

BIO Tokyo Tech

News Letter No.8

**Graduate School of Bioscience and Biotechnology
Tokyo Institute of Technology**



“From the Dean’s Office”

Dear Alumni and Friends:

It’s a pleasure writing to you and sharing the recent developments here at Suzukakedai. A 20-story tower building, J2, with seismic isolators has been constructed near the athletic field. Six laboratories (3 from the Department of Life Science and 3 from the Department of Bioengineering) have moved to J2 and started their research activities in a new inspiring environment. J2 will enjoy worldwide recognition through their activities. Other big news of the year include: (1) inauguration of the dual degree program between the Tsinghua University and our institute, (2) arrival of a frozen coelacanth from Tanzania, and (3) HITS2006 symposium held at the Shizuoka cancer center. Let me briefly explain each event below.

The joint graduate program for double degrees between Tsinghua University and Tokyo Institute of Technology is now only in its second year and needs a special care, supports, and attention from the academia and societies. Drafting policies of the program is important but the most important thing is the passion of the people involved. A delegation from Tsinghua University visited our Suzukakedai campus last November and our Tokyo Tech delegates are scheduled to visit Tsinghua University in March 2006. I hope this type of gathering will stimulate mutual understanding of the staffs of both sides and establish strong personal links among us. We also initiated an undergraduate program aimed at cultivating a spirit of endeavor.

(<http://www.titech.ac.jp/news/e/news060130-2.html>).

A frozen coelacanth was donated to our institute from the Tanzania Fisheries Research Institute and the African Coelacanth Ecosystem Programme and a donation ceremony was held on November 21, 2005 (for details, see the web page of Professor Okada’s lab). In 1985, we initiated actual preparation for establishing our School of Bioscience and Biotechnology. Since then 20 years have passed and our School of Bioscience and Biotechnology has reached the age of 20. The coelacanth is therefore a very timely gift for us and makes our Coming-of-Age Day very special and unforgettable one. I am sure that the coelacanth provides us special spiritual power for promoting our research and education. Coelacanth (meaning "hollow spine" in Greek) is a species of fish and represents the oldest lineage of living fish known to date. The coelacanth was believed to have been extinct since the end of the Cretaceous period (66 million years ago) – until a live specimen turned up off the east coast of South Africa in 1938. They are therefore called a “living fossil” that has changed little in its 400 million years on earth. They live in deep sea. No fish brought to the surface has survived for more than a day. Female coelacanths do not lay eggs; eggs are fertilized internally. Please see the picture of “ancient creature of the deep” on our web page and imagine the exciting moment of discovery of coelacanth, three days before Christmas, 1938, 67 years ago.

Partnerships and alliances are vital for us. We established an alliance, called HITS, consisting of four partners: Hanyang University, Imperial College of London, Tokyo Tech, and Shizuoka Cancer Center and held an inauguration

symposium in Shizuoka on 2006/1/26 to make big hits in the field of bionanotechnology and biomedical engineering.

My day begins, even on Sundays, by turning off the alarm clock and ends by setting it again; when (late at night?) and for when (early in the morning?), that is the question. Anyway, in contrast to the administrative work, doing science is fun and rewarding.

Professor Shigehisa Hirose

Dean,
Graduated School of Bioscience and Biotechnology
Tokyo Institute of Technology

“Three dimensional structures of proteins are quite interesting”

Dear Colleagues:

I was a professor of the Institute since 1988 until having retired last March, and was awarded the degree of the professor emeritus of the Institute after the retirement. One of my projects in the Institute was to elucidate the relation between the structures and thermostability of chimeras between thermophilic and mesophilic enzymes. The other targets were heme containing proteins from which the role of the heme in the enzyme could be discussed.

The importance of the structure of each protein is emphasized by the fact that the life is made from a series of chemical reactions among biological molecules. The enzyme, a part of proteins, controls the complex reaction between molecules as catalysis to gain the energy from hydrocarbon and lipid. The genes are also constructed with enzymes.

The recent development on the X-ray structural analysis has been progressive. The excellent X-ray generators, SR beam, were constructed at both Tsukuba of Ibaragi and Harima of Hyogo prefecture, which make it possible to gather the whole diffraction data of X-ray from crystals quickly. Many user-orientated programs were available for researchers to solve and display the big molecules of proteins. I contributed to design the beam line of the SR beam line as an outstanding researcher, and made the program of the rotation function to

determine the structure with the molecular replacement method.

As results of these efforts, the researcher of non-speciality like the biochemist can determine the structures of their own proteins. In this five years, the national project named the protein3000 was carried out to determine more than 3000 structures of proteins in relation with their functions.

You can enjoy the structures of proteins though the Protein Data Bank on the display of the computer. The Bank grows up every year. More than 30,000 structures are saved on it, and their molecular weights are varied from several thousands and more that several millions. I think that the Bank includes a lot of treasure, and hope that you use it to help your fruitful bio researches in the Institute.

Nobuo Tanaka

Emeritus professor
Distinguished professor of the COE program
Tokyo Institute of Technology

“TITech View from Outside”

Dear All,

I have been retired from Tokyo Tech last March by the age. Since then a fresh eye has been opened with me for observing Tokyo Tech from outside. As having been informed already, all national universities in Japan have been reorganized as independent organizations free from nation base. Among many universities, Tokyo Tech has posed outstanding features in science and technology, especially as a leading academic school in bioscience and biotechnology. Not to describe its present high potential in research, but input from outside, like most readers of this news letter who have gained scholarly status in respective country will be highly appreciated for its great stride in further development and the higher international evaluation.

Talking about myself, I am now with Kogakuin University, a private technical school, which locates in downtown Tokyo, 5 minutes' walking distance from Shinjuku station without umbrella even on a rainy day. I enjoy teaching and researching there, one primary research

subject being succeeded from the one while at TITech, which is related to environmental protection by utilizing biochemical functions. We are now in the Century of Environment. I believe the bio-function will surely be the strongest tool for keeping our living environment comfortable. Hope all of you to join/continue to contribute to the research for keeping human society in healthy condition for ever.

With faithful regards,

Hajime Unno, Professor & PhD.

Department of Environmental Chemical Engineering,
Kogakuin University

“Green Chemistry”

Dear Colleagues:

I came to Tokyo Institute of Technology on October 2004, and since that time I have been enjoying the research and education here. The last place I worked for was a private university, Ryukoku University, so the environment and people are very different, and there are a lot of surprises to me. I feel I am very lucky to experience both public and private universities, both Kansai and Kanto and both rural and urban areas. One of the best things here is that I can communicate with many international students. The group near my lab has also an international student. Last summer, I had a chance to give lectures in Tsinghua University in Beijing, China, and it is one of the most exciting international experiences.

I have been continuing the research about green chemistry since I was a PhD student because I want to contribute to protect environment, personally because I like to be in Nature; I love to see ocean, mountain, and sky. I use enzyme for the organic synthesis to find environmentally friendly organic synthesis. Especially, I conduct research to use enzyme in non-aqueous solvents. The solvent I am interested in most is CO₂. CO₂ is a gas at ambient conditions, so it is not possible to use it as it is. However, it becomes to be a supercritical state above the critical point

(31°C, 73 atm), and then it can be used as a solvent. Under the conditions, CO₂ is like both liquid and gas. Supercritical CO₂ have been used commercially for the extraction purposes, for example extraction of caffeine from coffee beans. I use it as a solvent for the enzymatic reactions. Then, the separation of the product from the solvent is easy because reducing the pressure makes it to be gas. Extraction process is complicated for the reaction in water, but it is not necessary for the reaction in CO₂. Moreover, the reaction using CO₂ as a substrate is favorable under the solvent with high density of CO₂, supercritical CO₂. I hope to develop an efficient synthetic method to use CO₂ as a raw material. After all, through these researches, I hope to contribute to protect environment and to build a sustainable society.

With best regards,

Tomoko Matsuda

Department of Bioengineering,
Graduated School of Bioscience and Biotechnology

Dear All

My name is Katsuhiko Shirahige. Let me briefly introduce my scientific background. After studying at University of Tokyo (B.S.), I gained my PhD degree in 1994, at University of Osaka. My PhD work was on the regulation of DNA replication of eukaryotic chromosome. After getting PhD, I got a position as research associate at Nara Advanced Institute of Science and Technology. I continued working on DNA replication and found connection of chromosomal DNA replication and cell cycle checkpoint regulation. During this period I started the transcriptome analysis of commercial yeast used for fermentation of beer with SUNTORY, the Japanese brewery company, and noticed the possibility of DNA chip technology for the understanding of genome dynamics. After moving to RIKEN as senior researcher, I tried to apply DNA chip for the analysis of chromosome structure. After two years, I finally established the ChIP-chip technology that can analyze protein-DNA interactions at 300bp resolution at genome wide scale. Now I am heading a Chromosome

Biology Lab at Center for Biological Resources and Informatics of Tokyo Institute of Technology.

The development of this special technology, CHIP-chip, have connected us with more than 15 laboratories from all over the world, and we have guest researchers almost every month from those laboratories (mainly from US, England, Canada, France, Austria, Sweden, and Italy). Most of them stayed here for two months, went back with fruitful results and most importantly, they got really good publication. Those guests' attitudes toward science also stimulated the students in my lab and they could learn the importance of communication and discussion (in English). I am really happy to be here and would like to say thanks to TiTech for giving me the opportunity to do my own research in such a comfortable atmosphere. If you have spare time, please visit my laboratory. I will take you for lab tour.

With kind regards,
Katsu

Katsuhiko Shirahige
Section of Gene Experiment
Center for Biological Resources and Informatics

“Nice to neat school”

Dear Colleagues:

It is my great pleasure to have an opportunity to introduce myself. I moved to TITech Suzukakedai campus last summer from Tokyo metropolitan area. This was my great relief since I don't have to get on a train in which people are packed like sardines. Among several universities and institutes that I know, the TITech Suzukakedai definitely has one of the best atmosphere and surroundings, though we sometimes wish to have more restaurants and stores in this area. Anyway, all students and colleagues I met were persons of visions, and I look forward to working together with them. Since I spent most of my research life in the science department, I expect and hope to collaborate with people in other fields and enjoy the life in Suzukakedai.

Now, most universities and institutes in Japan are undergoing a huge change. Hopefully, it will be an improvement. However, as for organizing the institution, I think we need to do more improvements. For example, we still need to spend extra charges for local agents to purchase supplies, even though we have many ways to directly get supplies from the original suppliers. We have to purchase all instruments in each labs and etc. etc. Although I know it is difficult to change something, I wish we would have a nicely organized institution so that each researcher comes, works and leaves very easily. I believe that an institute is not merely a building, but an organic substance that promote the science. As a member of this institute, I would like to do my best to improve our research environment.

Possibly, I may not have enough room for introducing my research. Just briefly, my current research mainly uses the zebrafish and medaka fish. Using the genetical and molecular approaches, I am trying to answer how the animal tissues and organs are formed and maintained (or regenerated). Recently, I feel more and more that research is like a job of detectives. We collect information, find the interconnection, make a hypothesis, prove it and come to a conclusion. Again, I hope to enjoy the life and research at the TITech Suzukakedai.

"Look at organisms, then they will tell us something"

With best regards,

Atsushi Kawakami
Department of Biological Information
Graduated School of Bioscience and Biotechnology

“Fins into limbs”

Dear colleagues,

Let me tell you something about myself. After nearly 6 years of postdoc experience in London, in Scotland and in Oregon, I was appointed as an associated professor of the Department of Biological Science on April 2004. I am a developmental biologist and my interest is to

understand how particular structures are formed in correct shape and position throughout the body. My particular interest is to understand the vertebrate body plan in relation to formation of limbs from evolutionary perspective. Humans have two pairs of limbs along side of the body and fossil evidence shows that these evolved from paired fins of ancestral fish. Why do paired fins/limbs arise in these locations and not anywhere along the flank? I am exploring when and how vertebrates acquired two pairs of limbs using embryological and genetic approaches. Approaching the body plan from both points of view-both evolution and development-helps us to understand how many animals acquired current body plan. As evolutionary developmental biology ("Evo-Devo") combines fields of comparative embryology, phylogenetics and genome analysis, being surrounded by biologists working in different disciplines would stand me in good stead for what I want to pursue. Currently, I am performing embryonic analyses using lampreys, shark, zebrafish and chick embryos with my students. The results will help us to understand the origin of the fundamental body plan providing essential information for medical approaches to patients who have congenital malformation for their hands and feet.

With best wishes,

Mikiko Tanaka

Department of Biological Science
Graduated School of Bioscience and Biotechnology

“Small Lab, Big Hopes”

Dear Colleagues:

It's my pleasure to introduce myself on this News Letter. In April 2005, I have started a new life as an Associate Professor of Department of Biological Information @BIO.TITECH. Suzukakedai Campus seems to be a very nice place to spend a research time. I'm an organic chemist, especially a synthetic organic chemist. My recent research interest is directed to design and synthesize an organic compound that shows specific biofunctions. Before arriving TITECH, I served as an Assistant Professor at Gifu University for ten years. During this period, I have collaborated with many biological researchers and shared hard times with them. What I have had from this experience is that these relationships in interdisciplinary area is very important and invaluable to do something scientifically new. I'd like to promote such an interdisciplinary research also at TITECH. One of my big challenge is to develop a new pharmaceutical drug from our laboratory to help patients suffering from a serious disease. Together with four fresh undergraduate students, my lab has launched this year to make the dream comes true. Although it's a small lab now, we have great hopes toward the future and doing our best. Our lab is located on the 9th floor of B1 Building. Please come and visit our lab anytime on the occasion of your arrival to Suzukakedai Campus.

Takamitsu Hosoya

Department of Biological Information
Graduated School of Bioscience and Biotechnology

From the Editors,

7 July 2006

We are pleased to send you News Letter No. 8 with the help of members of the committee of BIOTITECH News Letter and the alumni/alumnae of Faculty of Bioscience and Biotechnology in Tokyo Institute of Technology. We hope that this News Letter gives you a good opportunity to keep your mutual communication. Please visit at Suzukakedai campus, and you will see that our School is developing and growing.

With best wishes,

The Alumni/Alumnae of Faculty of Bioscience and Biotechnology
c/o Dr. Hiroshi Ichinose
Graduate School of Bioscience & Biotechnology
Tokyo Institute of Technology
4259 Nagatsuta-cho, Midori-ku
Yokohama 226-8501, Japan