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MESSAGE FROM DEAN

RECENT NEWS FROM SUZUKAKEDAI

Professor Shigehisa Hirose
(Department of Life Science)

How are you doing, alumni and alumnae! I will inform you about the progress of the Suzukakedai Campus and the Graduate School of Bioscience and Biotechnology in 2008. (1) Name boards for trees, on which tree names and brief explanations are inscribed, have been put up at the Kato-yama walkway mentioned last year. It is possible to learn the names of many trees just from

the area. (2) A hill adjacent to Route 246 had been an industrial waste material dump before it was back filled. The land was hard to use. It was about to be developed as a cemetery which would have been a visual problem for a university, however, in the end TOKYO TECH got out of this trouble by purchasing the controversial land. The land has such a story behind it and is impossible to be highly utilized, but it would



have been a waste if it was left unused. Therefore, the land has been improved to use it as a multi-purpose athletic field. Although we have to climb up a stairway with about 90 steps to reach the field, it is much more spacious than expected. Since any person can check if the playground is occupied or not by Web camera at all times, it is very convenient. A volleyball tournament comprised of 36 teams from the Suzukakedai Area is being held at present as an event to commemorate the completion of the playing field. (3) Part of Suzukake Street was expanded, and a plaza has been constructed. The plaza is very popular because it makes the place look more like a university. (4) As a new attempt by the alumni association, the Kuramae Seminar has been launched. Since the organizer is the Kanagawa Branch of the Kuramae Kogyokai, an alumni & alumnae association, the seminar was to be held first on the Suzukakedai Campus. It was held five times this academic year. The purpose is that our seniors, who have retired or are active in the front lines, talk to their juniors enthusiastically about their experiences and thoughts. The receptions after the seminars were also well received. Please see these seminars on the Web which will be prepared shortly. (5) A program of the graduate school has been adopted for "International Training Program for Young Researchers (ITP)" supported by the Ministry of Education, Culture, Sports, Science and Technology. A plan to send graduate students and young researchers to foreign countries and to accelerate internationalization has been progressing smoothly. Partner universities of this program are Imperial College (U.K.), University of Heidelberg/German Cancer Center, Swiss Federal Institute of Technology, and Tsinghua University (China). Since the budget for the program is 20 million yen annually, which will continue for five years, considerable results can be expected. (6) A program, "Distinctive GP" which triggered creativity education for departmental students has also been progressing successfully. In addition to "Biocon" which has been held up to now, "Bio-Related Educational Materials Development Contest" and "Biocon for Senior High Students" have also started this year. A world-class event, iGEM (The International Genetically Engineered Machine Competition) is held at MIT, in which a team of third year students participated for the first time from the Department of Bioscience and Bioengineering and won the gold medal.

It can be called a prodigious feat. I keenly realize the necessity of dealing with education, research and administration with a global perspective at all times. (7) "Program for Cultivating Human Resources by Industry-University," "Program Development Intended to Cultivate Human Resources of Leaders in Biology Who Will be Bearers of Innovation" ---- Attempts to Enhance Career Paths Aimed at Doctoral Students Who Want to Play an Active Role in a Government or a Corporation after Earning a PhD ---- jointly proposed by TOKYO TECH and Japan Bioindustry Association has been adopted, and "Special Course for Bioleaders" mainly aimed at doctoral students will start from 2009. We are busy with the preparations for the program now. As described above, the university system has changed, and unless we constantly apply for new programs and receive grants for them, funds will not be provided to us. This has kept the faculty members very busy. My second term as dean will expire soon. I secretly expected that I would get accustomed to my job in the second term and could relax some more, but that's not what happened. TOKYO TECH has been highly evaluated as "SciTech Fountain" (the Fountain of Science and Technology) by society. We want to continue to be the "SciTech Fountain" that produces excellent inventions and discoveries, and human resources to the world in the future, and that benefits society. (8) TOKYO TECH will celebrate its 130th anniversary in 2011. Projects called "TOKYO TECH 130" that commemorate its anniversary are being planned, and the main project is to establish a foundation to support SciTech Fountain functions. You may receive a letter asking for donations. Your agreement and cooperation in this matter would be highly appreciated.

At the end, I will talk about a bit of my private affairs. [1] My old mother living in a rural area of Toyama Prefecture had insomnia. I recommended over the phone that she go and see a doctor to have some medicine prescribed because she said an over-the-counter drug offered little benefit. Halcion, an ultrashort-acting drug was prescribed to her at a hospital in the town. She thought about taking only half a tablet because she was afraid of medicine, but went ahead and took one tablet a day for five days as prescribed. My sister, who was looking after my mother, said that something was strange with my mother from about the middle of this period. On the sixth day, she

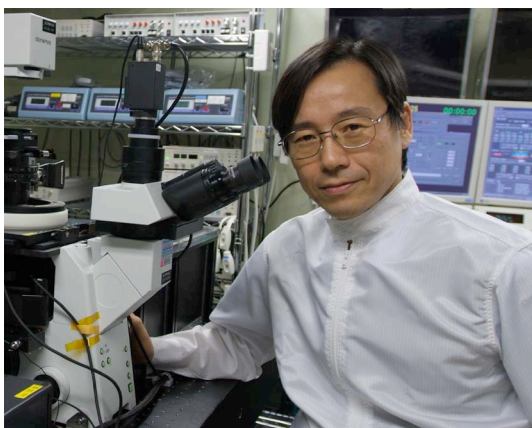
became delirious and was not able to recognize her family. My sister was upset and gave us an urgent call. My wife (pharmacist) heard this dialog beside me and said, "It may be a side-effect of Halcion." My mother stopped taking Halcion from that day but did not recover from the symptom immediately. Since it was difficult to take her to the hospital, my sister went to the hospital to consult with the doctor. The doctor said to her, "It must be an adverse effect." They decided to wait and see for a while. Several days later, while I was hearing the voice of my mother who was almost back to normal by phone, I was aware of the power and vulnerability of neuronal networks. [2] I looked forward to watching the sports corner of the TV program, "Sunday Morning," however, I feel sad because the newscaster in charge was replaced. I am a person who is more interested in a program's newscaster than in its content.

NEW STAFF

SINGLE MOLECULE IMAGING AND MOLECULAR SYSTEMS BIOLOGY

Professor Makio TOKUNAGA
(Biological Information)

Single molecule imaging coupled with the ability to simultaneously visualize several different proteins in cells has enabled the quantification of molecular dynamics, interactions, and kinetics. Immunological responses and signaling processes are visualized at the single-molecule level. Based on these three-dimensional and temporal parameters, we examine numerical modeling and computer simulations of cell functions.



Using the combination of single molecule quantification and in silico modeling, we aim to open up new frontiers for understanding immune cells as molecular systems.

NEW STAFF

ENJOYING SCIENCE 10 YEARS HENCE FROM NOW

Professor Satoshi MURAKAMI
(Life Science)



Study: Structure and Function of Biomolecules, Structural Analysis, X-ray crystallographic analysis of proteins, Structural biology.

NEW STAFF

RESEARCH FIELD

Visiting Professor Yutaka MUTO
(Life Science)

We investigate the post-transcriptional processing of RNA molecule (alternative splicing mechanism, the degradation of mRNA, etc) on the structural point of view. Mainly, we have utilized the nuclear magnetic resonance (NMR) method, which gives the structural and functional information of bio-molecules in aqueous solution.



NEW STAFF**RESEARCH FIELD**

Associate Professor Nobuhiro HAYASHI
(Life Science)

My specialty is biophysics and molecular biology. To understand the life at the molecular level, we make free use of physicochemical techniques (NMR, small angle x-ray/neutron scattering, surface plasmon resonance, mass spectrometry, etc.) for studying functions and structures of biopolymers, such as proteins and nucleic acids. We are developing new technologies (e.g., super high-precision, high-sensitive, high-throughput proteomics analysis system, hybrid NMR-mass spectrometer, etc.), and are pioneering new fields of research. The present subjects are 1)Disease proteomics, 2)Applications of antibodies as bio-nano-machines, and 3)Elucidation of molecular mechanism of signal processing on the bio-membranes.

**NEW STAFF****RESEARCH FIELD**

Associate Professor Junji HIROTA
(Center for Biological Resources
and Informatics)

Please allow me to introduce myself briefly. My name is Junji Hirota. I was appointed as an associate professor of the Section of Experimental Biology, the Center for Biological Resources and Bioinformatics this past April. I am responsible for managing the animal facility and teaching at the Department of Bioengineering. It is great honor for me to be a faculty member at the alma mater, the Tokyo Institute of Technology. As one of the first graduates of this school and graduate school, I feel great pleasure and responsibilities to teach, enlighten and encourage students. I will do my best to be a positive addition to this institute.

**EVENT****THE 17TH SUMMER LAB COURSE FOR HIGH SCHOOL STUDENT**

Professor Hirokazu URABE
(Biomolecular Engineering)

Associate Professor Atsushi KAWAKAMI
(Biological Information)

On July 28–29th, the 17th Summer Laboratory Course for High School Student “Invitation to the biotechnology in Tokyo Institute of Technology - Let’s explore the bio world-” was held in the Suzukake Campus. Forty six high school students from mainly Tokyo metropolitan area as well as some from distant prefectures participated in this course. The course in this year dealt with two themes, “Let’s see through the identity of medicines’ and ‘Let’s look at gene expression using the luminescent medaka fish”.

In the first theme, which were under the guidance of Urabe lab, students experienced the usages, origin of constituents, pharmacology and analysis methods using standard medicines that we often use. In



the second theme, which was under the guidance of Kawakami lab, students observed the gene expression using a transgenic animal that harbors the fluorescent protein gene, and further experienced the genomic DNA extraction and PCR DNA amplification. During the course, students needed to perform a number of different experiments during only 2 days, and these contents were also high level for high school students. However, they all struggled with experiments with unbelievable enthusiasm.

EVENT

THE 1ST HIGH SCHOOL BIO CONTEST

Associate Professor Tomoko MATSUDA
(Bioengineering)

The first “High School Bio Contest” was held at Suzukake campus, Tokyo Tech on Oct. 11, 2008. Our undergraduate students engaged in the guidance of high school students and the administration of the contest, 12 teams of high school students completed in making and presenting bio teaching materials for primary and secondary school student, and the neighborhood children played and learned with them. I was happy to see every participants having grown up through teaching and learning.



AWARD

THE AWARD FOR JAPANESE SOCIETY OF MUSHROOM SCIENCE AND BIOTECHNOLOGY

Professor Kazuo SHISHIDO
(Life Science)

“A New Development of Basic and Applied Researches of Basidiomycetous Mushrooms”

Basidiomycetous mushrooms are very attractive microorganisms to degrade lignocellulose, composed of cellulose, hemicellulose (its major component is xylan) and lignin, which is most abundant renewable organic resource on earth. Fruiting-body formation of basidiomycetous mushrooms is one of the most dramatic morphological differentiation observed in eukaryotic microorganisms. We investigated the molecular mechanism underlying the fruiting development of *Lentinula edodes* (Shiitake mushroom), providing valuable and meaningful information. It was revealed that an intramolecular triplex structure is associated with the expression of high promoter activity and a bent structure is with the regulation of DNA replication and transcription initiations. Further we molecular-genetically bred *Coprinopsis cinerea* strains with remarkably high lignin- and xylan-degrading activities. By using these strains, we succeeded in isolation of cellulose from rice straw as a soluble form. We bred *Coriolus hirsutus* strains producing a large amount of lignin peroxidase and rat cytochrome P450, CYP1A1. By using these strains, we succeeded in an efficient degradation of dioxins outside or inside of the mycelial cells.



AWARD**THE FELLOW DEGREE FROM THE JAPANESE SOCIETY FOR STUDY OF XENOBIOTICS (JSSX)**

Professor Toshihisa ISHIKAWA
(Biomolecular Engineering)

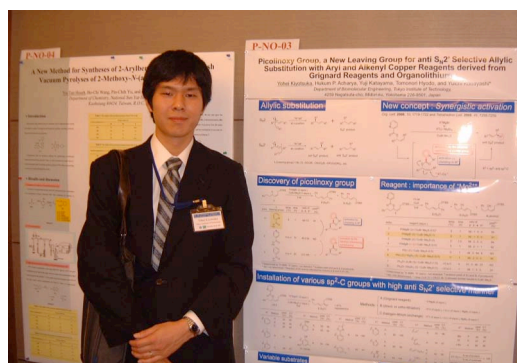
In October 2008, Professor Toshihisa Ishikawa received the Fellow Degree from the Japanese Society for Study of Xenobiotics (JSSX) for his remarkable achievement in the field of Pharmacogenomics. He has a very unique career as compared with the other faculty members in our graduate school. Dr. Ishikawa obtained his Ph.D. degree from the Graduate School of Science, Hokkaido University, Japan in March 1982. In the same year, he received the scholarship of the Deutscher Akademischer Austauschdienst (DAAD) and moved to Germany. From 1982 till 1987, he was a postdoctoral fellow at the Institute of Physiological Chemistry (Prof. Helmut Sies), Medical School of University Düsseldorf, in Germany. In April 1987 he returned to Japan and was appointed Assistant Biochemist at the Department of Biochemistry, Medical School of Osaka University, Japan. In 1989, he went to Germany again to become the project leader at the Department of Tumor Biochemistry in German Cancer Research Institute (DKFZ), Heidelberg. In 1991, Dr. Ishikawa left Germany for U.S.A, as he was appointed Assistant Professor at the Department of Experimental Pediatrics, University of Texas M.D. Anderson Cancer Center in Houston, Texas, U.S.A. In Houston, he had an adjunct appointment as Assistant Professor at the Graduate School of Health Science Center, University of Texas. In 1993, he received the Achievement Award from the International Life Sciences Institute (Washington DC). In December 1995, he was appointed to Senior Scientist and Manager at the Department of Medicinal Biology in the Central Research of Pfizer, Inc. and thereafter he became the Director of the Department of Research Technology Development at the Japanese Headquarters of Pfizer, Inc. in Tokyo, 1999. Since June 1, 2000, Dr. Ishikawa is a Professor at the Graduate School of Bioscience and Biotechnology, Tokyo Institute of Technology, Japan. In 2003, he founded a bio-venture company named "MedicinalGenomix, Inc.". He is also Professor (adjunct) at the Graduate School of

Tokyo Medical and Dental University as well as Senior Guest Scientist (adjunct) at the Omics Research Center of RIKEN Yokohama Institute. Dr. Ishikawa was a member of the International Nomenclature Committee for Human ABC Transporter Genes. He directed the NEDO International Collaboration Research project entitled "International standardization of *in-vitro* functional assay methods for human drug transporters" in 2005-2008. He received the Research Award for his distinguished study on "Pharmacogenomics of human ABC transporters" as well as the Fellow Degree from the Japanese Society for Study of Xenobiotics (JSSX) in 2005 and 2008, respectively. In addition, Dr. Ishikawa is currently serving as Associate Editor for several journals including *Journal of Experimental Therapeutics and Oncology* and *Pharmacogenomics*. Most recently, he was one of the Steering Committee members to organize the FDA Critical Path Transporter Workshop held in Bethesda, MD on October 2 - 3, 2008. Thus, Dr. Ishikawa has become an internationally-recognized scientist in the research field on pharmacogenomics of human ABC transporter genes. In addition, he is also currently developing the world-fastest SNP detection system for clinical practice.

AWARD**POSTER AWARD IN THE 9TH INTERNATIONAL SYMPOSIUM ON ORGANIC REACTIONS**

Yohei KIYOTSUKA
(Kobayashi Lab., D2)

In November of 2008, I joined to the symposium ISOR2008 (The 9th International Symposium on Organic Reactions) in Chiayi



and presented a poster, entitled "Picolinoy Group, a New Leaving Group for anti S_N2 ' Selective Allylic Substitution with Aryl and Alkenyl Copper Reagents derived from Grignard Reagents and Organolithiums", which got a poster award.

AWARD

DMPK EDITORS' AWARD FOR THE MOST EXCELLENT ARTICLE

Ai TAMURA
(Ishikawa Lab., D2)

It was my great honor to receive the *DMPK Editors' Award for the most Excellent Article in 2007* for our recent paper entitled "In vitro evaluation of photosensitivity risk related to genetic polymorphisms of human ABC transporter ABCG2 and inhibition by drugs." *Drug Metab. Pharmacokin.*



22(6):428-440 (2007). In addition, our recent paper entitled "Re-evaluation and functional classification of non-synonymous single nucleotide polymorphisms of the human ATP-binding cassette transporter ABCG2." *Cancer Sci.* 98(2):231-239 (2007) was ranked as one of the top-ten cited papers.

Single nucleotide polymorphisms (SNPs) of human ABC transporter ABCG2 are suggested to be a significant factor in the patients' responses to medication and/or the risk of diseases. Sequencing of the *ABCG2* gene from human samples has revealed over 80 different, naturally occurring sequence variations. We therefore intended to validate nonsynonymous SNPs of ABCG2 and identified alleles that are related to the risk of certain diseases resulting from disruption of porphyrin homeostasis. Based on the currently available SNP data for human ABCG2, we have created a total of seven variants by site-directed mutagenesis and stably expressed them in Flp-InTM-293 cells by using the Flp recombinase system. We found that cells expressing S441N and F489L variants exhibited high levels of both

cellularly accumulated pheophorbide a and photosensitivity, when those cells were incubated with pheophorbide a and irradiated with visible light. Furthermore, when ABCG2 was inhibited by imatinib or novobiocin, however, those cells became sensitive to light. Based on these results, we concluded that certain genetic polymorphisms and/or inhibition of ABCG2 by drugs can enhance the potential risk of photosensitivity.

In those articles, we therefore provided evidence that ABCG2 plays a pivotal role in photosensitivity. The technologies we have developed in that study would offer a great advantage for predicting photosensitive reactions before drugs are introduced in therapy or products made available on the market.

AWARD

BIOLOGICAL MACHINE COMPETITION "iGEM" AND GOLD PRIZE

Masashi KAJITA
(Biological Information, B3)

iGEM 2008 (The International Genetically Engineered Machine Competition) is a competition in which college students from all over the world compete with their original biological machine. It was held in MIT in November 2008. Our team won the gold prize which only 16 of 84 teams won.

iGEM is a competition of synthetic biology, which is the interdisciplinary field of biology and engineering. "Can simple biological systems be built from standard, interchangeable parts and operated in living cell? Or is biology simply too complicated to be engineered in this way?" iGEM competition was started to answer the question.

iGEM teams designed and built artificial biological systems from ~~a~~ standardized gene parts called "BioBrick". "The cell machine" is made as follows. At first, we design the control network (genetic circuit) by genes and also design the mathematical model. At the same time, we examine the behavior of each gene of the genetic circuit quantitatively. In addition, we use the mathematical model to



simulate whether the genetic circuit works as expected or not. Finally, we actually build a “machine” and tune up the genetic circuit if necessary.

The members of team Tokyo Tech are five junior students of the department of bioscience and biotechnology and one master course student of the interdisciplinary graduate school of science and engineering. Instructed by Associate Professor Daisuke Kiga, we started a project in May.

Our project was to construct a bacterial touch display “Coli Touch”. We used *E. coli* to the element of the display. The *E. coli* expresses GFP under the control of pressure inducible promoter. If you want to know our project in detail, please see here.

http://2008.igem.org/Team:Tokyo_Tech

It was very significant that junior students who don't belong to a laboratory participate to iGEM. Each team can freely set a theme in iGEM. It is good point of iGEM. However, its study duration is very short. It makes iGEM a very hard competition. We didn't know even “control experiment”. However, such students accomplished the following things for only half a year: the planning of the project, the investigation of the previous studies, the acquisition of the experimental technology, presentation in English, and poster presentation. We experienced a lot in order to start up the project by ourselves.

In MIT, we met many excellent students who gathered from all over the world. We were shocked by the skill of presentation of

not only European and American students but also Chinese and Taiwanese students. We realized that top school students are substantially superior to us. On the other hand, we won a gold medal with fewer members than other teams. We have confidence in this point.

This project was accomplished by the supports of many people. We participated in iGEM as a part of a lecture “Creative Design for Bioscience and Biotechnology II”. Moreover, without the supports of Aizawa Fund and Art and Craft Education and Research Support Center, it was impossible to participate in iGEM. Finally, we deeply appreciate for all concerned people who gave us great cooperation and supports.

STUDENT**ORGANIC SYNTHESIS OF
SACCHARIDES**

Liei You
(Yuasa Lab., D2)

I am a second- year-doctor course student belonging to Yuasa Lab, Department of Life Science. Currently my research is about organic synthesis of saccharides. I studied in analysis chemistry of polysaccharide for my master's degree in Taiwan. Thanks to Prof. Yuasa, who takes me entering the hall of organic synthesis and now, I become more and more interested in science. From now on, I will try my best to solvent any problems I may meet it in my research and enjoy my research.

**STUDENT****YSEP STUDENT**

Atikrit Chanjavanakul
(Okura and Asakura Lab., B4)

Hello! I am a new YSEP student called Atikrit Chanjavanakul (or Doam for nickname) from Chulalongkorn University, Thailand. I am very delighted to be in Okura/Asakura laboratory from September to August 2009. During one year, I will put all my efforts for the Sotsuron.

**From the Editors**

We are pleased to send you News Letter No. 11 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 grasp how our School is developing and growing for the future.

With best wishes,

March 24, 2009
Dr. Yuichi KOBAYASHI

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