passing trough one single channel molecule.



Finally, I would like to thank very much all the researchers and professors that I could meet here that are helping me for my research and daily life here in Tokyo Tech.

My best regards,

Tokyo Tech: A Great Place for Education and Profession

Dr. Ezharul Hoque Chowdhury
(Global Edge Institute)

Dear Colleagues:

At first, I would like to introduce myself to you. I am a citizen of Bangladesh and came to Japan in January, 2000 as a research student and completed my Doctor of Engineering program in 2003 under supervision of Professor Toshihiro Akaike, from the graduate school of Bioscience and Biotechnology, Tokyo Tech. After working as a researcher for more than 3 years in the same school, I have joined Global Edge Institute of Tokyo Tech in December, 2006 as a tenure-track assistant professor. In addition to my active research and teaching responsibilities in the School of Bioscience and Biotechnology, I have the duty of promoting the joint research program between Tokyo Tech and Shizuoka Cancer Center Research Institute.

I have been working since 2000 on drug delivery system (DDS). It was the end of 2000 when we found that pH-sensitive inorganic nano-crystals (active components of mammalian hard tissues, such as bones & teeth) are far more smart that classical organic materials (such as lipid, peptide or other polymers) in terms of simplicity of fabricating nano-devices as well as efficiency of delivering drugs (such as DNA, RNA, protein or conventional drugs) to mammalian cells or tissues. The innovation has promising impacts on designing new generation therapeutics for critical human diseases, like cancer and so on.

In addition to my satisfaction in independent

research under highly encouraging environment with state-of-the art facilities of Tokyo Tech, I believe that the opportunity of teaching offered by the School of Bioscience and Biotechnology, will significantly contribute to our development as young faculty members. I would also like to acknowledge for generous and valuable assistance being provided us by the Global Edge Institute.

Finally, I would like to invite you to the newly established Shizuoka Cancer Center where I am spending most of my working time. A giant and beautiful cancer hospital is closely associated with the modern cancer research institute harboring Tokyo Tech laboratories in its 2nd floor.

With best regards,

Small is Big

Dr. Jonathan Heddle
(Global Edge Institute)

Dear Colleagues:

I joined the Global Edge Institute in the spring of this year but only moved to building B2 in September. Before that I worked as a postdoctoral fellow at Yokohama City University, initially studying structural biology. Prior to that I was in the UK (my home country) where I did a degree in pharmacy and a PhD in biochemistry. The world of research doesn't stand still and I am now involved in bionanotechnology research. Working in the Graduate School of Bioscience and Biotechnology is a great opportunity because of the concentration of great minds and the opportunity for fruitful discussions and exchange of ideas. To quote the great Max Perutz, the Nobel Prize winner and one of the founders of Molecular Biology, referring to the building of the famous MRC Laboratory of Molecular Biology (LMB) in Cambridge: "Experience had taught me that laboratories often fail because their scientists never talk to each other. To stimulate the exchange of ideas, we built a canteen where people can chat at morning coffee, lunch and tea." Although, sadly we seem to lack such a "coffee room" in our building, I nevertheless hope we can have that sort of atmosphere, then maybe we too can win 13 Nobel prizes as the LMB has!

My own research is now in the wide field of bionanotechnology. This is a new and exciting discipline in which we are trying to engineer biological molecules to self-assemble into nano-structures which may be useful for building next generation therapeutics, computer chips and materials. I am especially interested in engineering proteins to form scaffold for nanoelectronics and smart drug delivery systems as well understanding more of the principles of self-assembly itself. Already this field of research is generating a lot of excitement and interest from academia and industry. Small really is becoming big!

Best Regards,

GLOBAL COE PROGRAM

Learning from Nature

Dr. Bayar Hexig
(global COE program)

Dear Colleagues:

I am grateful for this opportunity to introduce myself and communicate with you in this news letter. I came to Japan from Inner Mongolia of China in October 1997. I gained my PhD degree in 2005, at the department of biomolecular engineering of TITech. My PhD work focused on the creation and characterization of compositional gradient structure using environmental friendly biodegradable polymers. After nearly 2 and a half years of postdoctoral fellow experience in the national institute of health sciences (NIHS) in Tokyo, I was appointed to be an assistant of professor for the global COE program on October 1, 2007, and started studies on biomaterials design and cell biology in Akaike・Takawa lab.

During postdoctoral fellow period, I joined to Health and Labor Sciences Grants for Research on Advanced Medical Technology and Risk Analysis on Food and Pharmaceuticals by Ministry of Health, Labor and Welfare, and my research interest was to

develop novel compositional gradient functional materials with excellent biocompatibility. I am deeply interested in learning from nature, and utilizing the wisdom of skillfully structured biological assembly for the design and development of biomaterials. The gradation of composition and various factors exists most commonly in the extracellular matrix, and plays an important role for executing the sophisticated behaviors of cells and tissues.

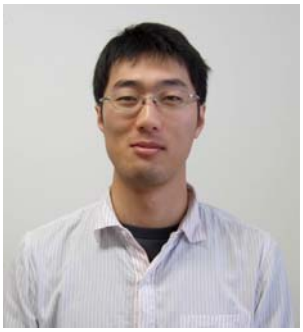
The biomaterials with the potential to promote the cell recognition and various cell behaviors are expected in the biomedical field. It is required to combine several advanced functions in one material. Learning from nature, understanding the technique of cells to construct their owning living environment-extracellular matrix to perform various functions and form large tissues and organ, are believed to provide me some inspirations for designing and developing advanced functional biomaterials.

With best regards,

Translation on a Balance

Dr. Shuntaro Takahashi
(global COE program)

Dear All:



It is my great pleasure to have an opportunity to introduce myself. I took my PhD degree from TITech in last March, and became a research associate of the Global COE program. I am a member of Okahata lab at department of biomolecular engineering and enjoy my research life with energetic colleagues every day. Since I was a postgraduate student, the research environment of TITech has impressed me because there are not only full facilities, but also many experts with various backgrounds. So, TITech is very special and powerful.

Now I am studying the translation system in living system. Translation means the process of protein biosynthesis to decode the genetic information on mRNA. This process is universal for the living cells on the earth. That is, it is important to investigate the mechanism of translation. Ribosomes synthesize proteins with systematical interactions by a large number of factors. Through this process, ribosomes dynamically move along mRNA. Being interested in the dynamic and well-ordered behaviors of ribosomes, I am trying to analyze the kinetic properties of the translation network. To determine the kinetics of the network of the biomolecular interactions, Quartz-Crystal Microbalance (QCM) has been used in our lab. Quartz is, as you know, often used in your watches, because it oscillates very stably by applying the voltage. On the other hand, it is known that the frequency is changed when a substance absorbed on the quartz surface. Based on this principle, QCM is the balance for micro substances. Especially, Our QCM is a highly sensitive tool to detect a mass of absorbed biomolecules at a nanogram level. As QCM is quite unique compared with other methodologies, it is useful to analyze the complex molecular interactions as mass changes of ribosomes and translation factors. I am sure of finding new aspects of a translation system by combination of biochemical researches and techniques of a unique device from TITech.

With best regards,

Fascinated by Chromosomes

Takashi Sutani
(global COE program)

Dear All:

It is my pleasure to introduce myself on this occasion. I am an assistant professor for global COE ("Spatio-Temporal Biological Network") since October 2007.

Here is my background. I was trained as a molecular biologist at Prof. Mitsuhiro Yanagida's lab in Kyoto University and obtained a Ph.D. in 1999. In November 2000, I joined Prof. Stephen C. Harrison's lab in Harvard Medical School as a postdoc and acquired skills for biochemical and structural biological analyses. Then I moved to here and have been a member of TITech since spring of 2005.

My research interest is structure of chromosomes. It fascinates me how a long string of DNA is folded and packaged into a chromosome, and how the folding or structure is modulated for cell cycle progression and gene regulation. These have been my research themes since I met them in

my university days. Currently I am focusing on a group of proteins that regulate chromosome structure and are required for faithful transmission of chromosomes to daughter cells.

In TITech I belongs to Prof. Katsuhiko Shirahige's lab, which is famous for his developed "ChIP-on-chip" technology. It is a powerful analytical tool to know where a protein in interest localizes along all chromosomes of yeast (an organism we use) comprehensively. With this new tool in my hand, I am eager to advance toward the mysteries of chromosome here in TITech.

Lastly I'd like to express my thanks to all the members of BioTitech. I enjoy encouraging and stimulative atmosphere it has and, am proud to be a part of this community.

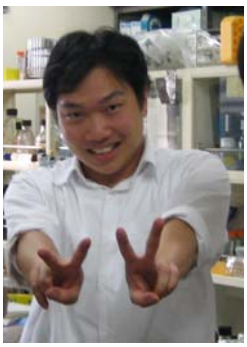
With best regards,

STUDENTS

Investigating the Interaction of gp34

Donny Sunanda, D1
(Arisaka Lab.)

Dear All Readers:



It is a pleasure to introduce myself in this newsletter. I joined the Tokyo Tech as a student of The International Master Course Program in 2005 in Prof. Arisaka's lab. The interest I have in biotechnology was initiated while I was engaging in a research project in my undergraduate course back home in Indonesia. I did a research on preliminary screening of recombinant vaccine candidates for *streptococcus pyogenes*.

I chose to apply to Prof. Arisaka's lab, because I find the bacteriophage T4 projects consistently explored in Professor Arisaka lab have the potential of practical application beside its fundamental aspects. The potency of designing the molecular machinery and developing the nano technology based on the mechanism of assembly pathway and structural transformations of bacteriophage T4 is a very promising practical application in the future.

For the subject of my Ph.D. degree, I currently investigate the interaction of gp34 (gp stands for gene products), the proximal part of the T4 long tail fiber protein that functions as host recognition device, with gp9, one of the baseplate socket protein. This interaction is assumed to play a very important role in the conformational change of series of structural proteins of T4 during the infection process. Understanding the interactions of the process and how their interaction triggers the subsequent conformational change of the tail will give a better understanding for the whole infection process and for exploring the potency of practical application of T4 phage.

In the future, I would like to be a researcher in a biotech companies or research institutes where I can contribute as well as improve my knowledge and experience.

Enjoying Research

Yu Fang, D1
(Inoue Lab.)

Dear Colleagues:

I'm very happy to have this chance to introduce myself here. I came from China and started my master course two years ago in Inoue lab, and now I'm a doctoral one year student. My major is biomolecular engineering, and it's mainly about the research on eco-friendly materials, which is in urgent need in nowadays society.

Research is amazing because it can make lots of impossible into possible. And it can always lead people going ahead. That's why I'm attracted by the research. I also feel lucky all the time because I meet a very nice Professor, who always encourages me going ahead to get to know the essential of research.

Currently I'm enjoying my research very much. I hope in the future I can become an experienced researcher. For this goal, I'll keep working.

Best regards,

From the Editors

We are pleased to send you News Letter No. 9 with the help of members of the committee of BIOTITECH News Letters and the alumni/alumnae of Faculty of Bioscience and Biotechnology in Tokyo Institute of Technology. We hope that this letter helps you to grasp how our School is developing and growing for the future.

With best wishes,

December 25, 2007
Dr. Yuichi KOBAYASHI

The Alumni/Alumnae of
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