TANSEI

The University of Tokyo Magazine

TANSEI aims at sharing worldwide the latest developments at UT with everyone interested in education and research.

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TANSEI – The school color of the University of Tokyo is light blue (tansei in Japanese). It was initially used at the first rowing regatta between the University of Tokyo and Kyoto University in 1920. The colors of the two universities were determined by drawing lots. Kyoto University drew dark blue and the University of Tokyo light blue. Since then, light blue has been the school color of the University of Tokyo.

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Greeting from the Editor

It is a pleasure to be able to issue Vol. 5 of TANSEI. This issue's special feature deals with the "UT Forum 2004 in Sweden" which was held in Sweden in August 2004. It is hoped that this will convey something of the atmosphere of the four academic forums – in the fields of environmental science, medical and life sciences, economics and management, and basic science – and the active academic interchanges, as well as the international exchange activities of the participating both Japanese and Swedish students.

The Presidents' Discussion touched on the discussion between Bo Sundqvist, Vice-Chancellor of Uppsala University and Takeshi Sasaki, President of the University of Tokyo, which was held together with the University of Tokyo Forum 2004 in Sweden, and they exchanged opinions concerning the approach to university reform in Europe and in Japan.

Two Executive Vice-Presidents' Interviews held on the occasion of the forum are also included: one between Anders Flodström, President of the Royal Institute of Technology, and Hiroshi Komiyama, Executive Vice-President of the University of Tokyo, and one between Hans Wigzell, former President of the Karolinska Institute and Takaaki Kirino, Executive Vice-President of the University of Tokyo.

Through this special issue, we hope readers will become more familiar with some of the University of Tokyo's international academic activities as a university aiming to contribute to the global community through international education, pioneering research, and worldwide fellowship.

Ichiro Sakuma, Ph.D.
Chairman of the Public Relations Committee

Presidents' Discussion

Bo Sundqvist, Vice-Chancellor, Uppsala University
Takeshi Sasaki, President, the University of Tokyo

University reforms in Europe and Japan

University reforms are under way in a number of European countries, including Sweden.
For Europe and Japan, what are the challenges for university reform and what measures are required?

01

What is the Bologna process that is being introduced in many European countries?

(Sasaki) I am now in charge of the special committee for drafting the future of higher education in Japan. Now, the European Union as a whole has tried to introduce a new scheme of university reform, and at the same time, each country tries to reform the universities as well as strengthen the infrastructure or support research. First of all, the impact of the Bologna process of the Bologna program – what does it mean for Europe as a whole as well as in Sweden?

(Sundqvist) A couple of years ago, the European prime ministers – the prime ministers in the European Union – had a meeting in Lisbon in Portugal. The systems for higher education in Europe were looked over then. The situation in Europe is quite sketchy. We have different degrees of strength, we have different systems of funding research, and we have different systems of higher education. The Bologna process will provide a standard for different systems of higher education and develop a common degree system to make it easier for students and teachers to be mobile. So this is one background to the Bologna process, to make teachers and students mobile, but it's also part of Bologna to make students employable. That means if you get your education in Sweden, you should be employable in France, for example. So that's another important thing and the Lisbon declaration really pushed the speed of implementing the Bologna process. Sweden has been fairly slow in this, but in the last two years we have been studying and discussing details and I think that Uppsala University has been even more active than other universities.

(Sasaki) How are the European countries, including Sweden, introducing the Bologna process?

(Sundqvist) In Sweden, our degree system will be modified to include a basic Bachelor's level and an advanced Master's level, which is closer to Bologna. In the Scandinavian countries, which I know best of course, both Denmark and Finland are a little further ahead than Sweden. They were both full members of the European Union before Sweden.

To promote the introduction of the Bologna process, I feel the need to establish a common research area, like the Research Council for Basic Research in Europe, so that we should have a common idea of research.

(Sasaki) It seems to me that the research may be some big scheme for Europe as a whole and can be designed on the table, even though it is not so easy to materialize.

(Sundqvist) Once you know the history of Europe, you can only look into how the Union's decisions have been implemented and at the discussions among the big countries like France and Germany and Britain, which, even in foreign policy, as you know, in recent years have landed up in quite different camps.

(Sasaki) Each nation has its own very strong tradition and institutionally they are all very different from one another, but from my point of view it seems to me that they all have the university degree. If the

Bo Sundqvist

Professor Bo Sundqvist has been the Vice-Chancellor of Uppsala University since 1997 and Chairman of the Swedish Association of Higher Education since 2004.
He was born in 1941, Lövånger, County of Västerbotten, Sweden.
He obtained his Ph.D. in Nuclear Physics in 1974, and became a Professor of ion physics in 1987.
He functioned as the Assistant Dean for Physics from 1992-1993 and the Dean of the Faculty of Science and Technology from 1993-1997. All degrees and positions are at Uppsala University.
He is a member of the Royal Academy of Arts and Sciences of Uppsala, the Royal Society of Sciences at Uppsala, the Royal Swedish Academy of Sciences, the Royal Swedish Academy of Engineering Sciences, and the Royal Danish Academy of Sciences. He was presented an Honorary Doctorate from the University of Colombo, Sri Lanka in 2003.

European Union has some common scheme – a common institutional scheme – maybe the students and teachers or professors can be mobile and pick an interesting university as a choice.

(Sundqvist) Already today there are certain exchange programs with seven, eight hundred students every year from various parts of Europe coming to Uppsala in the European Union scheme of scholarships. This is now about the same amount of Uppsala students who go to other universities in Europe. This has been expanded over the last decade. But under the Bologna process, the hope is that this would expand even more. But I think it will take some time.

(Sasaki) We see that European people are trying to implement these ideas, but in the case of Germany, we have heard that the government has proposed a so-called top university and this is only a national plan.

(Sundqvist) I think this is one of the interesting contradictions in the whole idea of the European Union, that you try to decide what should be decided on the European level but still the countries should compete. Rich nations like Sweden, Finland, Denmark, Britain and so on have their own program of preparing how to compete as successfully as possible with other European countries, as well as elevating Europe to a higher level. There are also a lot of activities going on to prepare for international competitions, to a very large extent, and you can notice today, and in recent years, with all the economic problems in the world, that many of the European governments, in addition to these European ambitions, invest a lot in higher education research.

So, for example, just a couple of months ago the six research universities in Stockholm and Uppsala formed a strategic alliance with one important ambition – to be more efficient strategic partners for universities for everyone in the world, because together we form a more competitive unit on the world stage.

(Sasaki) Nevertheless, these six universities are usually to some extent still in a competitive relationship.

(Sundqvist) Absolutely.

02

Tuition systems in Europe and Japan

(Sasaki) I'd like to get back to the so-called tuition program in the European Union.

(Sundqvist) This is certainly an area where there's very little harmonization in Europe at the moment, as you know. In Britain they have gone rather far in the direction of the American system, while the Germans are talking about introducing this system. So far, Scandinavia is part of a world where we still keep to the tradition of free higher education. You should have the possibility to develop your potential and that shouldn't depend on your family background. But I think that in the long run this will have to change and Scandinavia as a whole will be introducing modest fees.

So what is the situation in Japan with tuition?

(Sasaki) Japanese universities

Takeshi Sasaki

Professor Takeshi Sasaki was born in 1942. He graduated from the Faculty of Law of the University of Tokyo in 1965, and received his Ph.D. degree from there in 1973. He joined the University of Tokyo in 1968 as an Associate Professor in the Faculty of Law, and was promoted to Professor in 1978. He served as a member of the Senate from 1990-1992 and the Dean of the Graduate School of Law and Politics from 1998-2000, and took office as the twenty-seventh President of the University of Tokyo in April 2001. He was elected a Corresponding Fellow of the British Academy in July 2004, and received an Honorary Doctorate Degree from Seoul National University in March 2005. He is a member of the Steering Committee of the Association of Pacific Rim Universities and the President of the Japan Association of National Universities from 2003.

traditionally ask for a quite amount in tuition fees, even in the case of national universities, and we have a large number of private universities. They usually ask almost double the cost of tuition from students.

(Sundqvist) Are the fees of the national universities at the same level among different departments?

(Sasaki) They are all at the same level and there is no difference between the departments, such as between students of literature or students of medical science. That is, there is no difference in the case of national universities, but in the case of private universities, there are huge differences. The only exception is that we have established a new law school and as far as the new law school is concerned, the government set a higher rate for tuition.

(Sundqvist) But in the case of the University of Tokyo, which is a very prestigious and well-known institution, do you think that it's a possibility that you can have different tuition fees?

(Sasaki) A new system was introduced in national universities, at the beginning of April 2004, so each university can fix its own tuition system. There is some kind of standard and then you can introduce a 10% premium. That's the limit. The biggest problem in our society is that, so far, government investment in higher education is a relatively small percentage, in terms of GDP. In the case of Japan, it totals perhaps 0.5% of GDP.

03

Providing resources to improve higher education quality

(Sundqvist) So there is not enough public spending on higher education in Japan.

(Sasaki) In the case of other countries – OECD countries – it's almost 1%, so the Japanese university system has been so-called "disinvested" for a long time. That means parents – householders – have to put up more money for higher education. At the end of the 1990s, the Japanese economy was hit by structural problems, so that the household generally speaking was losing its resources to pay for their children. In such circumstances, the universities cannot raise the tuition fees. And public support will not be increased. Our next program is how we can increase investment in higher education. One example is the so-called COE program introduced by the government. The COE program means a Center of Excellence program in the 21st century in which the government sets up 10 research fields. So, each university can raise their hands to ask for support from the government, to support specific research proposals.

(Sundqvist) Is that long-term funding?

(Sasaki) Maybe five years. This scheme is not very generous.

(Sundqvist) For example, in the United States some of the tuition fees are, as we know, used for infrastructure investment for research. Is that possible in Japan?

(Sasaki) Before the change in the university system, all the tuition money went to the ministry and the ministry provided us with an amount of money, so it was not possible for us to use the money directly for the arrangement of infrastructure. But after the change in the university system, maybe it will become more possible.

(Sundqvist) Will that be possible?

(Sasaki) Yes I think there is some possibility. Probably the national universities would not like to raise tuition fees while support is coming from the government. But if the government cuts their support, they will be forced to raise tuition fees and this is a concern for most university presidents, but so far the economic situation as a whole is not so good. So tuition fees should not be increased; they should rather go down, according to the current economic situation.

04

The collaboration with industry and individuals is the key to competitiveness

(Sundqvist) When it comes to funding in Europe, to a large extent there is a dependence on tuition fees and donations. In Europe, particularly in a country like Sweden, there is a long tradition that research should be paid by the state – public funding – and developmental work is paid for by industry. This means that in Sweden, if you start fund-raising efforts, industry doesn't really like to listen to us because they say this is the responsibility of the government. In a small country like Sweden, it's a very difficult problem. We have noticed in recent years, that many of our major companies have moved their headquarters and a large part of their research to other countries. Of course, we think that for Europe and a country like Sweden, the only way to compete and increase our ability to compete is to invest more by the state to make us attractive, particularly for our own companies to stay in Sweden. If Europe is going to compete with the United States, Japan, China, I think Europe must create a higher quality of research – for example to make our own industries in Europe invest more in Europe.

(Sasaki) It's the same situation in Japan too.

(Sundqvist) As far as I know, I don't think this situation applies to Japan.

(Sasaki) So far, Japanese companies have not been very generous toward us. They try to invest more money in the growing market or the academic institution that can improve their image in global-market. For most of the big Japanese companies, they moved from the national point of view toward a more company-oriented, company interest-oriented point of view. At the same time we do not have a good tradition of personal donations. How about the contribution of the alumni in the case of Uppsala University as a driving force for providing a source of income?

(Sundqvist) I think we are slowly starting to work wih our alumni. We are now investing efforts and money into building up an alumni system.

(Sasaki) Our government budget is in the red. Still, they are trying to increase their investment in science and technology. This is the only good news for us. At the same time the so-called knowledge-based society is a very common word.

(Sundqvist) That's true.

(Sasaki) So this is one of the items I would like to stress in the report for the future of higher education. On the one hand the government will try to invest in science and technology as well as to – this is a very important from my point – respect the professional skill of people who studied in graduate schools, for example, and especially professional schools. In both these areas, I think the Japanese government in recent years has had a more serious interest, but, so far, not serious enough. They try to invest money in science and technology, but they have no serious interest in the quality of professional personalities. But our society is slowly moving toward being a so-called "knowledge-based society," one example being the establishment of the new law school.

(Sundqvist) Politicians don't understand the necessity of long-term investments, the fact that if you invest in research it's another decade before you really get to see the result and a possible economic return. Also in terms of education – this is, I think, in Sweden and Europe – they worry mainly about the next three or four years while we talk about the necessity to invest for the next 10 years.

(Sasaki) I think for politicians, especially, it's quite easy for them to speak for more investment in research, especially in science and technology, because this is a key factor for economic laws, but I think they are not very conscious of the importance of education and investment in education. I think it is critical to invest in education, because this is the human base for future research. If the government only invests more money in research, for the time being, then a worst-case scenario will be moving the money for education to research, which would mean throwing out the infrastructure of the knowledge-based society. That's one of the issues we are discussing in Japan.

(Sundqvist) I think in the case of a small country like Sweden one of the issues is to make sure we have a population that is very well educated to be able to compete with others. Anyhow, we contribute with one percent of the whole production of knowledge. We have to make sure that people are well educated to make sure they can make use of the knowledge production from the rest of the world. In Sweden, I find it very hard to make politicians responsive to such long-term investment. But we have to start here.

On August 23, 2004 at Uppsala University

UT Forum 2004 in Sweden

The University of Tokyo has established a program for holding international forums in major cities overseas for the purpose of disseminating the university's academic research abroad. The first of these forums, covering the field of science and engineering, was held in January 2000 at the Massachusetts Institute of Technology in Boston. This was followed by a forum in the fields of life science and biomedical research at Stanford University in Silicon Valley in December 2000 and another on the theme of "Communities and Contexts of Nature" at the National University of Singapore in November 2002.

It was only natural, since the forum had already traveled to the eastern and western US and to Asia, that the fourth forum be held in Europe. In light of a visit by the University of Tokyo president to Sweden in 2000, and a visit by 15 presidents from universities in Sweden to the University of Tokyo in 2003, it seemed only fitting that Sweden be chosen for the venue of the fourth forum.

This forum was unique from its predecessors in that it was held concurrently in four locations. Four forums, each in different fields, were held at four different universities. Environment was covered at Stockholm University, medical and life sciences at the Karolinska Institute, economics and management at the Stockholm School of Economics, and basic science at Uppsala University. The event also featured pre-symposium workshops, student sessions, informal meetings for participants, an informal meeting between the four Swedish university presidents and the delegation from the University of Tokyo, and interviews with prominent researchers from the three universities to appear in Tansei. The university president and two executive vice-presidents gave remarks and interviews at the opening and closing ceremonies, and were generally kept busy running around with their staff

The forum's success was due in large part to its venue, an academically progressive nation with a cluster of top-ranking universities within easy access of one another, as well as to the warm reception with which our Swedish hosts, including the embassy, welcomed the University of Tokyo delegation. However, none of this would have been possible without the enthusiastic efforts of the planning committee. I hope that UT Forums, each with its own vision, will continue to serve as part of the university's strategy in the future. In honor of the establishment of the Liaison Office in Beijing, the next forum is scheduled to be held in Beijing in 2005.

Finally, I'd like to make special mention of the level of dependability I witnessed in the students that accompanied the delegation. My impression of them was only confirmed by the fourth forum. They were both better speakers of English and better able to remain open-minded and flexible than the students of my generation. As I watch our young people grow in confidence and develop more fully day by day, I am convinced that the investment we are making in the next generation is going to prove very worthwhile.

Hiroshi KOMIYAMA, Chair of the UT Forum Steering Committee

Environment Session (Stockholm University)

Global Sustainability and the Human Environment

Kazuhiko TAKEUCHI
Professor, Graduate School of Agricultural and Life Sciences

Purpose of the UT Forum

The Environment Session of the UT Forum was held on August 24, 2004, in the Geo-Science Building at Stockholm University under the theme "Global Sustainability and the Human Environment." In this session, the impact of human activities on the climate and global ecosystems was assessed, and techniques to mitigate the environmental loads were proposed. Also, corrective measures evolving from the latest research aimed at regenerating a rich environment for humanity were discussed.

Stockholm University is one of the most prestigious universities in the world in the field of environmental studies. Its history extends back to the time of S. A. Arrhenius, a chemist in the 19th century who predicted that human activity would result in global warming. Stockholm University and the University of Tokyo (UT) had previously co-hosted the "Stockholm-Tokyo University Symposium on Global Environmental Challenges" in Stockholm in June 1997, and the hospitality extended to us this time was similar to that in 1997. We were warmly received, and a reception was arranged for us at the City Hall, well-known as the annual banquet site for the Nobel Prize laureates.

Researchers from the Royal Institute of Technology (KTH), the Swedish University of Agricultural Sciences (SLU), and Chalmers University of Technology, famous for their valuable contributions to environmental sciences, were invited to make presentations at this year's UT Forum. Five researchers from Sweden and five from Japan gave speeches, and there was a presentation on the activities of the Stockholm Environment Institute (SEI), an environmental NGO. The moderators were Professor Kazuhiko Takeuchi, Director of the Asian Natural Environmental Science Center, UT, and Professor Henning Rodhe, Dean of the Faculty of Science, Stockholm University.

Presentations

Following the opening speech by Executive Vice-President Hiroshi Komiyama, there were two sessions in the morning and three in the afternoon.

In the first session on "Global Climate Change," Professor Akimasa Sumi (Center for Climate System Research) reported on the most recent global warming forecasts from a highly accurate climate model using a global simulator. Professor Erland Källén (Stockholm University) spoke on the effects of global warming in the polar regions which has become a serious problem, and explained the importance of studying climate change in these areas of the world.

In the second session on "Global Change and the Response of Ecosystems," Professor Katsumi Tsukamoto (Ocean Research Institute) elaborated on the attempts to understand eel migration in the Pacific Ocean and the effects of global warming on such migration. Professor Carl Folke (Stockholm University) argued that man-made environmental changes have made the ecosystems weak and susceptible to damage. He stressed the importance of adaptive management and resilient control to prevent ecosystems from deteriorating.

In the third session on "Water Environment in Urban Areas," Professor Shinichiro Ohgaki (Graduate School of Engineering) reported on the current status of an advanced system for water reuse and water environment restoration in Tokyo. He also introduced an innovative method, using molecular biotechnology, to assess water quality. Professor Gunnel Dalhammar (KTH) said that a small-scale dispersion water treatment system utilizing a biological process will be effective in improving water circulation and treatment in Swedish urban areas.

In the fourth session on "Architecture and Human Environment," Professor Hiroshi Naito (Graduate School of Engineering) spoke about Japanese wooden buildings and traditional architectural methods that require sophisticated joining skills. He emphasized the importance of "wood," which can be used to incorporate nature and culture into architecture. Professor Michael Edén (Chalmers University of Technology) argued in favor of the need to reexamine the concepts behind architecture and develop corroborative measures to achieve a common understanding of "sustainable architecture."

Professor Ryoichi Yamamoto (Institute of Industrial Science) and Professor Bengt Kriström (SLU) gave the last set of presentations in the fifth session on "Green Production and a Sustainable Society." Professor Yamamoto argued that eco-material should be developed to improve resource productivity and to enhance environmental efficiency substantially. Professor Kriström described the multilateral functions of Swedish forests and noted the importance of an index that can contribute to the enhancement of sustainable welfare.

The day-long session was concluded by the closing speeches delivered by Professor Takeshi Sasaki, President of UT, and Professor Kåre Bremer, Vice-Chancellor of the Stockholm University.

Opinion Exchange Meeting at the Royal Institute of Technology (KTH)

On August 25, UT participants belonging to the engineering sciences

visited the Royal Institute of Technology (KTH) and participated in a meeting held for discussion and opinion exchange on issues related to environmental technology. Six professors from KTH attended this meeting, and the participants had very fruitful discussions.

KTH members described their current research projects and educational efforts in the field of environment and related areas. One of the more notable efforts was the integration of academic fields into a newly established “Center for Environmental Science,” which serves as a cross-departmental research organization. In terms of new educational undertakings, they have established a master’s program called “International Sustainability” to implement education on an international level. Both approaches are similar to those being followed in the field of engineering at UT.

Events at Swedish University of Agricultural Sciences (SLU)

On August 23, the day prior to the opening of the UT Forum, at the Swedish University of Agricultural Sciences(SLU), Professor Katsumi Aida, Dean of the Graduate School of Agricultural and Life Sciences, UT, and Professor Ann-Christin Bylund, President of SLU, signed an Academic Exchange Agreement in the presence of Professor Takeshi Sasaki, President of UT. Both parties agreed to promote research and student exchange activities mainly in the field of wood biomass utilization.

On August 25, those engaged in the fields of agriculture and marine science visited SLU and held a seminar on biomass utilization, attended by many SLU professors, staff members and students. This seminar also included discussions on how to organize future exchanges and made the decision to organize a symposium at UT in 2005.

Biomass Utilization Tour in Vaxjo City

UT members who participated in the Environment session of the UT Forum headed for a visit to Vaxjo City on the evening of August 25. Vaxjo is trying to eliminate the use of fossil fuels and is strongly promoting wood biomass energy utilization. Vaxjo Mayor Carl-Olof Bengtsson invited us for an intensive observation tour from August 26 to the morning of August 27.

On the morning of August 26, we were greeted by the mayor’s welcome speech, followed by an overview of environmental efforts to eliminate fossil fuels undertaken by the city, which also included a brief background, history and the current status of biomass utilization. Later, we toured some nearby locations, including a biomass power plant.

In the afternoon, we observed the logging and chipping operations in a forest and were amazed by the highly mechanized operation on flat land. Then we visited heat supply facilities that use wooden chips and pellets to produce heat. The final place we visited was Kosta Boda, famous for its glass products. The performance by the glass blower was excellent. We ended the long day by enjoying traditional local delicacies.

The following morning we visited Vaxjo University and were welcomed by Vice-Chancellor Johan Sterte and others. Vice-Chancellor Sterte had attended the Sweden-Japan University Presidents’ Joint Seminar held at UT in October 2003. He very much hopes to achieve joint research and student exchanges in the field of biomass between Vaxjo University and UT. After this visit, the UT participants headed for Copenhagen and departed for home.

After the reception, we were invited to Stockholm City Hall's Golden Hall.

UT Forum participants. (Seated in front is Vice-Chancellor Kåre Bremer.)

Commemorative photograph at the wood chipping site in Vaxjo City.

Molecular Medicine and Its Recent Advances

Kohei MIYAZONO
Professor, Graduate School of Medicine

The Aim of the UT Forum

Under the theme, "Molecular Medicine and Its Recent Advances," the Medical and Life Sciences Session of the UT forum discussed a wide range of topics that fall under the heading of medical and life sciences. We decided to being concentrate on five topics so that people could hear about the different fields of research being conducted at the University of Tokyo (UT). Consequently, there were many people who only attended the presentations they were interested in. However, the session was meaningful in the sense that many people could learn about our research.

Karolinska Institute is located in northern Stockholm. It has research centers and hospitals, and is the center of Swedish medical and life science research. Even though the institute is located inside the city of Stockholm, its premises are wide, green and quiet. Advanced research is conducted, and many overseas students are enrolled there. This includes many students from Japan, and several Japanese organizations are conducting collaborative research with Karolinska Institute. There are a good number of seminar halls on the institute's grounds, indicating that symposiums are frequently held. Considering that the Nobel Forum was being held at the same time as our symposium, the UT Forum fared relatively well.

In Stockholm

Each member of the medical and life sciences group (five presenters, 14 students and two other university members) arrived in Stockholm on their own. I arrived on August 21. Even in late August, it was already like autumn in Stockholm, and fortunately we were blessed with sunny days during our stay. I lived in Sweden for nearly eight years, but I'd never seen Stockholm so beautiful before. The sky was bright blue, and the blue of the lake was also fantastic.

On August 23, student sessions were held at Karolinska Institute. Our policy was for the students to be self-reliant, and I can see that they spent their time fruitfully.

Five Topics

The forum started on August 24. People start work early in the morning in Sweden, and the forum started as early as 9:00 a.m. The Medical and Life Sciences Session began with opening speeches by President Harriet Wallberg-Henriksson of Karolinska Institute and President Takeshi Sasaki of UT. The first presentations concerned the field of neurophysiology, and Professor Yasushi Miyashita (Graduate School of Medicine) spoke about the cognitive memory mechanism of primates. Professor Zsuzanna Wiesenfeld-Hallin (Karolinska Institute, hereinafter KI) spoke on the genetics of pain. After a break, Professor Takao Shimizu (Graduate School of Medicine) and Professor Jesper Haeggström (KI) both spoke on the "Molecular Biology of Lipid Mediator." This was followed by Professor Kiyoshi Takatsu (Institute of Medical Science) and Professor Catharina Svanborg (Lund University) who concentrated on "Immunology." Professor Takatsu talked about the molecular mechanism for generation of B-lymphocytes, while Professor Svanborg focused on a new type of protein that kills cancer cells. Because we took long breaks and did not allow the clock to dictate our discussions, the schedule was constantly being pushed back. Even so, some attendants continued active discussions after the session.

One of the student sessions (poster)

A group discussion during one of the student sessions

Professor Takao Shimizu during his presentation

In the afternoon, Professors Shigeaki Kato (Institute of Molecular and Cellular Biosciences) and Professor Jan-Åke Gustafsson (KI) spoke on the "Molecular Biology of Nuclear Receptors." After that, Professor Carl-Henrik Heldin (Uppsala University) and I made presentations on the "Molecular Biology of Growth Factors." Finally, Executive Vice-President Takaaki Kirino of UT made the closing speech. Most people who attended the session for the entire day were impressed, as they had an opportunity to listen to presentations in various fields. I usually do not have many opportunities to listen to my colleagues explain their research, but listening to the various speeches I realized anew that important research work is being carried out at UT. It seemed that many Swedish attendants had a similar impression.

In Uppsala

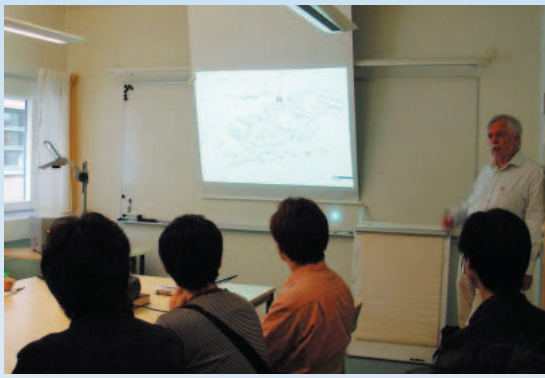
We moved to Uppsala on August 25. Uppsala is about 100km north of Stockholm. This is a student town, and I lived there for eight years. Other speakers and professors had already left for home or headed to other locations. The first contingent to arrive in Uppsala was the students, and Executive Vice-President Kirino and I followed them after finishing our work in Stockholm. The students visited the Biomedical Center and Uppsala University Hospital. The weather changed quickly, and they met with occasional showers, as often happens in Sweden. However more than anything, I was really surprised to see how enthusiastic the students were. It may be partly because the English spoken by the Swedish was easy to understand. But still, they asked a lot of questions and earnestly observed the places they visited. UT concluded agreements with Uppsala and Lund universities two years ago, and Uppsala University was very pleased that many UT students visited and were so enthusiastic. I hope new joint research projects will come about through the proposals raised by the students.

In Lund

On August 26, we headed for Lund, our last destination. Students from both UT and Lund University spent the evening eating together, and they seemed to have deepened exchanges. Lund is another college town with a long history, although it is a little smaller than Uppsala. It is located at the southern edge of Sweden, and its culture is closer to that of Denmark than to Sweden. The entire atmosphere and buildings are somewhat different from those of Stockholm or Uppsala, perhaps because it is closer to the European continent. On August 27, we visited the university's Stem Cell Center, where, for more than three hours, we were introduced to the research they are conducting. Their stem cell research was chosen to be part of the Swedish Center of Excellence program, and they are actively approaching their research from various perspectives. Our discussions were very interesting.

Through the UT Forum, I again realized the importance and variety of research studies being conducted at UT, learned much about Swedish research and was overwhelmed by the enthusiasm of the students. It was an impressive week on many levels. There are many types of international exchange activities; however, it is rare that the students of both parties hold joint workshops where they can openly discuss their research. This forum was an experimental project, but the benefit to the students was greater than we expected. This alone, I think, is an indication of the success of the forum.

Uppsala University Hospital's PET Center



A laboratory at the Stem Cell Center, Lund University

Economics and Management Session (Stockholm School of Ec onomics)

Economics and Management -A Statement from Tokyo-

Katsuhito IWAI
Professor, Graduate School of Economics

The Economics and Management Session of the UT Forum took place at the Stockholm School of Economics on August 25.

The Graduate School of Economics of the University of Tokyo (UT) currently has two Centers of Excellence: the Research Center for the Relationship between Market Economy and Non-market Institutions and the Manufacturing Management Research Center. The purpose of this session was to promote these two Center of Excellence Research Programs to Swedish academia. The morning presentations focused on leading-edge research studies in the fields of micro- and macro- economics. The afternoon sessions were dedicated to discussion on the Japanese-style corporate system. The overall theme was “From Evolutionary Game to Japanese Management,” a somewhat broad subject, but our goal was to present the very broadness of the research activities that our graduate school is involved in, from pure mathematical theory to on-site fieldwork.

Executive Vice-President Takaaki Kirino of UT kicked off the morning session with his opening speech. The next speaker was President Lars Bergman of the Stockholm School of Economics, whose welcoming speech efficiently included materials on the history and activities of the university, while using an overhead projector. I was impressed with how skillfully he presented the university, as I often am when listening to representatives of Western universities.

Basically, all universities in Sweden are national, the only exception being the Stockholm School of Economics. Supported by abundant private endowments, this institution is internationally renowned as a highly innovative university. I heard on another occasion that the Stockholm School of Economics is the most difficult university in Sweden, to get into, open only to students who have achieved straight As in high school, or otherwise excel in one particular skill. (I also heard that the second most difficult university to enter is Karolinska Institute, a medical university.) I couldn’t help being envious, thinking about the situation of economics departments in Japan, which have become less and less popular in recent years. I heard that 400 new students attend the freshman orientation at that university during the last week of August, and that shaking hands and speaking with each new student is one of the most important jobs for the president. In order to accomplish this important duty, President Bergman quickly returned to the administration office after his speech.

The program opened with a speech by Professor Michihiro Kandori (Graduate School of Economics) entitled “Decentralized Trade, Random Utility and the Evolution of Social Welfare.” Professor Kandori is known world-wide for developing the new field called evolutionary game theory. Partly because the Stockholm School of Economics has many specialists in evolutionary game theory, the question-and-answer session was very lively even though his speech was highly technical. After a break, Professor Akihiko Matsui (Graduate School of Economics) spoke on “Inductive Game Theory.” Though a world-renowned authority on game theory, Professor Matsui has a broad perspective and is expanding his research into monetary economics and institutional economics. His speech was an ambitious endeavor that proposed the inductive approach as a third possibility, in addition to the conventional deductive approach and the revolutionary approach, in game theory. Following the speech, the foundations of game theory were hotly discussed. After the second break, we moved on to the next subject, which was macroeconomics. Professor Fumio Hayashi (Graduate School of Economics) spoke on “The Depressing Effect of Agriculture Institutions on the Prewar Japanese Economy.” He has been engaged in pioneering works in the fields of macroeconomics and econometrics, and is now taking a step into history. His research paper, written in collaboration with Professor Edward C Prescott of the United States (who became 2004’s Nobel Prize laureate), skillfully uses the growth accounting methodology for

bridging macroeconomics and history. The in-depth discussion period revolved around interpretation of data and consistency with historical phenomena. We then broke for lunch in one of the university dining rooms, with professors and students from both UT and the Stockholm School of Economics joining in on what became a large gathering. Encouraged by the influence of wine, the exchange was more active than we expected. I was delighted to find that the Japanese ambassador to Sweden, Mr. Seiichiro Ohtsuka, had joined us as the UT’s guest of honor. (The Swedish guest of honor was President Lars Bergman.) When Ambassador Ohtsuka, who is well known as “The Singing Ambassador,” started to sing Swedish songs in Swedish, the atmosphere bubbled over.

My presentation, “Corporate Personality Controversy and Comparative Corporate Systems,” was the first one scheduled for the afternoon session. I was honored by the presence of Ambassador Ohtsuka and President Sasaki of UT. This was an unintended consequence of a slip-up, however. President Sasaki was supposed to make a speech before my presentation, but I mistakenly started to talk first, and he had to wait until my speech ended. (Sorry, President Sasaki.) The last speech was by Professor Takahiro Fujimoto, Director of the Manufacturing Management Research Center, UT, on the subject of “Architecture, Capability and Competitiveness of Firms and Industries.” His speech was highly concentrated, bringing together the results of his many years long research, mainly in the Japanese, American and European automobile industries. After a question-and-answer session, Professor Magnus Blomström, who presided over the afternoon meetings, made thoughtful concluding remarks to close this session of the forum.

That evening, professors and graduate students separately held exchange meetings with their counterparts from the Stockholm School of Economics. We were planning to meet later at a disco and cheerfully celebrate the completion of the session. Instead, however, due to rain, we ended our long day by drinking beer rather quietly in a bar next to the disco where no one was dancing.

Our session was held on the last day of the Congress of the European Economic Association in Madrid, and we were worried that only a few people might attend. To our relief, however, and thanks to efforts on the Swedish side, more than 40 people attended the session. We appreciated the support received from the staff of our International Affairs Division, especially the Head Ms. Michiko Tanaka, and Professor Magnus Blomström and his secretaries at the Stockholm School of Economics. Also, while in Sweden, we were helped by staff members of Ippeki in the logistics of the session. During the long period of preparation there were times when we were at a loss, caught between two different cultures — the rather perfectionist environment of UT and the take-things-as-they-come attitude on the Swedish side. In the end, however, our session was completed successfully. I’d like to thank everyone again.

Stockholm School of Economics

Lecture of Professor Hayashi

Discussion between Professor Fujimoto and Professor Blomström

Basic Science Session (Uppsala University)

Exploring the Universe and the Material World through Par ticles

Katsuhiko SATO
Professor, Graduate School of Science

The Basic Science Session of the UT Forum was held at the Ångström Laboratory, Uppsala University. Most of the participants were from Uppsala University, but people from both Stockholm and Lund universities were also among the more than 150 people who attended. This was more than we expected, and so we even ran out of brochures.

Before the presentations, Professor Bo Sundqvist, Vice-Chancellor of Uppsala University, and Professor Takeshi Sasaki, President of the University of Tokyo (UT) opened the session with speeches. Both presidents noted that academic and friendly exchanges between universities in Sweden and UT were developing, and that they hoped those exchanges would be further deepened through this UT Forum. Next, as the former Dean of the Graduate School of Science, I, explained the organizational structure of basic science research and post-graduate education at UT and highlighted our latest research achievements. In my presentation I also included the number of research papers and citations listed in the Thomson ISI Journal to support my assertion that basic science at UT is receiving high marks internationally, with the university being ranked top in physics, third in chemistry and fourth in biology worldwide.

The first presentation was by Professor Yoichiro Suzuki, Director of the Institute for Cosmic Ray Research, who spoke on the subject of “Probing the Extreme Micro World and the Universe by Neutrinos.” Among the physics and astronomy fields boasting of high activity, neutrino research at UT has achieved worldwide distinction as demonstrated when Professor Emeritus Koshiba won the Nobel Prize in 2002. Professor Suzuki explained neutrinos in a simple, clear manner so that even undergraduate students could understand the concept. He spoke about neutrino oscillation, whereby neutrinos with mass can change into a different type of neutrino, and the current status of neutrino astronomy, including neutrinos produced by solar nuclear reactions, which then travel to Earth. Next, I explained the “genesis of universe,” as depicted in physics centering on the unified theories of forces using the theme “Exploring the Early Universe through Particle Physics.” Uppsala University has preserved the Icelandic saga “Edda,” which is internationally famous for its description of the creation of universe. I used the illustrations and dialog regarding the creation of universe described in this saga as the introduction for my presentation. Vice-Chancellor Bo Sundqvist took me to the library where “Edda” is preserved and, even though the reference desk was closed, showed me the original, which is written on parchment. For the field of basic science, we asked two Uppsala University professors to make presentations. Professor Nikolai Piskunov of the Department of Astronomy and Space Physics spoke on “Exploring the Old Universe through Stars,” which skillfully played on the title of my speech. He made a comprehensive report from the perspective of an observer, approaching the early phase of space by observing old stars with a spectrum. A group led by Professor Bengt Gustafsson of Uppsala University has been carrying out notable observations in this field. Actually, when we visited Uppsala University last May to prepare for the forum, we had planned for Professor Gustafsson to be a featured speaker. However, due to his health problems, on very short notice we asked Professor Piskunov, one of the UT Forum organizers, to speak in Professor Gustafsson’s place.

After the morning presentations, Vice-Chancellor Bo Sundqvist organized a luncheon for UT professors. Michelle Mizuno-Wiedner, a student organizer at Uppsala University, also joined us, and we had a nice talk about various topics, ranging from hot research studies at both universities to the different systems the universities use.
The first speaker after the lunch break was Professor Ken’ichi Nomoto (Graduate School of Science), who gave a comprehensive report on a theory concerning the origin of elements involved in supernova explosions titled “Nucleosynthes in Supernova Explosions and the Origin of Elements.” Professor Nomoto has been working in this field for a long time, and his research has been a highly evaluated worldwide. The speech was complemented by Professor Piskunov’s presentation on elements. Next, Professor Hideyuki Sakai (Graduate School of Science) spoke. His topic was “Einstein Was Wrong? – Spin Correlation Experiment for EPR Paradox.” He spoke about the EPR paradox, which once again has become a hotly debated topic worldwide, as the basis of the field of quantum information. Professor Sakai’s group conducted an experiment concerning this paradox and for the first time used atomic nuclei instead of conventional electrons. Their results are close to what was predicted in quantum theory. Attendants, including postgraduate students at Uppsala University, seemed to be impressed with his vigorous speech. Professor Toshiaki Ohta (Graduate School of Science) commented on chemistry and materials physics research using synchrotron radiation under the heading “Synchrotron Light: How Is It Applied to Materials Science?” He introduced a method that examines the structure of magnetic thin film, a method recently developed by his laboratory using spectroscopy, and also its specific applications. His research team applied X-ray absorption spectroscopy to the surface, succeeded in speeding up the measurement process and applied it to surface chemical reaction tracking. Finally, he gave an overview of the VUV high-intensity light source project — the third-generation soft X-ray planned mainly by the Institute for Solid State Physics, UT. Another guest speaker from Uppsala University was Professor Nils Mårtensson. His speech, “New Developments in Synchrotron Radiation Research,” as if to complement Professor Ohta’s, was about the recent progress made in research using synchrotron radiation light, especially a research program planned at Uppsala University. To close the session, Professor Sten Lunell, Associate Dean of the Faculty of Science and Technology, said that he hoped this UT forum would further develop exchanges and collaborative research efforts between UT and Swedish universities.

The following day, Uppsala University hosted the “Sweden-Japan Workshop: Exploring the Universe and the Material World through Particles” at Sigtuna, a resort located between Uppsala and Stockholm, as suggested by Vice-Chancellor Bo Sundqvist. There we listened to presentations by Swedish university researchers and had informal and relaxed discussions. Future exchange meetings and points of cooperation were also proposed.

When I think back about things, it was in the fall of 2002, when I, as the Dean of the Graduate School of Science accompanying President Sasaki during his tour of Swedish universities, first heard the proposal for this UT Forum. Thereafter, I was involved in the preparations. During that time, I came to understand that Swedish universities are keenly interested in UT, and saw that they willingly provided us with considerable help for this UT Forum and the student session. Naturally, we could not have successfully completed the forum without the cooperation of Swedish universities, including Uppsala and Lund. In addition, the dedicated support from the International Affairs Division was essential in making this forum fruitful. Thank you all very much.

Sweden-Japan Workshop at Sigtuna

UT Forum at Uppsala University

Group photo at Lund-Tokyo student Seminar

Executive Vice-Presidents' Interviews

Anders Flodström, President, the Royal Institute of Technology

Interviewer: Hiroshi Komiyama, Executive Vice-President, the University of Tokyo

The influence of the research center and its organizational structure

Flodström: I think the main influence, or the first influence, then, of the structure of a technical university is when you set up the engineering education programs. The electrical engineer of today must have knowledge of management, knowledge of the environment, knowledge of business. So now we are building up our own research environments.

We have today, I think, between 14 and 15 research centers, and these have no departmental boundaries. So it is like a matrix. We have the column – or the department – and research centers. This is the matrix.

Komiyama: The professors, do they belong to departments as well as to centers? What is the organization?

Flodström: The organization is that the center has its own board, with representatives from the university, representatives from governmental agencies and representatives from industry. The reason for the governmental agencies is that in Sweden we have a system where, within certain areas, the responsibility lies with a governmental agency. For example, the road and traffic system in Sweden has its own governmental agency and that agency is also involved in research for progress in this area. And this board has the full responsibility for the budget and for what should be done. Most of the projects are collaboration projects, not only with different disciplines within the university, but also with industrial researchers.

Komiyama: How are the departments and centers related to one another with respect to the professors or students?

Flodström: Almost all the students and professors belong to the center but are also employed at the department. We have some students who are employed by industry who work directly in the center. But there is no one whose only employment is in the center, except for the director of the center. This makes the centers flexible. But, of course, some centers want to become departments or perhaps foundations separate from the university to be able to work effectively.

Komiyama: Could you be more specific about the basic concept of your center?

Flodström: The nano-technology center is very much directed into nano production technology and into nano-biology. I would say that apart from the nano-technology center, we have perhaps five or six other substantial activities within nano-technology. They are all connected in a network. One of the first tasks of the nano-technology center is to be good in nano-technology research within a limited area, and also work as a node for the network. So you can say that the nano-technology center is both a research center, but also kind of a broker.

Komiyama: You mean that each center works as a catalyzer or something for networking? Can you present one or two successful networking examples that have produced some exciting academic fruit or something?

Flodström: For example, if you look at one of the centers within semi-conductors or micro-electronic production, through networking they made contact with the pulp and paper research at KTH. And that resulted in a new research program with an intelligent paper. So, it's been more the opening up of new industrial areas, less scientific success.

Research evaluation and assessment

Komiyama: As for the University of Tokyo, especially now that Japanese national universities have changed their legal status from April 2004, we are receiving many judgments or assessments of our activity in the universities. In your case, when you assess or judge the activities of the research center or assess the research center project, what kind of policy do you have?

Flodström: If you look at the 2 billion euros research budget, 70% of that research budget is coming from

Anders Flodström

Professor Anders Flodström graduated from the Faculty of Engineering of the University of Linkoping, Sweden in 1970, and received his Ph.D. from there in 1975. He became a Professor in material physics in the Faculty of Engineering at KTH, the Royal Institute of Technology in 1985, and served there as the Dean of the Faculty of Engineering from 1988-1991. He was appointed to be the President of KTH, the Royal Institute of Technology in 1999.
He is a former researcher at Xerox Palo Alto Research Center and National Institute of Science and Technology.
He has also been the CEO of the Knowledge Foundation, established by the Swedish Parliament in 1994. He is a former Secretary General of the Swedish Research Council for the Engineering Science and a former President of Linkoping University.

external sources such as the European Union or governmental agencies. Of course these external financiers are very eager to look at the results of the quality of what is performed. So, I think that every center every third year has a major evaluation. It works this way: The center is asked to do a self-evaluation and to support that self-evaluation with statistics, citations, publications and Ph.D. exams.

After the evaluation is done, it is sent in to the external funding agency, and the external funding agency will engage three, four, five researchers. They make a site visit and then make a peer review – sort of looking in a peer review way at the information – and write a report.

Universities are now undergoing changes

Komiyama: I'll move to the education part. So, undergraduate student education is basically based on some classroom education and a kind of mass education. In the graduate school, we have to do one-on-one education, or sometimes advanced highly research oriented education is required. How do you balance these?

Flodström: If you look at KTH, – if you take away the school of architecture, which is very special because they work exclusively with project- and problem-based education – they have no classroom education. But if you look at the other schools, I would say the first 2 or 2 1/2 years is almost exclusively classroom education.
But after 2 1/2 to 3 years, when you get into the master part of education, I would say that perhaps half of the education is in the classroom and the other half is projects. It increases in the last year. I think the trend is more toward project- or problem-based education.

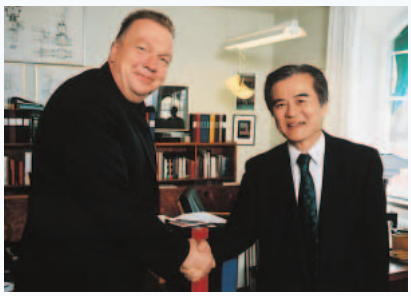
So, since five years ago, we have had a group or activity called the learning lab group – professors, lecturers, students, teachers, administrators, all sorts of people. It can be, on a regular basis, perhaps 35 or 40 people. They are doing new applications or research projects on new learning methods, including IT and including project-based, and so on. This learning lab group is connected in a network with Uppsala, which also has a learning lab, and Karolinska and with Stanford, which also have learning lab activity, and with the technical university in Hanover, Germany.

Komiyama: It is a very interesting story, but it is rather easy, not easy but possible, to discuss how to educate, how to deal with classes. But the question of how to implement is very difficult.

Flodström: It was very hard to get the projects to involve the university even with all the projects that worked on this issue. The last one and a half years there has been a dramatic change for some reason. Because we now have an activity called the One Activity, and in that activity, we have 390 teachers and professors participating. And they work together setting up platforms for using IT for their education, mostly to do better education, but also to organize in a better, new way. I didn't think that would ever happen. I believe the universities are gradually beginning to change.

Komiyama: Thank you very much.

On August 25, 2004 at the Royal Institute of Technology



Hiroshi Komiyama

Professor Hiroshi Komiyama was born in 1944. He graduated from the Faculty of Engineering of the University of Tokyo in 1967 and received his Ph.D. degree from there in 1972. He became a Professor in the Faculty of Engineering in 1988, and filled the office of the Dean of the Graduate School of Engineering from 2000-2002. He was elected the Vice-President of the University of Tokyo in April 2003. He is going to be inaugurated as the twenty-eighth President of the University of Tokyo in April 2005. He is the Chairman of the Solar Generation Evaluation Section Meeting and the Industrial Technology Environment Evaluation Committee, and a member of the Comprehensive Energy Research Committee, the Industrial Technology Council, and the Industrial Technology Planning Committee.

Executive Vice-Presidents' Interviews

Hans Wigzell, Chairman of the Scientific Advisory Board, Karolinska Institute

Interviewer: Takaaki Kirino, Executive Vice-President, the University of Tokyo

University reforms at the Karolinska Institute

Kirino: First of all, I would like to ask you to give an overall or brief description of the Karolinska Institute.

Wigzell: The Karolinska Institute is close to 200 years old. It is, according to the European Union definition, a university, despite the fact that it is only in the medical area. It has 19 different fields of professional education. It may be the largest medical school in the world. It has something like 2,400 MD Ph.D. students, and it is the leading research university in Sweden. Seventy-five percent of the activities at the Karolinska Institute are devoted to research.

Kirino: So, please give me a brief description also of the financial conditions of the Karolinska Institute.

Wigzell: It has a certain endowment given by private donations in the order of about $300 million. The proportion of support from the government to the proportion from society is going down. We have, right now, approximately 10% of the college/institute money coming from industry.

Kirino: What is the percentage of grants coming from abroad?

Wigzell: It is about 10%. And the European Union is maybe about one third of that.

Kirino: I understand that the Karolinska Institute is a leading institute of research in the field of bio-medical sciences in Europe. Who are your competitors?

Wigzell: Cambridge, Oxford, Imperial College for instance have magnificent activities on this. And it is of interest that the Karolinska Institute, Oxford, Cambridge, Leiden and Leuven universities were the founders of the League for European Research Universities. And there are now 12 universities.

Kirino: How are the reforms of university management going in Sweden?

Wigzell: I think that a modern university has to have a mix of management philosophy and collegiality, but Swedish universities have differed. I would say that the Karolinska Institute is now relatively advanced in introducing a proper mix. In 1999 we made very major reforms. Now, a full professor at the Karolinska Institute today has only 11% of his or her salary guaranteed by university-government money. The rest they have to make on their own. In summary, this means that most professors at the Karolinska Institute are now project-hired people in essence. They are kind of functioning like project or group leaders, or by various kinds of activities that accumulate the money.

Kirino: But the introduction of such a competitive system could have produced unstable sentiments among professors.

Wigzell: No, but you have to make very good strategy. I think several other Swedish universities were not up to this competitive feeling or quality, and it would have been very difficult to make this work. We closed down the medical faculty and the dental faculty. And then we made the research faculty, the research education faculty and the basic education faculty and gave them the money for various things. This was also to protect education.

University-Industry Collaboration

Kirino: Let's look at the university and industry collaboration. Please give us an explanation on the historical background, why and when and how you changed the system.

Wigzell: In 1996, in essence, the Karolinska Institute was allowed to put up a high-tech transfer company. At that time the Minister of Industry gave the Karolinska Institute the founding capital of the company,

Takaaki Kirino

Professor Takaaki Kirino was born in 1946. He graduated from the Faculty of Medicine of the University of Tokyo in 1972, and went through medical training at the Department of Neurosurgery of the University Hospital. He studied intensively at the Lab. of Neuropathology and Neuroanatomical Sciences, NIH, USA from 1980-1982. He received his Ph.D. degree at the University of Tokyo in 1982. He became a Professor in the Faculty of Medicine in 1992, and fulfilled the functions of the Dean of the Graduate School of Medicine from 1999-2002. He was designated to be the Vice-President of the University of Tokyo in April 2003.

which was, in essence, something like 600,000 euros, as a single amount of capital. It then said that the Karolinska Institute was not allowed to use its own money to run that tech transfer company. When we made the first agreement with pharmaceutical companies we also made it clear that the scientists should also get certain rights out of that. Now, we have made it in such a way that, something like $5 million each year was announced for scientists at the Karolinska Institute to compete for.

We also created a research committee, I think of very good scientists, to give advice to venture capitalists and financial analysts. And the name of that company is the Carnegie Global Health Care Fund. They now have more than $1 billion in their fund. So, we get a little, little piece of that and also take it to run the tech transfer company. While the money from this advice given goes to the foundation, the foundation buys the shares that we own at the Karolinska tech transfer company.

Kirino: Science is, in a sense, open-minded – it says to publish right away. Intellectual property is a closed system – it requies not being published. For me it seems to be a contradictory condition.

Wigzell: Our agreements with industry forbids that anything we do to could not be publishable. The only thing we accept is delay – it could be the passage of four months. We do not allow our scientists to accept grants for research that can't be published.

Kirino: So, you are saying that scientists should be the masters of scientific work?

Wigzell: Absolutely. The university should never accept doing research and not being able to publish – doing military research or anything like that.

A leading university president's view of promising bio-medical science

Kirino: This will be my last question. What is the future direction of bio-medical science? What is the most promising?

Wigzell: Right now, people talk about living in an information society, but we have never been losing so much information as now, because we don't know what to do with it. I was involved in research in the middle of the 1970s related to white blood cells. We wrote two articles. Now there are 25,000 articles. I cannot keep in my mind 25,000 articles. So, assembling information systems of an intelligent kind is a fantastically promising research development. The company that I like the most that comes from the Karolinska Institute is a company where you can selectively train a little piece within the brain of children. The dysfunctional part – it can be like training a muscle – can grow, and they can be normal, happy children. This also will be a promising field.

This interview took place thanks to the good offices of Professor Hiromichi Kimura of the Graduate School of Pharmaceutical Sciences.

On August 25, 2004 at Hilton Stockholm Slussen

Hans Wigzell

Professor Hans Wigzell was the Principal of Karolinska Institute from 1995-2003. He graduated from the Karolinska Institute as a Physician (MD). He became a Professor of Uppsala University in 1973, and returned to the Karolinska Institute as a Professor of the Department of Immunology in 1982. In March 1999, he was named Chief Scientific Adviser to the government by Sweden's Prime Minister, which he still is. He was also a member of the Karolinska Nobel Assembly from 1984-2003, and President of the Assembly in 1994. He chaired the Nobel Prize Committee from 1990-1992 as well. He is a member of the Swedish Royal Academy of Sciences, the Royal Swedish Academy of Engineering Sciences, the American Academy of Science, the Danish Academy of Science, and the Finnish Academy of Sciences. He has received numerous awards and published more than 600 articles in peer reviewed international journals.

Teachers in UT

The University of Tokyo has a faculty of approximately 2,800 professors, associate professors, and lecturers, all of whom devote their energies both to world-class research in their particular fields and to providing students with a solid education.

Solitons, integrable models, and knots

– *A unification of solvable models in physics*

Miki WADATI

Shijuhosho (Medal with Purple Ribbon) 2004
Professor, Graduate School of Science

Various fascinating phenomena in nature and everyday life are often caused by nonlinearity, implying that 1 plus 1 simply does not equal 2. The Fourier transformation was introduced in 1811 to solve the diffusion equation, which is a linear partial differential equation. A lack of knowledge regarding the fundamental concept and analytical method prevented the systematic study of nonlinear problems.

In 1965, a nonlinear wave equation referred to as the KdV equation was solved with the use of the computer, and localized waves with particle properties were found. This striking wave was termed as soliton (fig. 1). Subsequently, the inverse scattering method (ISM), considered as a generalization of the Fourier transformation into the nonlinear problem, was invented. The KdV equation, the modified KdV (MKdV) equation, and a hybrid of the KdV and MKdV equations is shown to be soluble by ISM. Further, the relationships among ISM, transformations, and conservation laws have been clarified. These contributed to the establishment of a new concept—solitons. More strictly speaking, the soliton system is shown to be a completely integrable system.

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ISM has been extended to the treatment of quantum systems. For instance, the integrability of the Heisenberg and the Hubbard models, both in 1-dimension, was shown. ISM has also been extended to include statistical models. In particular, the existence of an infinite number of solvable models in 2-dimensional statistical mechanics has been proven. These solvable models are realizations of the universal classes predicted by the conformal field theory, which was being studied in parallel. In this manner, integrable models in classical and quantum mechanics as well as solvable models in statistical mechanics are set on an equal footing. That is, a unification of solvable models is provided in physics.

The soliton theory is associated with rich mathematical structures. Among these, the relationship between solvable models and the knot theory is unexpected. A closed string in 3-dimensional space requires various configurations (referred to as knots in topology). Figure 2 illustrates some examples of knots. The classification of different knots is a fundamental problem in topology; we would like to distinguish whether the knots are different or similar (equivalent). For this purpose, the link polynomial, a topological invariant in the form of polynomial, is used. A general method was established in order to construct the link polynomial from the solvable models. What is remarkable is that all the necessary data required for the link polynomial are supplied by the solvable models. In this manner, physics has resolved a mathematical problem.

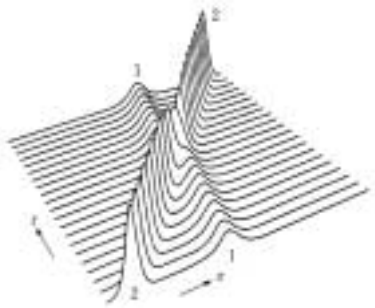


Fig. 1
Collision of two solitons (soliton 1 and soliton 2). Against mutual nonlinear interactions, solitons preserve their individual properties such as velocity and shape.

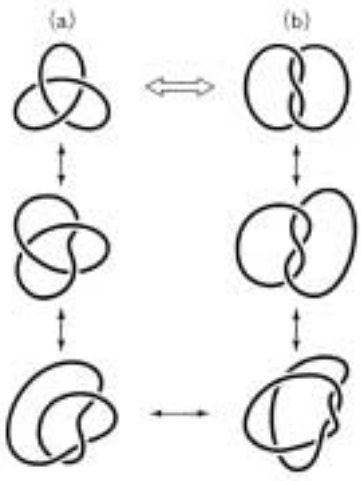


Fig. 2
Knot (a) and knot (b) are equivalent. One can be continuously deformed into the other.

Here we introduce a selection of two UT scholars who received prestigious awards in 2004, and who represent the rich variety and high level of scholarship at this university. Among the awards is the "Shijuhosho" (Medal with Purple Ribbon), given to a scholar who has made a great invention or carried out important research in a field of science or technology.

By introducing these award-winning scholars, we hope to give you a taste of the wonderful research and education being carried out at UT. Of course, there are also many other faculty members engaged in similarly worthy activities.

An Artificial Atom Provides a Glimpse into the World of Quantum Mechanics

Seigo TARUCHA

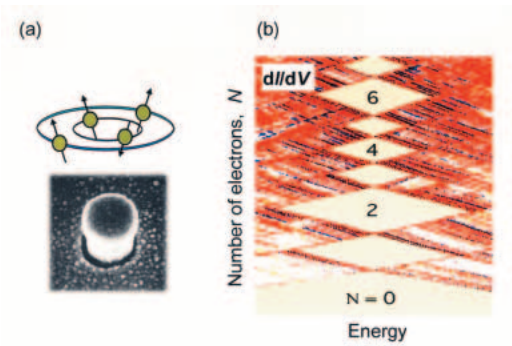
Shijuhosho (Medal with Purple Ribbon) 2004
Professor,Graduate School of Engineering

Since the beginning of the 20th century, materials science has advanced through research on quantum mechanical properties. Recently, the remarkable progress made in semiconductor technology has enabled us to fabricate a tiny substance, leading to an understanding of the presence of a unique world of quantum mechanics. A small semiconductor can be used to prepare correlated electronic system with a tunable number of electrons, starting from zero up to a few hundreds. In such a world, the properties of each individual electron as a quantum play an important role. A typical example of this world is an artificial atom, in which electrons can be arranged in much the same manner as real atoms, and their properties can be freely changed, contrary to those of a real atom.

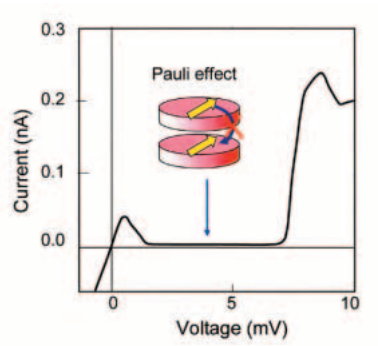
With the expectation that the artificial atom can be used to create a desired quantum system leading to a new world of physics, we seek to demonstrate the fundamental principles of quantum mechanics for materials, conduct a microscopic analysis of electronic system issues, and find applications of our knowledge thus acquired.

The conditions required of the artificial atom are that it have an outstanding symmetry, that the number of electrons, 0, 1, 2, … be adjustable, and that its properties be accurately measurable. We have fabricated a small cylindrical, rotationally symmetric semiconductor in which we have produced a thin disk—an artificial atom. By individually controlling the number of electrons in the disk, we have confirmed that this product follows the same fundamental rules—the shell structure and Hund's rule—as those of the atom. Furthermore, we have built an artificial molecule consisting of two artificial atoms and substantiated the molecular state with an equal number of ionic and covalent bonds and the existence of the Pauli exclusion principle specific to the electronic system. We have also successfully developed an idiosyncratic electronic system that cannot be found in molecules. Moreover, we have successfully reproduced the Kondo effect that is believed to be a typical spin-correlation problem—we have also come across various new examples of the Kondo effect.

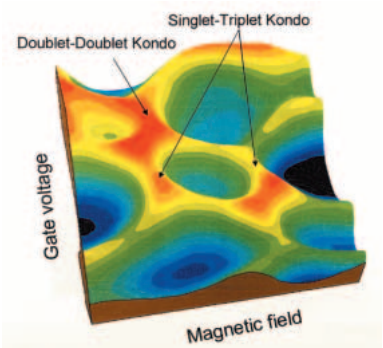
We recently conducted research on "a quantum computer," which is considered to be the ideal technology, using the technique of controlling individual electronic spins in the artificial atom/molecule. This research is an attempt at using the principles of "superposition" and "quantum nonlocality" to acquire a computational capability that no other means can provide. It is the information processing that, for the first time, incorporates the essence of quantum mechanics. Consequently, there are some major problems that are yet to be addressed, both in terms of physics and technology. A possible outcome of this research is that it is expected to become a key touchstone for science in the 21st century.



(a) An Electromicroscopic Image of a Small Cylindrical Semiconductor Containing the Artificial Atom
(b) Changes in the Electroconductive Characteristic due to Changes in the Number of Electrons 0, 1, 2, … The Size of the Diamond Area in the Center Represents the Changes in the Ionizing Energy of the Artificial Atom



The Artificial Atom's Electric Current Suppression Phenomenon as Explained by the Pauli Exclusion Principle



Significant Enhancement in the Kondo Effect by Manipulating the Singlet-Triplet or Doublet-Doublet Degeneracy of the Electronic System (Conductance)

Nanostructure Created by Jostling Electrons and Colossal Response

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Recently, some groups of novel materials have been attracting the attention of materials scientists. We are perplexed as to whether these groups are metals or insulators. Although numerous electrons exist, they barely move.

These are strongly correlated electron materials that create high-temperature superconductivity and colossal magnetoresistance, the phenomenon wherein the electrical resistance drops dramatically on the application of a magnetic field.

"Do you know why a metal glitters and feels cold to touch?" This is the question I ask students at the beginning of my lecture in the Solid State Physics I course at the University of Tokyo Hongo campus. Although this is an elementary-level question, it is nevertheless an important problem that is addressed in rudimentary metal physics. When the students attend my class the next time, they would be aware that "metals contain numerous freely-moving electrons that reflect light and convey heat." On the other hand, we are expected to teach students that insulators, which are materials insulating electricity, contain no moving electrons. In reality, however, the cutting-edge electronic materials of our time harbor a large number of electrons leading to a great difficulty in movement.

Strongly correlated electrons refer to an electronic state, in which numerous electrons in a solid strongly repel each other by the Coulomb force. Accordingly, electrons are beginning to localize at each atom site, and just as ordinary atoms or molecules become a fluid, solid, or crystalline, strongly correlated electrons can assume the form of an electron liquid (a metallic state), an electron crystal (an insulating state), or an electron liquid-crystal. Electrons that are virtually bound or constrained by an atom site characteristically display the attributes of particles. Two of these attributes are spin as a source of magnetism and the internal degree of freedom of orbital representing electron probability distribution. In an electron crystal state, the strongly correlated electrons possessing this orbital degree of freedom are arrayed on a geometrically patterned atom lattice. As a result, they form a varied order state that has a nanoscale periodic structure. (fig. 1)

These electrons are not very firm in structure, and consequently, external stimulation could melt electron crystals alone while the atom-arrayed lattice structure remains intact. Melted electron groups begin to show quantum mechanical fluctuations again. High-temperature superconductivity is believed to be a phenomenon that occurs at the moment when a slight change in the number of electrons on the copper-oxygen two-dimensional lattice causes the group of electrons to change from a localized (crystal or liquid-crystal) state to an itinerant state (metal). On the other hand, as seen in fig. 2, in manganese oxide compounds, an external stimulus such as a magnetic field, an electric field, or light causes the electron crystals to liquefy. This results in the transformation of the electron-crystallized insulators to the electron-melted metal state.

A response that can be acquired by the transformation of electrons from one state to another is both dramatic and colossal, and this response could occur much faster than that in the case of the transformation of a group of atoms or molecules. Thus, an attempt—strongly correlated electronics—to apply this electronic response as a new electronic technology has already been initiated.

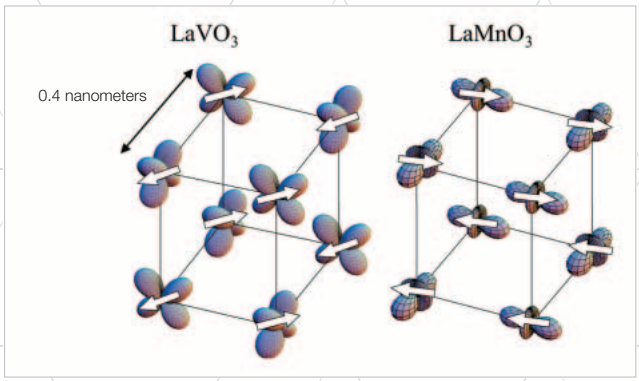

Fig. 1: Spin and Order of Orbital. Examples found in vanadium oxide compounds ($LaVO_3$) and manganese oxide compounds ($LaMnO_3$), both with a perovskite structure. Electrons with two different electron clouds (orbitals) alternately occupy a cubic lattice of atoms (V or Mn) arrayed at a space of 0.4 nanometers, and depending on the pattern of these electrons, an arrangement of spin (arrows) is determined.

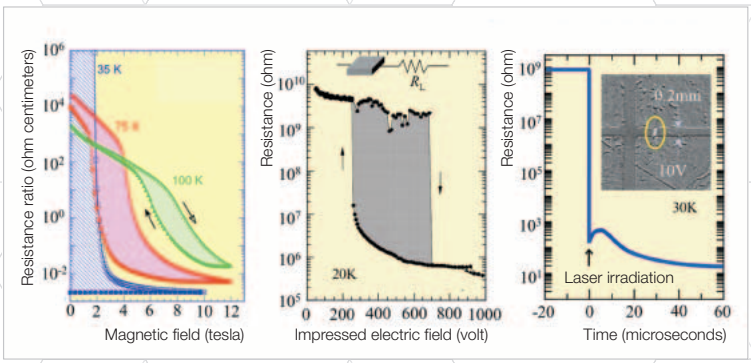

Fig. 2: Examples of electron phase control in manganese compound crystals with a perovskite structure. Crystallized electrons dissolve due to the effect of a magnetic field, an electric field or light, and insulators (high resistance) transform into metals (low resistance). The picture on the extreme right-hand side in this figure shows a white spot indicating the insulator metallized while an electric current flows at the encircled laser beam-exposed position.

A Study of Drug Transporters: Biophylactic Mechanism and Drug Discovery

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I received the AAPS Distinguished Pharmaceutical Scientist Award in 2003. This award is biennially presented by the American Association of Pharmaceutical Scientists to a researcher who has made significant contributions to pharmaceutical sciences. I am the first non-American recipient of this prestigious award.

I specialize in pharmacokinetics, which is the study of the mechanism by which an administered drug is absorbed by the body, distributed in the target tissues, produces a pharmacologic effect, and is metabolized, excreted, and detoxified.

My study is based on quantitative analyses of both the processes of pharmacokinetics and pharmacodynamics. Pharmacokinetics is the study of the process by which a drug is absorbed, reaches the target organ, and is metabolized and excreted from the body. Pharmacodynamics is the study of the process by which drugs bind with receptors and produce a pharmacological effect. I have paid special attention to drug transporters expressed on cell membranes and have been cloning various crucial transporters and analyzing their functions. At the same time, I have been studying the role of these transporters in drug pharmacokinetics (fig. 1).

Biological Significance

This study may help in elucidating the concepts of certain biological processes through an understanding of the biophylactic mechanism. During the long evolutionary process, living creatures are believed to have acquired a defense mechanism against harmful environmental substances and orally consumed xenobiotics. My study aims to shed light on the excretory system that living creatures have acquired as a defense mechanism. This differs from the immune system that functions against a wide variety of xenobiotics, including pharmaceuticals. I have focused on (a) an excretion mechanism through molecular transportation (transporters), (b) an excretion mechanism through molecular transformation (metabolic enzymes), and (c) elucidation and control of the functions of these excretory systems and organs in their absorption, distribution, metabolism, and excretion (ADME). Science is beginning to clarify that proteins, which play a role in eliminating xenobiotics, have some common features, such as diversity, presence of genetic polymorphism, a large difference in species, and broad substrate recognition (fig. 2). This has some analogy to the antibody diversity that appears in the body to fight against various antigens. In the course of our study, we expect to elucidate the mechanism by which xenobiotic eliminators have acquired these common properties and to identify the biological significance of biophylactic mechanisms.

Contribution to Drug Discovery

This study will certainly provide synergetic solutions to some of the challenges that we face in the field of drug discovery, such as improvements in the current testing and study approaches for the development of new drugs and means of avoiding individual differences in drug sensitivity. Specifically, the functions of transporters and metabolic enzymes have been analyzed in an in vitro environment using cDNA expression systems, cells, and tissues. Based on the information derived from this analysis, methodologies to predict drug pharmacokinetics in the human body through computerized calculations have been proposed and established. The proposed approaches are greatly contributing to the "selection of chemical compounds that have favorable pharmacokinetic characteristics" in the development of new drugs.

To date, chemical compounds that show a high affinity to pharmacological receptors in an in vitro setting have been chosen as possible drug candidates. However, most of these drug development projects have been relinquished halfway because of the chemicals' poor pharmacokinetic properties, such as low absorbability and extensive metabolism in the liver. Based on this experience, and in an effort to increase efficiency in the development of pharmaceuticals, the pharmaceutical industry is presently carrying out screening tests on the pharmacokinetic characteristics of drugs in the early stage of development. The system that I have developed suits this purpose.

This system enables us to predict drug-drug interactions that are observed when several drugs are administered. This is the phenomenon in which ADME, efficacy, and expression of adverse reactions of the main drug are affected both by other drugs used concurrently and individual differences in pharmacokinetics stemming from the genetic polymorphisms of genes that code transporters and metabolic enzymes. It is a great boon for drug therapy in the clinical field. I am a representative of the project entitled "The Strategic Approach to Drug Discovery and Development in Pharmaceutical Sciences," undertaken by the Graduate School of Pharmaceutical Sciences, University of Tokyo, under the Ministry of Education, Culture, Sports, Science and Technology's 21st Century COE (Center of Excellence) Program. As my contribution to drug discovery, I intend to maximally utilize this method and other methods. Please visit my laboratory's website at http://www.f.u-tokyo.ac.jp/~sugiyama/. You will be greeted by the logo shown in fig. 3. I hope this article will communicate to you that "molecular pharmacokinetics is a very interesting study that requires comprehensive scientific abilities."

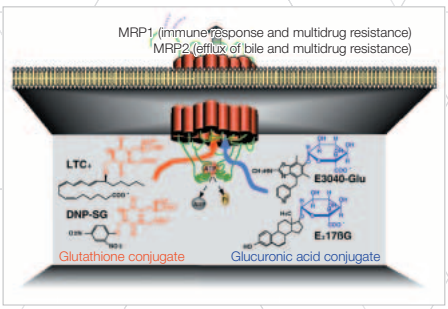


Fig.1:The Process of Excretion of Drugs by Multidrug Resistance-Associated Transporters (MRP1/MRP2). Multidrug-resistant proteins are pumps that efflux variously structured foreign objects from cells in conjunction with ATP hydrolysis. Members of the MRP family include nearly 10 types of isoform proteins that are distributed in various organs and work to detoxify extraneous objects.

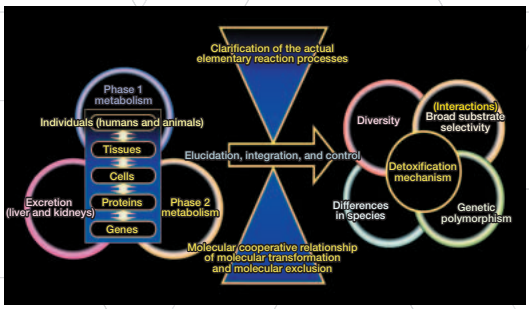


Fig.2:Common Attributes of Foreign Object Excretion Mechanisms (Metabolic Enzymes and Transporters).

Fig.3:My Laboratory s Logo. Based on the results of cellular biology and molecular cytology experiments, mathematical models are used to show the importance of in vivo prediction of pharmacokinetics, efficacy, and adverse reactions of drugs. This logo represents our wish that young researchers will promptly discover how exciting a study is, to the extent that they think about it even while they are dozing off!

News in Brief January to December, 2004

February

7,949 candidates who had already passed a nationwide examination took the first half of the undergraduate entrance examination, but only 2,758 passed.

March

The second half of the undergraduate entrance examination was held. Out of 1,484 candidates, 330 were successful.

The commencement ceremonies for the 2003 academic year were held for 3,416 undergraduate students and 3,818 graduate students. Ms. Mayumi Moriyama, a Diet Member; Professor Xu Zhihong, the President of Peking University; Professor Emeritus Wataru Mori and Professor Emeritus Akito Arima, former Presidents of the University of Tokyo, attended the ceremony as guests of honor and gave congratulatory speeches.

April

Start of the new academic year.

The University of Tokyo became incorporated.

The University's matriculation ceremonies were held for 3,128 undergraduate freshmen, and 3,110 Master's course and 1,531 Doctoral course students in the presence of Professor Emeritus Shigehiko Hasumi and Professor Emeritus Hiroyuki Yoshikawa, former Presidents of the University of Tokyo. Professor Lawrence H. Summers, the President of Harvard University, and Professor Jung-Ho Sonu, the President of Seoul National University, also gave their congratulations in video letters.

Professor Miki Wadati, Professor Yusuke Nakamura and Professor Seigo Tarucha received the Medals with Purple Ribbon from the Emperor's Spring Honor Roll. (Refer to pages 22 and 23)

May

The 77th Students' May Festival was held on the Hongo Campus. About 59,000 people participated.

July

University tours by student guides were launched.

The Imperial couple visited the Kamioka Observatory of the Institute for Cosmic Ray Research (ICRR), and inspected the Super-KamiokaNDE, well-known for its association with the 2002 Nobel Prize laureate in Physics, Professor Emeritus Masatoshi Koshiba.

"Sino-Japanese Sustainable Development : Tianjin Forum" was held in Tianjin, China under the auspices of the Tianjin People's Municipal Government and the University of Tokyo. The University of Tokyo concluded a memorandum about technology and human resource exchanges with the Tianjin People's Municipal Government.

August

The Open Campus 2004 was held, and 1,930 senior high school students took part in this event to have experiences at the university.

Dr. Fayez, the Afghanistan Minister of Higher Education and his entourage visited

the University of Tokyo.

"The University of Tokyo Forum 2004 in Sweden" was held in cooperation with Stockholm University, the Karolinska Institute, the Stockholm School of Economics and Uppsala University. (Refer to page nine)

September 09

Professor Hiroshi Komiyama was elected in a presidential election to become the 28th President of the University of Tokyo from April 2005.

October 10

Career Support Service for International Students has been launched.

The University of Tokyo Foundation, the organization for gathering and accepting contributions, was established.

November 11

Professor Yasushi Miyashita and Professor Motoichi Ohtsu received the Medals with Purple Ribbon from the Emperor's Autumn Honor Roll.

The 3rd Homecoming Day, an alumni meeting, took place. About 2,000 alumni enjoyed a lecture, campus tours by student guides, a concert given by a famous alumna singer, and a football game of university students.

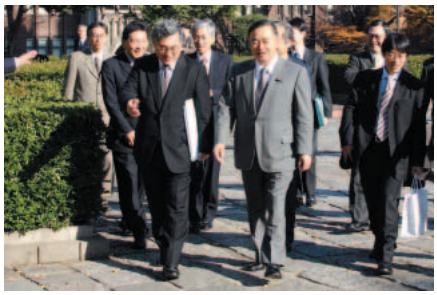
The AGS Technical Meeting was held with 130 people, including participants from foreign universities, companies and students. The Alliance for Global Sustainability (AGS) is a consortium of four of the world's leading universities working to address environmental and sustainability issues.

The AGS Technical Meeting

The 55th Students' Komaba Festival was held on the Komaba Campus.

December 12

Mr. Noriaki Nakayama, the Minister of Education, Culture, Sports, Science and Technology visited the University of Tokyo.



TANSEI Vol. 05

The University of Tokyo Magazine

March, 2005

Cover: Sanshiro Pond

Sanshiro Pond was once a part of the Ikutokuen gardens located within the Kaga feudal load's manor grounds. The formal name of the pond is Ikutokuen Shinji-Ike. In the 1908 novel "Sanshiro," written by Natsume Soseki (1867-1916), the hero Sanshiro encounters his love Mineko by the side of this pond, and so it has been called Sanshiro Pond ever since. You can see this pond on the Hongo Campus.

Photo by Yuji OZEKI

Back cover: The ornamental Gate, Nou-Seimon

Nou-Seimon, the gate to the Faculty of Agriculture, was originally built in 1937 for the Faculty of Agriculture on the occasion of its transter from the Komaba Campus in exchange with the First Higher School, the precursor of the present Graduate School of Airs and Sciences. This restored gate was made of Hinoki, Japanese cypress, in 2003.

Photo by Yuji OZEKI

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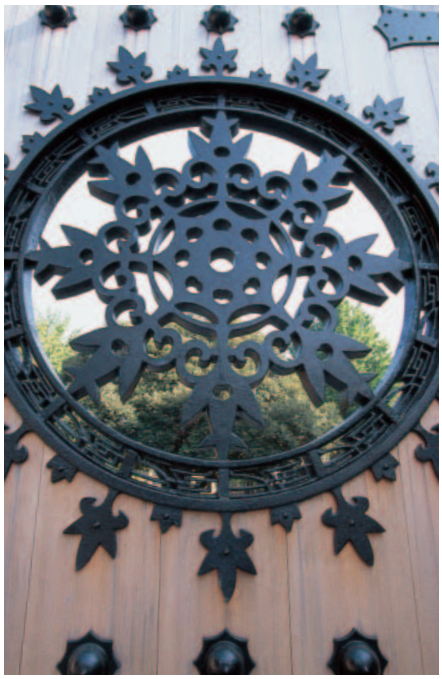

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