# Tohoku University

## Annual Review 2010

## MISSION STATEMENT

Tohoku University has been committed to the "Research First" principle and "Open Door" policy since its foundation, and is internationally recognized for its outstanding standards in education and research. The university contributes to world peace and equity by devoting itself to research useful in solving societal problems, and educating human resources in leadership skills.

## HISTORY

Tohoku University was founded in 1907 as the third Imperial University of Japan, following Tokyo Imperial University and Kyoto Imperial University. From its start, it displayed to the world an unswerving commitment to an "Open Door" policy. Departing from the norms of other imperial universities, it accepted graduates from technical schools and higher normal schools, and despite opposition from the government at that time, became Japan's First University to admit female students in 1913 (admitting three in that year).

At the time of its founding, Tohoku University was able to attract a group of young and brilliant researchers who had trained around the world to serve on its faculty. For this reason, a "Research First" principle was established, calling upon scholars to not only pursue highly productive research but to also put their findings to work in the teaching of their students. In addition to this, Tohoku University has nurtured a tradition of "Practice Oriented Research and Education," in which the results of cutting edge research are being put to use for the good of society and the improvement of living standards. Evidence of our pioneering practice (before the Second World War) includes the establishment of local venture businesses which have contributed to regional industry, and our status as the nation's center for research on family law; the domestic branch of law which is closely associated with our daily lives.

This spirit, which continued strongly through World War II and the rapid economic growth of the postwar period, remains alive and can be seen in today's new era of advanced globalization.


C O N T E N T S



*This Annual Review 2010 covers activities conducted from April 2009 to July 2010.
*Personal information of those who are in this Annual Review including affiliation, position, and age is not current.

# Our Path Toward Becoming a World-Class University

Ever since Tohoku University was established in 1907, our philosophy has always been to put "Research First" while maintaining an "Open-Door" policy in order to emphasize "Practice-Oriented Research and Education." We have conducted research and education at the world's highest level. Tohoku University's Annual Review 2010 describes our remarkable achievements and highlights of the previous year.

Humanity today is facing a variety of difficult and complex challenges which need to be addressed on a global basis. By applying the knowledge we have accumulated over the past century, and by continuing our efforts to achieve innovation in the fields of research and education, our university is determined to play a leading role as a "world-class university" in helping humanity overcome the challenges it faces today.

Tohoku University announced "Inoue Plan 2007" in March 2007, an action plan that consists of five pillars: education, research, social contribution, campus environment, and organization/management.

Three years have now passed since the plan was introduced, and during this period the University continues to make steady progress. In the field of education, for example, we are moving forward with the development of our new proprietary liberal arts curriculum and globalization, including the expansion of the overseas internship program, and the Global 30 Project for Establishing Core Universities for Internationalization. Further, we founded the "International Advanced Research and Education Organization" to raise researchers who will lead sciences in the 21st century with excellent, creative and comprehensive knowledge, and inaugurated the Advanced Institute for Materials Research (WPI-AIMR) following the adoption of the World Premier International Research Center Initiative (WPI). Thus, we have created novel research frontiers that integrate different fields. We are also pursuing a number of highly original strategies: improving our global presence by participation in APRU (Association of Pacific Rim Universities), T.I.M.E. (Top Industrial Managers for Europe) and AEARU (the Association of East Asian Research Universities); developing our campus to meet international standards; introducing a personnel system to improve global competitiveness; establishing the Tohoku University Foundation; and implementing external evaluation by the European University Association (EUA).

2010—Even universities must question their raisond'etre when faced with the tide of sudden changes on the unprecedented scale that we are facing. It is imperative that we clarify the path, carry out our mission and increase further the pace of reform. I believe that by helping all our stakeholders to understand our mission and the various activities carried out at Tohoku University, and by actively seeking the cooperation of a wide variety of peoples, we will become a university that is trusted, respected, and loved by society, and one which is truly capable of serving the needs of humanity.

Akihisa Inoue
President of Tohoku University

## Tohoku University News and Events (April 2009–July 2010)

| 2009 | |
|---|---|
| Apr 3 | "Inoue Plan 2007 (Tohoku University Action Plan, Revised for 2009)" Announced |
| Apr 7 | 2009 Tohoku University Entrance Ceremony |
| Jul 30–31 | Tohoku University Open Campus |
| Sep 25 | Tohoku University Commencement Ceremony |
| Oct 10–11 | Tohoku University Homecoming Day |
| Nov 21–23 | Tohoku University Festival 2009 |
| Dec 31 | Tohoku University Silvester Concert 2009–2010 |

| 2010 | |
|---|---|
| Jan 6 | Unveiling Ceremony of Kawauchi Welfare Facilities Bldg. New Cafeteria |
| Jan 15 | Commemorative Events for Life Sciences Project Research Laboratory Completion |
| Feb 25–26 | 2010 Tohoku University Entrance Examination: First Examination for General Admission |
| Mar 12 | 2010 Tohoku University Entrance Examination: Second Examination for General Admission |
| Mar 25 | Tohoku University Commencement Ceremony |
| Apr 1 | Trial Campus Bus Service Started |
| Apr 2 | "Inoue Plan 2007 (Tohoku University Action Plan, Revised for 2010)" Announced |
| Apr 5 | Opening of "BOOOK" |
| Apr 6 | 2010 Tohoku University Entrance Ceremony |
| May 13 | Completion Ceremony for Fluctuation Free Facility for New Information Industry |
| Jul 27 | Completion Ceremony for Extended Education & Research Building |
| Jul 28–29 | Tohoku University Open Campus |

### Inoue Plan 2007 (Revised for 2010)

This is the latest edition of the Tohoku University Action Plan. It deals with challenges on which President Inoue wants to focus in aiming to be a world-leading university. It consists of the five pillars of education: research, social contribution campus environment, and organization/management. The university periodically reviews the plan according to changes in the university environment and steady progress made on the plan, and updates the contents to keep it on course.


http://www.bureau.tohoku.ac.jp/president/open/plan/Inoue_Plan_2010.pdf

| | | |
|---|---|---|
| 1 | Education | As a "Transmitter of knowledge," we will restructure the system of instruction we use to pass along our store of accumulated wisdom, and as a "Creator of knowledge," we will strive to produce future leaders with a strong liberal arts background, specialized expertise, and an international outlook. |
| 2 | Research | As a "Creator of knowledge" our goal must be to develop original, innovative research structures capable of producing world-class results through strategic, original research as well as through basic research carried out with a long-term perspective. |
| 3 | Contribution to Society | As an institution "open to the community and open to the world," we will contribute to the progress of human society by applying our human and intellectual resources to the community. |
| 4 | The Campus Environment | Establish a world-class campus environment to support the diverse research and educational activities that will need to be carried out by the university in its capacity as a "Creator of knowledge" and as a "Transmitter of knowledge." |
| 5 | Organization/ Management | Establish a management infrastructure with a sound financial base capable of transforming our university into an "Enterprise of knowledge," which can adapt to changes in the environment surrounding the university and better respond to the needs of the times. |

# Fighting infectious diseases through field researches across borders to save the children of the world


## Professor Hitoshi Oshitani

Department of Virology, Graduate School of Medicine


Born in 1959. Ph.D. in medicine and master of public health. Graduated from the School of Medicine, Tohoku University. Trained at the National Sendai Hospital, and dispatched to Zambia as an expert in virology by the Japan International Cooperation Agency (JICA). Was a regional advisor for infectious diseases to the Regional Office for the Western Pacific of WHO from 1999-2005. Has been in his current position since September 2005.

**http://www.virology.med.tohoku.ac.jp/index.html**

Professor Hitoshi Oshitani was at the forefront of the battle against severe acute respiratory syndrome (SARS) in 2003. Having engaged in various researches on rabies, Japanese encephalitis, influenza, etc., Professor Oshitani says that his research is based on field activities. It is most important for him to understand cultures, local characteristics and the living conditions in the field in order to take measures against infectious diseases.

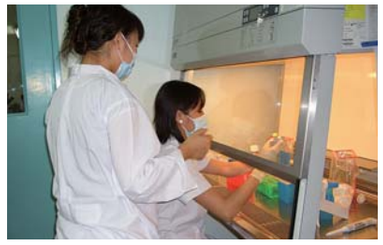
About 8 million children aged less than 5 years die in the world every year, and respiratory infections such as pneumonia account for about 20% of the deaths of children in developing countries.

Professor Oshitani and his colleagues established the Tohoku-RITM Collaborating Research Center for Emerging and Re-emerging Infections Diseases in the Philippines in 2008. As a part of the Japan Initiative for Global Research Network on Infectious Diseases (J-GRID) of the Ministry of Education, Culture, Sports, Science and Technology of Japan, this project is being implemented jointly by the Graduate School of Medicine, Tohoku University, and the Research Institute for Tropical Medicine (RITM) of the Philippines.

The Eastern Visayas Regional Medical Center (EVRMC), a mid-sized government hospital in the Philippines with 250 beds located on Leyte Island, admits more than 800 children with severe pneumonia every year, resulting in 70-80 deaths. The most common cause of pneumonia deaths is respiratory syncytial (RS) virus. It is rare for RS infection to cause death in Japan; however, for financial reasons in developing countries many children infected with this virus do not come to hospitals until the condition becomes deteriorated, which is a main reason for its high mortality rate.

Professor Oshitani and his colleagues have engaged in comprehensive approach to not only identifying etiological pathogens for pneumonia in health care institutions, but also doing field studies on the virus transmission and control measures with the aim of preventing the spread of viral diseases in the community. The system that they have been building will not only be used in the Philippines but applied to many other developing countries to save many children's lives.

A picture of the ward of the Pediatrics Department of the Eastern Visayas Regional Medical Center (EVRMC), conducting research on pneumonia in children. This hospital is located on Leyte Island, which is a one-hour flight from Manila. It is poorly equipped with medical equipment, not even one working respirator in the ICU for children.



At the Research Institute for Tropical Medicine (RITM) in Manila six research projects, including those in respiratory disease viruses such as influenza viruses, and rabies virus are being conducted.

Research work in a community on Leyte Island (the leftmost person is the resident researcher from Tohoku University). Knowing the real local conditions is a great help to establish more effective measures against infectious diseases.

Life on Leyte Island. Epidemiological research on respiratory infections and comprehensive research in identifying risk factors for severe pneumonia have been conducted as a project of the Science and Technology Research Partnership for Sustainable Development since 2010.

**My favorite**

Prof. Oshitani has also been in Mongolia to research infectious diseases. There are research sites in Selenge on the border with Russia and Ulaanbaatar, the capital city. He likes the grandeur of nature, and boundless vistas, in Mongolia. "I am comforted, feeling the spacious atmosphere, just by looking out over the grassland spreading out boundlessly in front of me," says Prof. Oshitani.

# Reconstruction of social sciences from a gender perspective —To end "disadvantage from gender difference"


## Professor Miyoko Tsujimura

Modern Civil Law, General Legal System, School of Law


Born in Tokyo in 1949. Graduated from the doctoral course, School of Law, Hitotsubashi University, and acquired a Ph.D. in Law. Has served on the Science Council of Japan, President of Japan Association of Gender and Law, Director of the Japan Public Law Association, and as a member of committee of specialists, the Council for Gender Equality, Cabinet Office. Currently, Professor, School of Law, Tohoku University, also selected as a Distinguished Professor.

**http://www.law.tohoku.ac.jp/gcoe**

Gender issues have been discussed mainly in the field of sociology. On the other hand, Professor Miyoko Tsujimura has approached issues in the fields of constitutional law, and gender law, and brought to light gender issues in laws that have been ignored. She has addressed, for example, the constitutionality of the provision of the Civil Code that prohibits only women from getting remarried for six months after divorce, and theorethical relation between military service and gender. Thus, she has brought up different viewpoints for gender issues that reside in the Constitution, discussing them from a standpoint of elucidating the theories of human rights.

Professor Tsujimura is currently the Leader of the G-COE Program: Gender Equality and Multicultural Conviviality in the Age of Globalization, presiding over many international symposiums. Her work, "Constitutional Law and Gender," published as a result of the G-COE, was recently awarded a Showa Women's University Prize for Studies of Women's Culture. It was highly regarded for many of its ideas, such as positive actions and a quota system, which could be incorporated into actual policies.

It was her encounter with *La Declaration des droits de la femme et de la citoyenne* (The Declaration of the Rights of Woman and of the Female Citizen) by Olympe de Gouges that guided her to the study of gender and law, when she was studying in Paris during her master's course. As a woman she had a lot of problems in continuing to study law, which was considered a "men's discipline," and was extremely impressed with this work, which clearly says that The Declaration of the Rights of Man and of the Citizen ignores the rights of women. When she returned home, she translated this Declaration for the first time in Japan. It was the starting point of her activities.

"Gender issues in the Constitution should not be addressed as marginal at all, but as a main subject," says Professor Tsujimura, who thinks it necessary to enlighten academic experts in law. She is planning to revise the textbooks on the Constitution and books on comparative constitutional law that she has so far published, and to publish "The Possibilities of Gender Research and Social Sciences" series, co-edited with Professor Mari Osawa, Ph.D. in economics.

Professor Tsujimura has produced brilliant achievements including her book titled "The Constitutional Principles of the French Revolution" awarded Le Prix Shibusawa Claudel 1990. "I am not in the field of gender because I am a woman, but I persist in looking into it from the perspective of a scholar in constitutional law," she says.

A G-COE International Seminar titled "Gender Equality in Multicultural Societies: Gender, Diversity and Conviviality in the Age of Globalization" was held in August 3 and 4, 2009. Professor Frances Olsen and Professor Chizuko Ueno were invited, there were lively discussions.

Her fields of study are broadly divided into 4 groups, "constitutional law," "comparative constitutional law," "French Constitution," and "gender and law." She is vigorously working on 17 books in many areas.

The second Showa Women's University Prizes for Studies of Women's Culture for "Constitutional Law and Gender – Prospects for Gender Equality and Multicultural Conviviality," was published in 2009. The ceremony for the prize was held on May 25 2010.

**My favorite**

Olympe de Gouges gave great influence to Prof. Tsujimura. The Place Olympe de Gouges in the 3rd arrondissement of Paris was named after her in 2004. Prof. Tsujimura often travels to Paris because she has studied the French Constitution. She always visits this place, where she reminds herself of the starting point for her study of gender and law and to reaffirm her resolve.

# Policy issues on the social dimension of engineering and technologies

Professor Yuko Harayama

Chair of Management of Technology, Technology Policy,
Department of Management Science & Technology, Graduate School of Engineering

Born in Tokyo in 1951. Received her Ph.D in Education Science and a Ph.D in Economics, both from the University of Geneva. Worked as Assistant Professor in the Faculty of Economics and Social Sciences, University of Geneva, and then as a fellow at the Research Institute of Economy, Trade & Industry of the Ministry of Economy, Trade and Industry. Professor, Graduate School of Engineering, Tohoku University since April 2002. Also served as a member of the Council for Science and Technology Policy, Cabinet Office.

**http://www.most.tohoku.ac.jp/~policy/**

Professor Yuko Harayama is responsible for the chair of Technology Policy. Her teaching and research cover policy issues on science and technology, technology management, innovation, and regional clusters.

Professor Harayama's research focuses on technology policies, considering them as an interface between technologies and society, examining their economic effects and social contribution, and makes a systematic analysis of various related problems in modern society. Furthermore, it explores ideas and methods for producing solutions to them from a scientific point of view.

Professor Harayama points out the necessity of the science of science, technology, and innovation policy (Sci SIP). "What effects will science and technology policies decided by the government produce? Will they be really useful in society? If they do not produce the expected effects, what should be done to correct the results? It is essential for scientists to propose policies based on data and analysis, taking a step forward beyond armchair discussion," she says. It is necessary to examine the outcome of, and issues in, policies, always in the pursuit of social values of such policies.

This is why, it is important to develop engineers and researchers who are able to not only develop new technologies but also take into consideration the effects on society and environment in designing and operating social systems. It is essential to look at things not only from a perspective of one's own field but also to keep in mind a multi-disciplinary approach.

Professor Harayama thinks that it is extremely important to find and nurture torchbearers in the next generation to lead science and technology policies in the best direction. "We are now making arrangements to discover such torchbearers. We have set up some small networks across university and field boundaries, in cooperation with business enterprises," she says.

Panel discussion in the GIS symposium (Mr. Evans to the right and Mr. Touffut to the left)

Prof. Harayama exchanging greetings with the Deputy Secretary General before the OECD workshop (hosted in Japan with her as chairperson).

Planned and organized a workshop to consider how to deal with an aging society with the Deputy Mayor (on the right) of Oulu City, Finland. (Prof. Harayama was a Japanese counterpart in the planning.)

Opening of "Summer Session for the Next Generation"

**My favorite**

Prof. Harayama finds pleasure in visiting art galleries and museums. She enjoys new discoveries there. She says, "It is the time when I am facing an artist through his or her art works that I feel most composed." The picture is an art work by Yuzo Saeki at the entrance of an apartment house in Paris. She discovered that it was the entrance of the apartment owned by a person who had taken care of her like her parent when she was in Paris for the first time. She was extremely moved by it.



# The effect of a blood-flow shear stress on vascular endothelial cells may be a key to elucidating the mechanism of atherogenesis

Professor Masaaki Sato

Tissue Biomechanics, Department of Biomedical Engineering, Graduate School of Biomedical Engineering

Born in 1949. Acquired a Ph.D. in the doctoral course, M. Sc. Mechanical Engineering, Graduate School of Engineering, Kyoto University, in 1976. Worked with Nikkiso Co., Ltd. Worked as a researcher at the Department of Mechanical Engineering, University of Houston. Assumed the position of Assistant Professor at University of Tsukuba. Has been Professor at the Faculty of Engineering, Tohoku University since 1992. Appointed as Professor at the Graduate School of Engineering, and then, as Associate Dean at the same Graduate School. Appointed as Visiting Professor at the Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama University. Has been in his current position as the Dean of the Graduate School of Biomedical Engineering since 2008. Ph.D. in engineering. Served as the Leader of the 21st Century COE Program of Future Medical Engineering Based on Bio-Nanotechnology for 2002–2007.

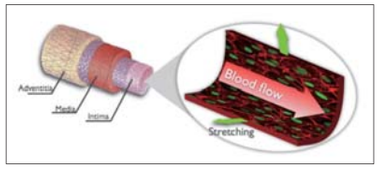
**http://www.biomech.mech.tohoku.ac.jp/satolab/**

Cutting-edge medical examination technology can hardly identify "what part of the artery has what degree of atherosclerosis." Professor Masaaki Sato and his colleagues are now performing research that may elucidate the mechanism of atherosclerosis, with the possibility of greatly improving its treatment and examination methods.

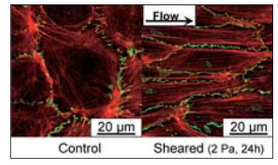
One of the research subjects on which Professor Sato, *et al.*, are working is the workings of endothelial cells that cover the internal walls of a blood vessel. These endothelial cells have a unique sensor that senses the force of flowing blood rubbing the vessel wall, i.e., shear stress. They vary in their form and functions according to the shear stress, which expands or shrinks the blood vessel, which in turn controls the blood flow and pressure. The mechanism by which this occurs is still a mystery. Professor Sato, *et al.,* are working on how endothelial cells change their shapes according to the magnitude of shear stress, where the sensor of these cells that sense the force is located in the cell, how that sensor functions, and on a quantitative basis to elucidate their working mechanism.

Actually, this deformation of endothelial cells is related to atherosclerosis. The theory is that endothelial cells normally cover the internal walls without gaps, but there can be gaps in regions where the shear stress is low because such cells bind to one another weakly there, and LDL enters into the gaps. If this mechanism is elucidated, it may lead to not only preventing and treating atherosclerosis but also the possibility of in-blood monitoring and the identification of parts with atherosclerosis. In addition, their research is also expected to make a return contribution to the field of engineering and also robotics.

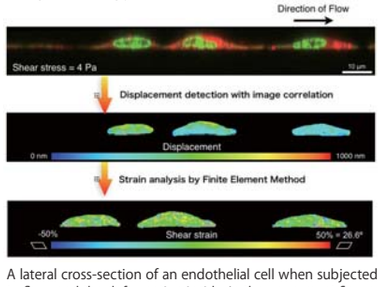
The subject of "the effect of a blood-flow shear stress on the shapes and functions of vascular endothelial cells" is being researched by Prof. Sato, Assistant Prof. Sakamoto, and two students in the doctoral course. They are engaged in a quantitative exploration of a world measurable in nanometers.




Endothelial cells that reside in the innermost layer of blood vessel walls are always exposed to forces (shear stress) due to the blood flow and the deformation of the walls.




When force is applied via flow to a cultured endothelial cell, the cell changes its shape from a polygon on the left figure to a spindle shape on the right figure to adapt to the dynamic environment. The cytoskeletal structure (red) inside it changes accordingly.




A lateral cross-section of an endothelial cell when subjected to flow, and the deformation inside. In the uppermost figure, green indicates the nucleus, and red cytoplasm. In the middle and lowermost figures, no boundaries of the nucleus are observed, which means that both the nucleus and cytoplasm are deformed almost to the same degree.

**My favorite**

Although Prof. Sato now uses a personal computer to create materials and papers, he still writes with a fountain pen in the process of organizing his thoughts. The first fountain pen he used was a Montblanc that he bought more than 30 years ago. His collection consists of about ten fountain pens contained in a dedicated case.

# Elucidating the culture of human beings in the Ice Age from stone tools, products of the oldest manual technique


## Professor Kaoru Akoshima

Archaeology, Japanese History, Historical Studies, Graduate School of Arts and Letters

Born in Shiroishi City in 1955. Graduated from the doctoral course of the Department of Anthropology, University of New Mexico. Studied archaeology and prehistoric studies. Has been researching the use of stone tools, etc., mainly in the Paleolithic Age, and comparative cultures in archaeology. Appointed as Assistant and then Assistant Professor at the Faculty of Arts and Letters, Tohoku University before assuming current position.

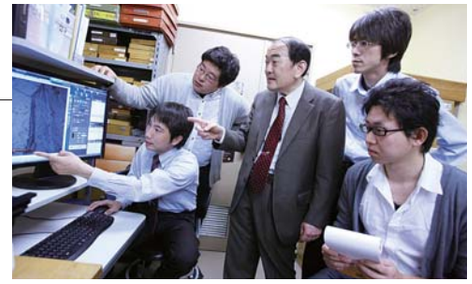
**http://www.sal.tohoku.ac.jp/archa/home.htm**


Two million years ago, in the Paleolithic Age, humankind had a technique for making stone tools, long before it was able to keep fire. One of Professor Akoshima's research subjects is use-wear marks on stone tools made by striking stone or taking flakes off stone, which elucidate human activities and cultures in daily lives in that era.

The analysis of stone tools includes observing very small traces (or use-wear marks) left on stone tools through a microscope and comparing them with those made in reproduction experiments to study how they were made. Stone tools left in the natural environment are compared with reproduced stone tools that were used to work animal bone or leather, or just flawed. The way a very small chip was made on a stone tool may be of great importance in reconstructing the ancient world. It is a wonder that there are identical use-wear marks on stone tools that have been excavated in countries that have had little historical relationship. It seems that stone tools with the same function look similar regardless of differences in age and place.

This "archaeology as anthropology" pursued by Professor Akoshima is based on the theory of Lewis Binford, the founder of processual archaeology. It is not only intended to reveal the history of the researcher's own country but emphasizes comparative studies as a part of the study of humankind. It aims to reveal how human groups in the same historical background and environment adapted to environmental changes, discover their universal experiences, and study them from a global perspective. This is the field that Tohoku University began to explore in the 1980s, earlier than any other. Use-wear analysis on stone tools is considered a way of comparing cultural remains on a global scale. A goal of this analysis is to join archaeology with anthropology for new development.

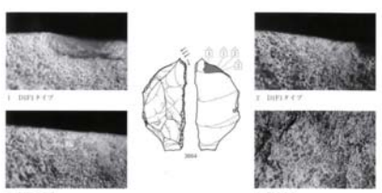
This work is like re-experiencing the memory of humankind of the far distant past. Archaeology is a long-range study that is synchronized with a remote past beyond time and space. Professor Akoshima says that hands-on and field-oriented approaches are important. They are also looking at the problem of reliably passing on archaeology to future generations in the form of theoretical anthropology.



Professor Akoshima leads the use-wear mark research team of Tohoku University. They inherited a tradition of empirical studies from Professor Chosuke Serizawa who performed great work as a leader in the study of Paleolithic tools in Japan.

They observe use-wear marks on stone tools through a digital microscope, a laser microscope and/or a metallurgical microscope, and compare them with reproduced stone tools. Modern archaeological means do not miss even extremely small marks such as micro flaking, linear marks and wear gloss. In the field of use-wear marks on stone tools, the laboratories of Tohoku University have led the world since the 1980s. Methods used and developed by Tohoku University are now used as standard methods not only in Japan but also in other Asian countries.


Drawers where materials for comparison from 600–700 cases are organized. Only a few academic institutions have materials for experimental comparison under set conditions. Important archaeological materials are also stored at the university.



Use-wear polish on a stone tool called a "Chokokuto (burin)" (Excavated from the Araya site in Niigata Prefecture, Upper Paleolithic Age). It has marks showing that it was used to make tools from animal bones or deer antlers, or process animal leather.

**My favorite**

Shale and obsidian (volcanic glass), are the main materials of excavated artifacts from ruins in the Tohoku region. Leather is a cushion material on which a stone tool is pressed in processing it. It is elastic and protective against injury. Tools for experimentally making stone tools include a flaking tool made of a deer antler, and a stone hammer, used to strike and break stone. Prof. Akoshima demonstrated how to make a reproduced stone tool.



# Mysterious plants that do not travel but stay put A world's first! Supports Darwin's hypothetical theory published in *Nature*


## Professor Masao Watanabe

Laboratory of Plant Reproductive Genetics, Division of Genetic Ecology, Department of Environmental Life Sciences, Graduate School of Life Sciences

Born in Ehime Prefecture in 1965. Graduated from the Department of Agronomy, Faculty of Agriculture, Tohoku University. Completed the first half of the doctoral course of the Division of Agricultural Sciences, Graduate School of Agricultural Science, Tohoku University. Acquired a Ph.D. in Agricultural Studies. Assumed positions of Assistant Professor at the Faculty of Agriculture, Tohoku University, then Associate Professor at the Faculty of Agriculture, Iwate University, then invited Professor for a 21st Century COE Program at Iwate University. Has been in current position since 2005.

**http://www.ige.tohoku.ac.jp/prg/watanabe/**

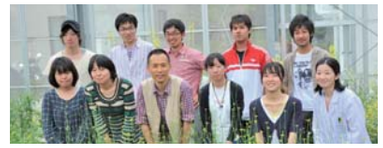

Plants do not speak, nor can they travel freely. However, they have their own ways of taking in outside information. In 1876, Charles Darwin, who put forward the theory of evolution, proposed the hypothetical theory that self-fertilization, i.e. being pollinated with their own pollen, was advantageous for plants in an environment with few breeding partners. This spring, research results that support this hypothetical theory were published in *"Nature."*

For many plants, if the stigma surface is pollinated with the plant's own pollen, this pollen is rejected, and as a result no seeds will be produced. This is because plants have the ability to distinguish their own pollen from other plants' pollen, i.e., self-incompatibility (SI). This trait is to prevent inbreeding depression, which is observed in most of animals and plants, including human being. On the other hand, there are self-compatible (self-fertilized) plants, like rice and *Brassica* plants. Why do these plants accept their own pollen? Professor Masao Watanabe and his collaborators elucidated the molecular mechanism of the evolution of SI.

*Arabidopsis thaliana*, known as a model plant, is self-compatible. Professor Watanabe, *et al.,* surveyed several ecotypes of *A. thaliana,* and found one ecotype (Wei-1) having functional *SRK* (female *S* determinant) and non-functional *SP11* (male *S* determinant). After modifying and repairing the non-functional *SP11*, the repaired (functional) *SP11* was introduced into Wei-1 ecotype. The transgenic *A. thaliana* showed the SI phenotype. This is the first case of success in artificial SI in *A. thaliana* using modified gene introduction in the world. Since Darwin, researchers have discovered how finely plants have adapted to various environments in wonderfully sophisticated ways. The data from Professor Watanabe's group is the first case of demonstration of the evolutionary process at the gene level.

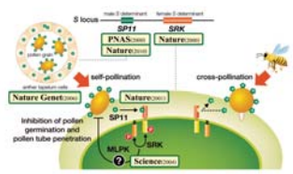
Professor Watanabe has also done outreach activities at elementary and junior/senior high schools more than 100 times. In the future, he is looking forward to doing research with children. His ideas and ambition will be passed on to the next generation in this way. "A whole understanding of the molecular mechanism of plant activities should elucidate the problems of environments, food, and energy," says Professor Watanabe.

*Brassica* plants are used as research material. It is important for human beings to understand the fertilization of plants, because they eat their seeds/fruits. If climate change is drastic in the future, plants may evolve by changing their genes. The mystery posed by Darwin is still left unsolved.



Members of Prof. Watanabe's laboratory. They do cross-breeding experiments of rapeseed plants at the green house. They cultivated several cruciferous plants, including cabbage, Chinese cabbage and radish (self-incompatible), and *Arabidopsis thaliana* and other wild relatives (self-compatible).

Spring is the important season for collecting the stigma (i.e., the top of the pistil) and anther (i.e., the top of the stamen) of Brassica flowers. This work requires picking up one stigma with a weight of 0.1 mg one at a time with tweezers. In one season, the members of laboratory will collect tens of thousands of stigma and/or anthers in total for several experiment.




A figure of a schematic model for the recognition mechanism of SI in cruciferous plants including turnips, cabbage, and Chinese radish. Self and non-self pollen are transferred to the stigma's surface by insects, like honey bees. If self pollen pollinates the stigma surface, SP11 (male *S* determinant) and SRK (female *S* determinant), bind, and SI reaction (rejection of self pollen) occurs. In contrast, when pollinated with non-self pollen, SP11 and SRK do not bind, and the pollen tube can penetrate into the papillar cells of the stigma surface. The scientific journals, in which our experimental results were published, are shown in the figure.

**My favorite**

"I still sharpen pencils by hand. So I need a knife. Tweezers are a very important tool for genetic experiments. I grind them by myself. And I always have candies for the throat, because I do a lot of lectures," says Professor Watanabe. Apart from them, on his desk there are shells of cicadas, models of a whale and seal, a miniature set of cabbages, Chinese radishes and Chinese cabbages, and so on. They are very important items to make his space comfortable and give him good ideas for experiments. There are three chestnuts in a pocket of his white coat—playing with them is helpful when he is thinking.

# Electronic Doctor's Bag: A mobile communications system for home-visit medical services to overcome shortage of doctors and regional healthcare disparity


## Professor Makoto Yoshizawa

Research Division on Advanced Information Technology, Research and Development Divisions, Cyberscience Center


Completed the last half of the doctoral course of the School of Engineering, Tohoku University in 1978. Ph.D. in engineering. Worked as Research Associate and then Associate Professor at the Faculty of Engineering, Tohoku University. Then, assumed the positions of Associate Professor at the Faculty of Engineering, Toyohashi University of Technology, and then, Associate Professor at the Graduate School of Information Science, Tohoku University. Appointed as Professor at the Information Synergy Center, Tohoku University in 2006, and then, at the Cyberscience Center in 2008. Worked as Visiting Researcher at the Johns Hopkins Medical Institution of Medicine, Baylor College of Medicine, in 1999. Also a member of the Society of Instrument and Control Engineers, a member of Japanese Society for Medical and Biological Engineering, and an advisory committee member of IEEE Engineering in Medicine and Biology Society.

**http://www.yoshizawa.ecei.tohoku.ac.jp/**

Images are highly compressed, while maintaining high definition, so that a doctor at a distance from a patient can check the patient's face complexion, presence of skin diseases, edema, actions, way of walking, etc. In addition, diagnostic data is encrypted to prevent any leak of a patient's personal information, and transmitted to doctors at a hospital/clinic via a PHS or a mobile phone.

In Japan, regional health disparity is getting larger and larger. Many central hospitals in rural areas are short of doctors. Applications of information and communication technology (ICT) in the medical field are drawing attention as they may be effective for solving those problems.

Professor Makoto Yoshizawa and his colleagues set up the Consortium for Medical Information Communication Systems in the Mobile Environment, together with Professor Tomoyuki Yambe of the Institute of Development, Aging and Cancer, and concerned business enterprises, in 2009. Then they undertook the development of a mobile health check system, called the "Electronic Doctor's Bag," that takes advantage of a mobile communication system to easily transmit not only sounds and high-quality video images but also biological information such as an electrocardiography (ECG) and blood pressure data. Its features are broadly as follows:

1 ) With encrypted communication of high-quality video images, sounds and biological information, remote medical practice is made possible with almost the same security as face-to-face medical practice.
2 ) Applicable via mobile communication systems (PHS and mobile phone), in other words, in places without Internet lines (e.g., patients' homes, ambulance car, site of disaster, etc.)
3 ) Makes it possible to combine bio-measurement terminals without restrictions, and thus, can be operated flexibly according to the purpose, e.g., home medicine, fast aid treatment, and health care.
4 ) Enables electronic control of patient data.

An Electronic Doctor's Bag contains communication equipment including a PC, video camera and mobile phone, and medical equipment including an ultrasonography, blood pressure meter, and ECG, and can be easily carried. The intended usage scenario is that a nurse visits a patient's home, carrying this Bag, and takes an ECG graph and measures blood pressure, communicating with a doctor at a hospital and transmitting the medical information to the doctor by means of ICT. Thus, it is designed to achieve a virtual environment for face-to-face medical practice through a video camera.

This will make it possible for medical institutions to cover many more patients in areas with a scarce number of doctors. For emergency medical care, it will allow for emergency medical technicians to send measurement data on a patient to doctors, and thereby obtain an exact and quick diagnosis from them.

This system is expected to play a great role in medical practice in rural areas or on disaster sites once necessary legal arrangements and cooperation with medical institutions are put in place. This work was supported by the Sendai Area Knowledge Cluster Initiative founded by the Japanese Ministry of Education, Science, Sports and Culture.

A nurse sends biological information on a patient to a doctor at a medical institution. Necessary measurements are made by means of the biological measuring terminals (an electrocardiography, blood pressure meter, ultrasonography, etc.) according to the type of disease. The obtained measurement data is stored in a USB memory card or the main unit of the Bag via wireless LAN, and thus, it can be encrypted and transmitted to the medical institution by extremely simple operations.

The Electronic Doctor's Bag contains a PC, video camera, mobile phone, ultrasonography, blood pressure meter, ECG, etc. It is expected to use a tablet-shaped PC such as the iPad.

Members of Yoshizawa Laboratory. Their fields of research widely range from artificial hearts, to virtual reality, to biomedical control engineering

**My favorite**

Karaoke is the best stress relief for Prof. Yoshizawa. His favorite song is *Hymne a l'amour*. He has a large repertoire of songs. His nice singing voice is well known to the members of his laboratory. He also works as a coordinator for the Tohoku University Science Café.



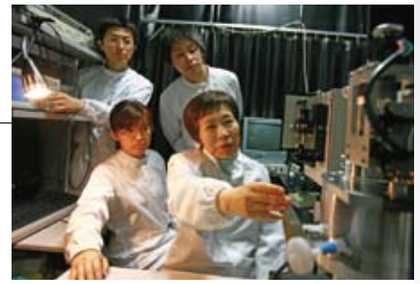

# Revealing an "unknown interaction of molecules" using surface forces measurement


## Professor Kazue Kurihara

Interface PhysChem Laboratory, Soft Materials Group, Advanced Institute for Materials Research (WPI-AMIR), and Nano-surface Chemistry, Measurement Research Division, Institute of Multidisciplinary Research for Advanced Materials


Born in Tokyo in 1951. Completed the doctoral course, Department of Industrial Chemistry, School of Engineering, University of Tokyo. Ph.D. in engineering. Worked as Technical Assistant at the University of Tokyo, then a postdoctoral fellow at the Department of Chemistry, Texas A&M University, a postdoctoral fellow at the Department of Chemistry, Clarkson University, a researcher at the Research Institute for Production Development, Visiting Researcher at the Institute for Surface Chemistry, Group Leader at the Research Development Corporation of Japan. Appointed Associate Professor at the Department of Applied Physics, School of Engineering, Nagoya University. Appointed Professor at the Institute for Chemical Reaction Science, Tohoku University, in 1997, and at the Institute of Multidisciplinary Research for Advanced Materials, reorganized from the former Institute in April 2001. Has been in current position since 2010.

**http://www.tagen.tohoku.ac.jp/labo/kurihara/index.html**



Prof. Kurihara and the members of the Nano Surface Chemistry Laboratory. They are cheerful and lighthearted in spite of the fact that they engage in work in a severe area where extremely high precision is required more than anything. In this laboratory, every day measurements take place to elucidate an extremely small world scaled in nanometers.

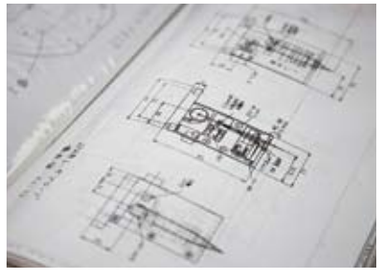
Interactions like attraction and repulsion between magnets also exist between molecules. These intermolecular interactions are an area of study for Professor Kurihara and the members of her laboratory. The measurement of intermolecular surface forces, among others, is the main matter that they are dealing with. In other words, they are measuring the distances and forces with which such interactions occur among various molecules. Resulting measured values can be a key to understanding specific intermolecular interactions.

This area of measurement of surface forces deals with extremely small objects observed on the nanometer scale in research. Thus, the measurement requires extremely high precision, and this area of research is full of challenges, including maintenance and improvement of research facilities. Not many researchers have chosen this area for their work. Under these circumstances, Professor Kurihara and the members of her laboratory have developed new approaches and new apparatus by themselves. A lot of apparatuses that they have developed are viewed with keen interest by other researchers in the same field.

Some interactions among molecules exist close to you. For example, the light or moist sensation of lotion, or a mechanism to increase the viscosity of a sealing material used in buildings, are attributed to a micellar aggregate of surfactant that easily deforms, or interactions that occur among liquid molecules. It is interesting that the process of elucidating an unknown world on the nano scale leads to discoveries and advances in areas of daily life. In fact, their laboratory has often received unanticipated inquiries from businesses.

One of their future research themes is interactions among liquid molecules, which are mostly unknown. Furthermore, they are considering developing a new apparatus that integrates electrochemistry and optical engineering to increase research possibilities.

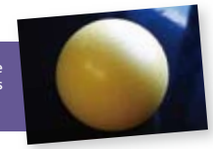
The twin-path surface forces apparatus, among others, that Professor Kurihara *et al.*, have developed attract the most attention. This apparatus is rated highly because it can be applied to materials close to our daily life. It is easy to use for surface forces measurements, which have so far taken place in a special, distant world performed only with transparent samples. It enables the application of these measurements to general uses.



A surface forces apparatus is fully disassembled and stored immersed in ethanol each time it is used, in order to prevent even extremely small particles of dust from entering, which could damage its precision.

**My favorite**

Prof. Kurihara often works at a PC for several hours. She stretches with a balance ball every two or three hours. The space for stretching is at the back of the table, and cannot be seen from the doorway. Thus, she sometimes surprises students who come to this room because she is "audible but invisible."



# Award Winners 2009
**(August 2009–July 2010)**

## Order of Culture
Awarded in November 2009

**Adjunct Professor** Sumio Iijima **Advanced Institute for Materials Research (WPI-AIMR)**

### Discovery of Carbon Nanotubes and the Development of High Resolution Electron Microscopy

Adjunct Prof. Sumio Iijima at WPI-AIMR was presented with the Order of Culture in an award ceremony at the Imperial Palace on November 3, 2009.

He observed carbon electrodes using a high resolution electron microscope, and discovered that carbon nanotubes were formed on the cathode after discharge. This discovery triggered today's flourish of nanotube research and has been internationally well-recognized.

## Order of Culture
Awarded in November 2009

**Emeritus Professor** Yorio Hinuma **Tohoku University**

### Excellent Achievement through Research on EB Virus and ATL Virus

Emeritus Prof. Yorio Hinuma is highly recognized in Japan and worldwide for his great accomplishments in research on the Epstein-Barr virus and adult T-cell leukemia. He discovered a virus that causes T-cell leukemia in 1981, and was the first to show that human cancer is caused by a retrovirus. This pioneering work was achieved three years before the HIV retrovirus was discovered, thus, he was globally profiled with awards and honors such as the Person of Cultural Merits, Imperial Prize, and Japan Academy Prize, and in 2009, the Order of Culture. Many researchers who were encouraged and mentored by Emeritus Prof. Hinuma during his many years of medical and dental research are now actively conducting research endeavors in various fields.

## Medal of Honor with Purple Ribbon
Awarded in November 2009

**Professor** Takakiyo Nakazawa **Center for Atmospheric and Oceanic Studies, Graduate School of Science**

### Contribution to the Development of Geoenvironmental Sciences and Meteorology

About 30 years ago, when the global warming issue was yet to be widely acknowledged, Prof. Nakazawa launched research activities to elucidate the circulation of greenhouse gases on a global scale; his academic contribution is highly esteemed.

## 2010 Japan Prize
Awarded in January 2010

**Emeritus Professor** Shun-ichi Iwasaki **Tohoku University**

### Creation of Large-capacity Hard Disk Drives

The Japan Prize, sometimes called "Japan's Nobel Prize," is presented by the Science and Technology Foundation of Japan to prominent researchers who have made significant innovative scientific achievements. During the 26th annual awards, Emeritus Prof. Iwasaki was honored as one of two (the other being Stanford University's Peter M. Vitousek, Ph.D.) 2010 Japan Prize winners in the "industrial production and production technology" field for his great contribution to high-density magnetic recording technology by developing the perpendicular magnetic recording method. He established the principles of the method, which differed from conventional approaches, back in 1977. The newly developed method significantly increased the capacity of hard disk drives (HDDs), and is now widely applied in HDDs for PCs, data servers and various consumer electronics.

## Acta Materialia Gold Medal
Awarded in March 2010

**Professor** Akihisa Inoue **President of Tohoku University**

### Contribution to the Development of Material Sciences on Bulk Metallic Glasses

President Prof. Inoue was awarded the Acta Materialia Gold Medal for his significant achievements in leading the development of materials science in the area of bulk metallic glasses. Acta Materialia, Inc. annually awards the Medal to researchers based upon their demonstration of great ability and leadership in materials research since 1974. Prof. Inoue is the third winner from Japan, following distinguished laureates across the country and world. The award ceremony was held at the WPI-AIMR Annual Workshop on March 26, 2010, where President Inoue was presented with the Gold Medal by Ted B. Massalski, Professor at Carnegie Mellon University and Executive Secretary of Acta Materialia, Inc.

## Medal of Honor with Purple Ribbon
Awarded in April 2010

**Professor** Masataka Nakazawa **Director, Research Institute of Electrical Communication**

### Significant Contribution to Constructing a Global Information and Communication Network

Prof. Nakazawa developed key technologies that led to high-speed and large-capacity optical communication in the communication engineering field, including the invention of the EDFA, which is the world's first compact optical fiber amplifier. His series of research projects revolutionized optical communication technologies and paved the way for a new era.

## Japan Academy Prize
Awarded in June 2010

**Emeritus Professor** Hiroshi Ohrui **Tohoku University**

### Successful Creation of Innovative Biofunctional Substances

Emeritus Prof. Ohrui is highly esteemed for his outstanding contribution to the development of the life sciences through multidisciplinary accomplishments across fields such as organic chemistry, biochemical analysis and plant physiology. He shared the Prize with Takeshi Kitahara, a professor emeritus at the University of Tokyo, for research on the creation and application of novel biofunctional molecules.

## Duke of Edinburgh Prize
Awarded in June 2010

**Emeritus Professor** Moritaka Nishihira **Tohoku University**

### Research on Structuring and Conservation of Coral Reef Communities in Japan, Especially in Okinawa

Emeritus Prof. Nishihira presented basic data on coral reef studies and proposed the concept of inhabitation chains. He advocated for a groundwork on which local communities can readily work for coral reef conservation. He also introduced data that indicated increases in both fish species and total fish numbers as transplanted corals grew.

# To go further in education and research
# Environment, Organization, and Management for creation of new knowledge

## Funding Program for World-Leading Innovative R&D on Science and Technology

Selections of the "Funding Program for World-Leading Innovative R&D on Science and Technology (FIRST Program)"were made at a meeting of the Council for Science and Technology Policy on September 4, 2009.

The FIRST program is an all new system that places top priority on researchers as a part of government strategy that supports innovative R&D efforts to reach world-leading excellence within a 3–5 year period. It aims to reinforce Japan's global competitiveness and lay a groundwork for industry, security control etc., and also to steadily distribute R&D results to people and our society. From Tohoku University, two research projects by Prof. Masayoshi Esashi and Prof. Hideo Ohno were successfully designated amongst 565 applicants across the country. Furthermore, a research project by Nobel Laureate Koichi Tanaka at Shimazu Corporation was also designated; he is a visiting professor of Tohoku University and an initiator of the "joint lectures for fusion research" program at the university.

| Research Project | Research and Development of Integrated Microsystems | Research Project | Research and Development of Ultra-low Power Spintronics-based Logic VLSIs |
|---|---|---|---|
| Core-Researcher | Masayoshi Esashi | Core-Researcher | Hideo Ohno |
| Outline | This project aims to increase added value in connection with advanced electronics,through more integration of not only transistors, but also various components, with their integrated circuits. Universities/Institutions will conduct R&D projects driving growth in industrial applications, and support industries by utilizing their facilities and know-how, which will help the country lead the world in the field of microelectronics, including applications for mobile phones. | Outline | The project aims to contribute to the realization of a low-carbon and energy-saving society and to the strengthening of international competitiveness in the field of next generation VLSIs, through the development of innovative energy-saving logic VLSIs that fuse spintronics devices and logic-integrated circuits. |

## Micro System Integration Center ($\mu$SIC)

By integrating human resources, organizations and technologies across different fields and businesses, the Micro System Integration Center ($\mu$SIC) is engaged in Microsystems R&D activities for high added value, which requires a vast range of knowledge and technology.

It will create an R&D center that can provide a platform, from basic research to design, prototyping, and packaging steps, with the best technology, people, information and opportunities/themes at the most appropriate time and cost.

Thus, the $\mu$SIC will establish an open R&D model where multiple companies and research institutions participate, a goal which has so far been difficult to realize, and found an industry-academia cooperation model that contributes to efforts for high-mix low-volume production in industrial applications. It will generate new merged areas and improve the competitiveness of Japanese industry.

## Center for Spintronics Integrated Systems

Under the project "Research and Development of Ultra-low Power Spintronics-based VLSIs" (PI: Hideo Ohno), which started in March 2010 and is supported by JSPS's "Funding Program for World-Leading Innovative R&D on Science and Technology" (FIRST), the Center for Spintronics Integrated Systems aims at assuming a leading role in achieving innovative change by the fusion of spintronic devices and logic integrated circuits. In this way, the center intends to play a pivotal role in the world-wide innovation cycle of logic VLSIs.

The center concurrently promotes the research and development of spintronics materials, devices and circuits. In doing this, it aims to establish a peerless technology structure for spintronics logic integrated circuits that includes research and development, processing and production technology and circuit design as well as a circuit integration prototyping environment.

Furthermore, the center plans to demonstrate high performance of spintronics logic integrated circuits at ultra-low power far surpassing conventional levels as well as a high performance ultra-low power integrated computing system that combines processing and memory through logic-in-memory architecture using nonvolatile spintronics memories and CMOS. An open innovation center for spintronics logic integrated circuits will be established at the center, creating a standard for high performance ultra-low power systems. Through these dynamic processes, the center plans to play a critical role in the education and training of researchers and engineers, giving hands on knowledge of all aspects of spintronics-based VLSIs.

## Global Centers of Excellence Program (Global COE Program)

The Global COE Program is an initiative by the Ministry of Education, Culture, Sports, Science and Technology in order to support internationally excellent centers for education and research in a concentrated manner to promote internationally competitive universities with the intention of developing creative human resources to lead the world.

During the selection process, they are reviewed in terms of their possibility of growth as education and research centers with the function of human resource development on the precondition that they have world-leading, original and epoch-making research bases.

At Tohoku University, 12 programs in eight research fields were designated in FY2007 and FY2008.

### Titles of Selected Global COE Programs

- Basic & Translational Research Center for Global Brain Science
- International Center of Research & Education for Molecular Complex Chemistry
- Materials Integration International Center of Education and Research
- Center of Education and Research for Information Electronics Systems
- Global Nano-Biomedical Engineering Education and Research Network Center
- Global COE for Conquest of Signal Transduction Diseases with "Network Medicine"
- Weaving Science Web beyond Particle-Matter Hierarchy
- Global Education and Research Center for Earth and Planetary Dynamics
- World Center of Education and Research for Trans-disciplinary Flow Dynamics
- Center for the Study of Social Stratification and Inequality
- Gender Equality and Multicultural Conviviality in the Age of Globalization
- Center for Ecosystem Management Adapting to Global Change

## Evaluation Team Visits: the Institutional Evaluation Programme (IEP) of the European University Association (EUA)

Tohoku University participated in the Institutional Evaluation Programme (IEP) of EUA in FY2009, which is performed as an external evaluation with global viewpoints. This was the first time it was performed not only in Japan but also in Asia.

After submitting self-evaluation reports in English, the university had two visits by an evaluation team of the IEP during the 27th–30th (4 days) of October 2009 and 13th–15th (3 days) of January 2010. The teams interviewed concerned people inside and outside the university. On the final visit day, they made an oral report with a Q&A session to the university executives and division directors, so the university as a whole shared their advice.

In the process for preparing the self-evaluation report, we conducted a SWOT analysis, which led to clarifying some challenges in our university.

It was extremely fruitful to receive an external evaluation by the EUA. Not only the evaluation result itself, but also the self-evaluation process and the visits, including interviews and report meetings, produced a very beneficial outcome.

Inspection of the University Library

Interview with directors of research institutes

## Ranked World's 3rd of ESI's Most Cited Papers in Materials Science

Topics

Thomson Reuters Scientific analyzed their statistical database of researchers and research institutions ranked in the top one percent of the world, *Essential Science Indicators*℠, by the citation counts of academic papers, which provides data on the trend of citations in papers; Tohoku University ranked world's 3rd (1st in Japan) in "Materials Science" and world's 10th (2nd in Japan) in "Physics" over the decade of 2000–2010. This data shows that Tohoku University is attracting attention as a research institution with outstanding academic achievement throughout the world.

**3rd in the world (1st in Japan): Materials Science**

**10th in the world (2nd in Japan): Physics**
**20th in the world (6th in Japan): Chemistry**
**61st in the world (3rd in Japan): Pharmacology/Toxicology**

(Period of Academic Paper Citation: January 1, 2000–April 30, 2010)

# A wide variety of education/research support programs to vitalize the university

## Contribution Award in Education

To enrich the university's Common Subjects program, this award celebrates university staff members who have made great achievements in educational methods, study support and creative approaches for students toward the betterment of education.

Graduate School of International Cultural Studies and Center for the Advancement of Higher Education

### Spanish Language Education Group, International Language Committee, Educational Review Board

Headed by: Mitsuhiro Shigaki, Professor, Graduate School of International Cultural Studies
Members: Shigeto Yoshida, Associate Professor, Graduate School of International Cultural Studies
Cecilia Noemi Silva, Lecturer, Center for the Advancement of Higher Education

The group introduced CALL digital technologies in various ways to provide a practical communicative approach, resulting in great learning effects.

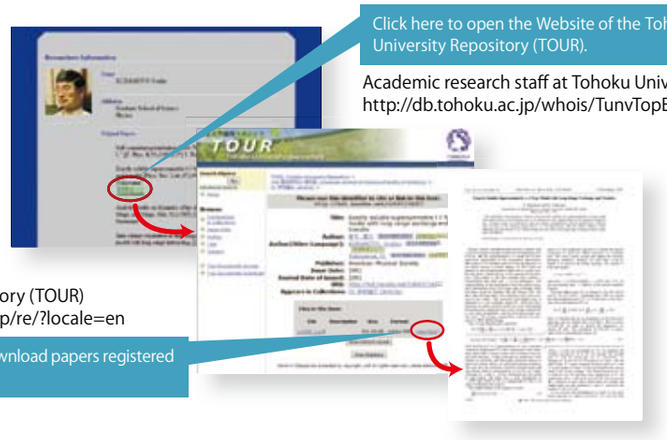
Their attractive approach has increased the popularity of Spanish language classes year after year. Students learning Spanish are the third largest group among language classes for first learners, following German and Chinese. The Spanish classes were highly rated in an evaluation questionnaire survey by students.

## Mutual Linkage of the Database for Academic Research Staff at Tohoku University and Tohoku University Repository (TOUR)

It is possible to directly refer to a paper registered in the Tohoku University Repository (TOUR) among the papers, reviews and explanatory articles stored in the Tohoku University Database, by the data link from the relevant paper in the researchers' database.

This is a part of joint efforts for links made by Evaluation-Analysis Office of University Activities and the Library according to the Inoue Plan (Tohoku University Action Plan) to spread Tohoku University's education and research results.

Now, about 2,500 academic papers are linked, and the number will increase.




## Presidential Prize for Educational Excellence

This award is presented to university staff members that have made great efforts and achieved outstanding educational excellence in such areas as classes, extracurricular activities, and international exchange programs.

### Spanish Language Education Group

Improved and developed Spanish language education drawing on a novel view of language education, e.g., by introducing digital technologies from various perspectives, resulting in high ratings of classes by students.

### Graduate School of Environmental Studies

■Hideki Ishida
Professor

■Ryuzo Furukawa
Associate Professor

Have implemented environmental leader education as an innovative approach to structuring environmental studies, which is a totally new system of academic study, and thereby contributed to the development of practical human resources in the area of the environment.

Associate Prof. Furukawa on the left and Prof. Ishida on the right

Professor Maki Suemitsu

Made a great contribution to ensuring students' active extracurricular activities as the head of the Cultural Association of the Student Union by coordinating students' groups of cultural activities.

Professor Ryoichi Nagatomi

Has made a great contribution to ensuring/developing active extracurricular sports activities for a long time as head of the Sports Association of the Student Union.

### 2009 Projects of Tohoku University adopted in "Support Program for Distinctive University Education" by the Ministry of Education, Culture, Sports, Science and Technology

http://www.tohoku.ac.jp/japanese/profile/about/08/about0803/

( ) indicates the division responsible for the implementation of the program.

#### Project for improving perinatal care environment (improvement of human resources development)

● Project to support young/woman doctors to engage in perinatal medical care (Tohoku University Hospital)
http://www.ob-gy.med.tohoku.ac.jp/ydw/

Designed to maintain and improve the educational environment for young doctors who will play a large part as medical service providers of the next generation, and support the continuation of, and return to work of women doctors, to reinforce the function of Tohoku University Hospital to nurture human resources, reduce the heavy work load of doctors, and construct a local medical system for perinatal care.

#### Nurse career system construction plan

● Development of a nurse career promotion support system (Tohoku University Hospital)
http://www.kango.hosp.tohoku.ac.jp/carrier/

This plan calls for the University Hospital and the School of Medicine to cooperate with each other in reviewing academic clinical training methods and systems to improve the educational levels in clinical and basic learning courses for nurses. It's goal is to ensure that they can improve their expertise efficiently and continuously, and to construct a safe and secure nursing service system.

## Productive days, leading a full life in academic and extracurricular activities
# The campus life of our individualistic and diverse student body

### Awarded the Grand-Prix, JASSO's Student of the Year 2009

The Japan Student Services Organization (JASSO) awards excellent students with the Student of the Year award, funded with donations from many people, to commend students who have made great achievements in the categories of academic activities, culture/art, sports, and social contributions to help the development of promising youths who will be great human resources.

Mr. Toru Naganuma, a sixth-year School of Medicine student, was awarded the Grand-Prix of the Student of the Year in the category of academic activities on December 12, 2009. This year, 216 students applied, and 92 received awards.

The subject of Naganuma's research, for which the Grand-Prix was awarded, was a cohort study on the risk of colorectal, oral, pharynx or esophagal cancer related to coffee drinking, and a cohort study on the risk of malignant tumors as related to the drinking of green tea. His research report was published in an international medical journal. Mr. Naganuma was given the opportunity to study at the School of Public Heath, at the University of Washington for one year.

### The Japanese Archery Club of Tohoku University won both the men's and women's championships at the 48th Seven University Athletic Competition

The Seven University Athletic Competition is an annual athletic meet held by seven national universities: Hokkaido University, Tohoku University, the University of Tokyo, Nagoya University, Kyoto University, Osaka University, and Kyushu University. At the 48th Seven University Athletic Competition in 2009, the Japanese Archery Club of Tohoku University achieved the brilliant feat of winning the championships in both categories of men's and women's Japanese archery for the second year in a row. Particularly, the women have been the champions for three years running since 2007. In other sports, Tohoku University won the fencing and semi-hard baseball championships in the summer games. In the total results for the seven universities, Tohoku University was fourth overall.

### Ceremony for presenting the 2009 Ishida Cup and Umino Prize of by the Cultural Association, University Union

The presentation ceremony for the Ishida Cup and Umino Prize was held in the Kawauchi-Kita Campus on March 10, 2010.

The Ishida Cup is awarded to the club that has made the greatest contribution to the development and promotion of the Cultural Association for the year. For 2009, this was given to the Japanese Calligraphy Club, which actively held exhibitions of their calligraphic works and achieved great results in many competitive events. The newly established Umino Prize is awarded to the club that has achieved the greatest results or made the greatest contribution to the local community or the university. The first awarded Prize was won by the *Rakugo Kenkyu-bu* (*rakugo* or comic storytelling club) for visiting many diverse facilities to present their *rakugo* performances.

### Three individuals and three groups that belong to the Student Union were awarded the Sendai City Sports Prize of 2009

The presentation ceremony for the Sendai City Sports Prize was held on February 9, 2009. This prize is given to individuals and groups that have made great achievements in the area of amateur sports. This prize was given to three individuals who belong to the Student Union and the following three clubs; Triathlon, Orienteering and Japanese Archery.

**■Individual prize**

| | Name | Sport | Results |
|---|---|---|---|
| Glory Prize | Masashige Tomita | Triathlon | ◎Men's Japan Student Duathlon Championship: First place<br>◎The 14th Invitational University Triathlon Meet: Second place |
| Prize for Excellence | Takahito Fujimoto | Triathlon | ◎Men's 2009 Japan Intercollegiate Triathlon Championships Kannonji: Second place |
| Encourage-ment Prize | Takahiro Ota | Orienteering | ◎Men's Japan Intercollegiate Orienteering Championships 2008: First place, Middle Distance |

*Takahiro Ota, winner in orienteering, graduated from the Faculty of Physics in March 2009.

**■Group prize**

| | Name | Results |
|---|---|---|
| Glory Prize | Triathlon Club | ◎Japan Student Duathlon Championships: First place, University Championships, Team Competition<br>◎The 14th Invitational University Triathlon Meet: First place, University Invitational, Men's Team Competition, University Selection<br>◎2009 Japan Intercollegiate Triathlon Championships Kannonji: First place, Men's Team Competition<br>◎2009 Japan Student Spring Triathlon Championships and Triathlon Team Time Trial Championships: First place, Men's Team Time Trial |
| Prize for Excellence | Japanese Archery Club | ◎The 57th All Japan Student Japanese Archery Championships: Second place |
| Encouragement Prize | Orienteering Club | ◎2008 Japan Student Orienteering Championships: First place, Women's Relay Championships/First place, Men's Relay, Parallel Class/First place, Women's Relay, Parallel Class |
| Performance Prize | Orienteering Club | ◎For sponsoring and holding 32 competitions in order to popularize orienteering |

### Award ceremony for the Four Prizes of the Student Union Sports Association and Student Union Chairman Prize

On March 8, 2010, the award ceremony for the "Four Prizes of the Student Union Sports Association" and the "Student Union Chairman Prize" was held at the Aoba Memorial Hall. The Kurokawa Cup, which is awarded to groups that perform most actively and obtain the most excellent results in that year, was given to the Men's Volley Ball Club, and the Shimura Cup, which is awarded to groups that held the most substantial events, was awarded to the Orienteering Club. Other prizes, including the Suzuki Prize and the Otani Prize, were awarded to outstanding groups and individuals who belong to the Sports Association of the Student Union.

**■List of groups and individuals awarded the Four Prizes of the Student Union Sports Association and the Student Union Chairman Prize**

| Name | | Results |
|---|---|---|
| Four Prizes of the Student Union Sports Association | [Kurokawa Cup] A group prize presented to groups that obtained the most excellent results in that year | ◎Men's Volleyball Club |
| | [Shimura Cup] A group prize presented to groups that held the most substantial events in that year | ◎Orienteering Club |
| | [Suzuki Prize] An individual award given to high-achieving second year students who are expected to have future success | ◎Archery Club (Shusaku Nakakawaji) ◎Orienteering Club (Yuka Onuma, Tomonori Nakai) ◎Japanese Archery Club (Mai Sato) ◎Ballroom Dancing Club (Akihiro Hayashi) ◎Swimming Club (Akira Hanzawa) ◎Skiing Club (Sayaka Suzuki) ◎Triathlon Club (Masaharu Sakamoto) ◎Sailing Club (Hiroko Ishimaru) ◎Track Club (Takashi Sugimoto) |
| | [Otani Prize] A group prize awarded to clubs that won a victory in the Seven University Athletic Competition | ◎Semi-Hard Baseball Club ◎Men's Japanese Archery Club ◎Women's Japanese Archery Club ◎Equestrian Art Club ◎Fencing Club |
| [Student Union Chairman Prize] An individual prize awarded to students who had excellent results during the last 4 years and will graduate from the university that year | | ◎Orienteering Club (Yusuke Ohashi) ◎Japanese Archery Club (Hiroto Fujita) ◎Ballroom Dancing Club (Tomonori Uchiwa) ◎Swimming Club (Yu Stephen Matsushita) ◎Track Club (Takuma Imaizumi) * Excludes winners who belong to the Cultural Association. |

## Creative research at the world highest level
# Give our inherited and accumulated knowledge back to society

### New "Fluctuation Free Facility for New Information Industry" research building of the New Industry Creation Hatchery Center completed

A new research building the "Fluctuation Free Facility for New Information Industry" of the New Industry Creation Hatchery Center (NICHe) for industry-academia collaborative research has been completed at the new Aobayama Campus. This new building was built with a fund from the Ministry of Economy, Trade and Industry. It is designed to provide facilities to develop human resources to support approaches to form and develop regional industrial clusters. It is also the first step toward the "approaches to realizing the Science Park Plan" of Tohoku University for further engagement in joint research with private enterprises.

In order that the most advanced research results can be assimilated into industry and rapidly put into practical applications, joint research activities linking to the university's basic research will be facilitated among university researchers and researchers/engineers/skilled workers from major businesses/local small and medium sized businesses/Japanese small and medium sized businesses that are looking for global niches.

This research building will be located next to the new Aobayama Station (tentative name) on the Sendai Tozai subway line, which will open in 2015 and increase accessibility.

### Highly Ranked Achievements in Industry-University-Government Collaborations: two faculty members of Tohoku University received the award for Persons of Merit in Industry-University-Government Collaboration.

The Government has commended people who have made great accomplishments and taken leading approaches in industry-university-government collaborative activities among universities, public research institutions and the private sector, aiming at further development of collaboration in Japan since FY2003. Two faculty members of Tohoku University were honored with the Minister of Education, Culture, Sports, Science, and Technology Award in 2009.

#### Minister of Education, Culture, Sports, Science, and Technology Award

**Development of Superhybrid Materials**

Professor Tadafumi Adschiri
Advanced Institute for Materials Research (WPI-AIMR)

Prof. Adschiri invented supercritical hydrothermal synthesis that enables continuous synthesis of organic-inorganic hybrid nano-particles. Based on this technology, he jointly and successfully developed composite materials where contradictory properties are made compatible with each other in a new collaborative project by the Ministry of Economy, Trade and Industry and New Energy and Industrial Technology Development Organization (NEDO). The technology is expected to diffuse as a technological base for various industries.


High thermal conductivity materials (heat dissipation sheets)

Optical materials (anti-reflection films)

#### Minister of Education, Culture, Sports, Science, and Technology Award

**Development of a casting CAE system named ADSTEFAN**

Professor Koichi Anzai
Graduate School of Engineering

Prof. Anzai researched and developed a casting CAE system called "Stefan 3D" for casting engineers. This technology was transferred to Hitachi, Ltd., and further made into a software system product named "ADSTEFAN." It is now widely used in Japan as well as other Asian countries. It has contributed to improved quality and cost performance of cast products, and has been upgraded every year since it was launched. It is an excellent case of meeting the needs of society through collaboration.



A practical casting throttle chamber and results of flow analysis

### The 2nd Tohoku University International Industry-University Collaboration Symposium


The 2nd Tohoku University International Industry-University Collaboration Symposium was held in Tokyo, on February 22, 2010, as a part of the Ministry of Education, Culture, Sports, Science and Technology (MEXT) "Project for the Strategic Development of Industry-University-Government (I-U-G) Collaboration." The event featured lectures on the current state of industry-academia collaboration in Japan and other countries. It also included Tohoku University's reports on world-leading collaborative activities, and case reports by its researchers who took principal roles in the development of international collaborations. Through the program, Tohoku University's global competitiveness in various research fields was promoted to participants from Japanese and international businesses and other sectors.

The Symposium started with opening remarks by Akihisa Inoue, President of Tohoku University, and Takashi Yanagi, Director, Research Environment and Industrial Cooperation Division, Research Promotion Bureau of MEXT. Following the remarks, Marc M. Wall, Minister-Counselor for Economic Affairs, Embassy of the United States, made a keynote speech entitled "United States' Perspectives on the Government's Role in Fostering Private Sector - University Collaboration."

The event closed with an enthusiastic gathering of about 120 participants, including many Industry-University relations representatives and experts from government, private sectors, academic institutions, and other foreign agencies.

Tohoku University will continue to promote its international industry-academia collaborative activities, and further contribute to the development of the country's international collaborations as a whole.

### 2nd Prize of the German Innovation Award, "Gottfried Wagener Prize 2009" Won

The presentation ceremony of the German Innovation Award, "Gottfried Wagener Prize 2009" was held in Tokyo on February 8, 2010. At this ceremony, Takafumi Fukushima (Assistant Professor at Koyanagi Laboratory, Department of Biorobotics, Graduate School of Engineering) was honored with the 2nd Prize for his research "Surface-Tension-Powered Chip Self-Assembly Technology for Three-Dimensional IC Fabrication" and its innovative physical and chemical approaches.

Inspired by the work of Gottfried Wagener, a German scientist who had close links with Japan, this award has been initiated by twelve technology-focused German companies and the German Chamber of Commerce and Industry in Japan to promote cooperation between Germany and Japan in industry and academia.

This was the second time that a young researcher from Tohoku University has won this prize, following the previous year. There are great expectations that the university will continue to make great contributions to the promotion of industry-academia collaborative activities both for Germany and Japan.

### Hints for Industry-Academia Collaborative Activities: Tohoku University Research Profile Search—Now Available in Web Format (English/Japanese)


The Tohoku University Office of Cooperative Research and Development released the Tohoku University Research Profile Search, web version, to increase opportunities for using research results and resources of our researchers by people in industry and other sectors. It supports the collecting of information with useful facilities such as a list of research areas of life science, information communication, environment, nanotechnology, materials, energy, manufacturing technologies, infrastructure, frontier, and others; various navigation functions; and abundant links to related information. This Search can also be used to explore subjects related to joint research and development.
http://www.rpip.tohoku.ac.jp/seeds/lang:en/

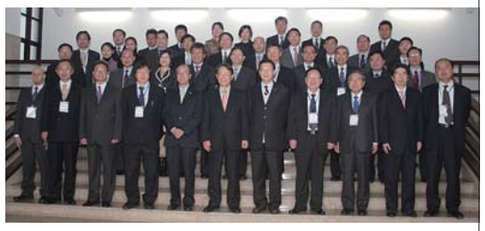
# Becoming a World-leading University through the Construction of a Global Network
# Creating a World-class Research and Education Center through International Exchanges

## Hosted the 15th Annual General Meeting, the Association of East Asian Research Universities (AEARU)

Tohoku University hosted the 15th Annual General Meeting of the Association of East Asian Research Universities (AEARU) on December 2–4, 2009. AEARU is an international consortium of 17 research-oriented universities in East Asia, Tohoku University, University of Tsukuba, The University of Tokyo, Kyoto University and Osaka University from Japan; Tsinghua University, Peking University, Fudan University, The University of Science and Technology of China, Nanjing University and The Hong Kong University of Science and Technology from China; Korea Advanced Institute of Science, Seoul National University and Pohang University of Science and Technology from Korea; and National Tsing Hua University and National Taiwan University from Taiwan, and furthers workshops and student exchange programs.

This Annual General Meeting chaired by President Matsumoto of Kyoto University reviewed its past activities and discussed plans for future activities.

Following the General Meeting, each of the member universities gave a presentation of its activities in a session led by President Inoue of Tohoku University, where attendees exchanged views about the improvement of undergraduate education and specialized education provided in English for universities to meet the globalization.



## Selected as a core university in the "Global 30" program of the Ministry of Education, Culture, Sports, Science and Technology

Future Global Leadership

In July 2009, Tohoku University was selected as a core university to implement the Project for Establishing Core Universities for Internationalization (Global 30) of the Ministry of Education, Culture, Sports, Science and Technology with the aim to provide an educational environment that is very attractive for international students.

"Future Global Leadership," a Global 30 program of Tohoku University, is designed to increase lectures and research guidance in English so that students can acquire a degree by taking such classes. Under this program, Tohoku University has established the Institute for International Education and the FGL Office as bases for the management of this program.

For the courses taught in English, our university is planning to increase to 16 courses until 2013, including the existing three courses. It is also planning to commence the International Program in Liberal Arts (IPLA) program in the autumn of 2010, based on its results in the Junior Year Program in English (JYPE) program, a short period English education program for students in science and engineering. Tohoku University has a plan to set up an overseas joint office with other universities for common use in Russia to support public relations there, and has established the Office of Japan-Russia Relations.

## Tohoku University Day (Shanghai Jiao Tong University, the Northeastern University of China and the Bandung Institute of Technology)

In FY2009, we launched Tohoku University Day to promote the understanding of our university's latest research results and educational activities to attract many more excellent international students/researchers, thereby making the university more internationally open.

Tohoku University Day was held at Shanghai Jiao Tong University in Shanghai on December 18, 2009, at Northeastern University in Shenyang, China on March 13, 2010, and at The Bandung Institute of Technology in Bandung on March 18, 2010.

The events included speeches delivered by the presidents of Tohoku University and each host university, presentations on the status and research results of Tohoku University, its divisions' teachers giving counsel to individuals, and poster/panel exhibition.

Shanghai Jiao Tong University

The Bandung Institute of Technology

Northeastern University (China)

## United Nations University Global Seminar 8th Tohoku Session Increasing Poverty and Rich-Poor Gaps: From Glocal Perspectives

United Nations University Global Seminar 8th Tohoku Session under the title of "Increasing Poverty and Rich-Poor Gaps: From Glocal Perspectives" was jointly co-hosted by Tohoku University and United Nations University on November 21–23, 2009.

UNU Global Seminars are held annually to enhance awareness about contemporary global issues and the role of the United Nations in addressing them. They are designed to provide a place where students who will lead the next can interact with distinguished scholars and practitioners and explore issues at once globally and be familiar in depth through lectures and group discussions.

This year's seminar was held as an event with two-night lodgings, with 83 attendees from across the country. They participated in lecture classes, group discussions, and presentation sessions.

## Study Abroad Program

Had the Tohoku University Study Abroad Program (SAP) at the University of California, San Diego (UCSD), in the United States, and at the University of Sydney in Australia.

Started in 2008, the SAP was carried out for the first time at USCD this year.

28 students participated in SAP at the University of Sydney, and 16 at USCD, mostly from undergraduate classes. During the spring academic break, they stayed about four weeks at the University of Sydney or USCD, where they received intensive English training and took lecture classes on special subjects together with local students. They also went on field trips or homestays to experience local culture and people's lives.

## Tohoku University Study Abroad Fair

Tohoku University Study Abroad Event was held by the Center for International Exchange on April 12, 2010.

This event is designed to encourage our students to go abroad for study or participate in international exchange activities.

This event included presentations about study abroad programs, short-period overseas training courses, language learning supports, etc., that our university carries out and about study abroad programs provided by overseas universities in partnership with our university, and from reports of students about their experiences as foreign exchange students or in short-period training programs. We invited universities in partnership with Tohoku University and domestic institutions to support studying aboard. The students who were interested in going abroad had an opportunity to consult with the universities and institutions.

Tohoku University Study Abroad Fair

The Study Abroad Program at the University of Sydney

## 12 New Inter-university Academic Exchange Agreements Concluded. Total Agreements now at 144 (as of June 1, 2010)

### Topics

*The 2009 version is based on information as of July 1, 2009. The 2008 version is based on information as of August 1, 2008.

| Country/Area | Name of university | Date of conclusion | Country/Area | Name of university | Date of conclusion |
|---|---|---|---|---|---|
| Vietnam | Vietnam National University, Hanoi | 2009. 7. 6 | France | Université lumière Lyon 2 | 2009.10.20 |
| UK | The University of Sheffield | 2009. 8.21 | Taiwan | National Tsing Hua University, Hsinchu | 2009.12. 2 |
| Italy | Università degli Studi di Firenze | 2009. 8.21 | Austria | Universität Wien | 2010. 2.24 |
| Germany | Technische Universität Berlin | 2009. 8.26 | Korea | Kyung Hee University | 2010. 3. 5 |
| France | École Polytechnique | 2009. 9. 9 | France | Université de Technologie Compiègne | 2010. 3.15 |
| China | Shanghai Jiao Tong University | 2009. 10.15 | Indonesia | Bogor Agricultural University | 2010. 3.23 |

## A Tradition of "Open-Door" Spirit
# Active Approaches to Social Contribution and Gender Equality

### Tohoku University "Exploring-Germination-and-Growth program for young Scientists (EGGS)" Held

Founded in June 2009, Tohoku University's "Exploring-Germination-and-Growth program for young Scientists (EGGS)" (opened to 70 students in the Basic Course and 30 students in the Advanced Course) had its opening ceremony on June 12, 2010. These courses are provided annually for high school students across the country as a part of the Japan Science and Technology Agency (JST)'s Fostering Next-Generation Scientists project. The university sent invitational letters to about 2,000 high schools, and received 278 applications in FY2010, and finally 100 students were selected. They come to the university once a month to take two lecture classes. The selected young people are given the opportunity to experience cutting-edge research and tackle assignments in many scientific fields, including general sciences, engineering, biology, medicine, agriculture and environmental science. They also have opportunities to visit the university's research facilities and learn about their prospects through career education. Students and their parents have great interest in these fruitful opportunities.

In FY2010, the Extended Course was launched; it allows FY 2009 Advanced Course students to explore research in-depth with particular faculty members for one year.

### "*Hirameki☆Tokimeki Science*"—Welcome to the University Lab-Science inspiring outreach science program for elementary and junior high school students

This program of the Japan Society for the Promotion of Science (JSPS) invites fifth and sixth year elementary school students, and junior high school students to university laboratories to have them see, hear and experience the results of research conducted at universities so that they can learn the relations between academic activities and daily life, and feel how interesting they are. Tohoku University held the following five events in FY2009.

■July 30–31, 2009 (same event program on both days)

**Professor Motoyuki Sato, Center for Northeast Asian Studies:**
***Ground-penetrating radar to detect mines***

Presentation to the children on how mines were removed in Afghanistan and Cambodia, and explained how the Advanced Landmine Imaging System (ALIS) detects mines by means of radar using electromagnetic waves. The children handled measuring instruments for electromagnetic waves and electricity, and experienced detection of a simulated mine by moving an ALIS around a large earth tank for the experiment.

Detecting a simulated mine with an ALIS

■August 8, 2009

**Professor Shoichiro Kurata, Graduate School of Pharmaceutical Sciences:**
***Feel the wonders of insect functions, together with Tohoku University Science Angels***

Some estimates claim that more than 80% of the species on the Earth are insects, and insects account for 99% of all the population on it. The children, guided by Science Angels, who are female students of graduate schools of natural sciences, explored the forming of insects' shapes, which enables them to thrive, and their excellent protective function against infectious diseases.

■October 3, 2009

**Professor Mamiko Sasao, Graduate School of Engineering:**
***Let's experience plasma—Energy around us***

Lectures on the present state of plasma technology, and an introduction of the relevant laboratories, were conducted. The children also experienced what plasma around us is like through an experiment to generate it, and how it can be used.

■October 12–13, 2009 (same event program on both days)

**Associate Professor Toshiaki Muramoto, Graduate School of Information Sciences:**
***Language, Mind, and Communication***

The language that we use has ambiguous and insufficient aspects; nevertheless we can communicate with others, because of the excellent work of the human mind. Professor Muramoto presented various examples and demonstrations of that work.

■January 7, 2010

**Professor Hitoshi Soyama, Graduate School of Engineering:**
***Strengthening by striking with bubbles***

The children learned why metal is strengthened by applying an impact force produced when special bubbles called, cavitations, are collapsed on it. They assembled bubble generators that they could take home for their own experiments. They also processed aluminum pieces with equipment actually used in research at the laboratory, and analyzed them with an X-ray diffractometer to learn about research activities at the site.

Lecture with an experiment by Prof. Soyama

### The 8th Tohoku University Gender Equality Symposium

Ten years have passed since the Basic Act for Gender-Equal Society was enacted. Tohoku University, the first university to admit women in Japan under the "Open-Door" policy, set up the Gender Equality Committee in 2001, and has since made active efforts to implement gender equality, including establishing the Sawayanagi Prize (Tohoku University Prize for the Encouragement of Gender Equality) and the Support Program for Female Researchers.

This symposium has been held annually since 2002. In FY2009, it took place at Katahira Sakura Hall at Tohoku University on November 28, 2009. It included the presentation ceremony for the Sawayanagi Prize, lectures, reports and panel discussions.

The Sawayanagi Prize consists of three categories: Research, Activity, and Projects, to promote research and activities related to gender equality, with emphasis on active proposals or plans to realize a gender equal society. The 7th Sawayanagi Prize (Research) was awarded to Miyuki Shimoebisu, Associate Professor at the Graduate School of Arts and Letters, for her paper: "Research on Policies of Child Support after Divorce and the Status of Women – Ambiguity in the Nation's Intervention in Families." It was praised as "research from a broad perspective that covers a wide range of family welfare policies, with a focus on changes in the child support system for fatherless households with divorced mothers, and depicts the status and problems of Japan in comparison with the United States and Britain."

The second part of the symposium titled "The State of Gender Equality in Tohoku University – Issues and Prospects as Truly Discussed" was a comprehensive report by Miyoko Tsujimura, Professor, Graduate School of Law, followed by a panel discussion on the state of gender equality and problems at Tohoku University with views and comments from the floor.

Some of the attendees' comments were: "the perspectives of 'broadening the range' and 'life-work balance' which will lead to the creation of an environment where individuals can give full play to their abilities regardless of gender" and "I would like the university to lead society theoretically and practically in implementing gender equality."

The 8th Tohoku University Gender Equality Symposium
The State of Gender Equality – Issues and Prospects as Truly Discussed

### Tohoku Women's Hurdling Project—toward Next-step Actions

The Tohoku Women' s Hurdling Project has provided support to help female researchers overcome obstacles along their career paths and establish systems for such support for three years since 2006. This project has produced results including newly established systems and revised internal regulations to increase female academics and improved attitudes among academics toward gender issues in the university, and increase women' s involvement in the management system of the university. To further develop these results, the Tohoku Leading Women's Jump Up Project for 2013 commenced in FY2009. It has set a target of having 30 female researchers in five years in the fields of physic, engineering and agricultural sciences, where the ratio of female researchers is low, with the aim of fostering "female researchers in Tohoku who are independent, helpful to each other, and who will shape the future." The Tohoku Women' s Hurdling Project still continues to be implemented as a unique project of our university, to realize a gender equal society by providing further support. This project includes the following.

#### ■Child Rearing/Elderly Care Support Program

One of the highest hurdles that female researchers must step over along their career paths is the task of taking care of their children/elderly parents while engaging in research. The Child Rearing/Elderly Care Support Program has reviewed, administered on a trial basis, and fully executed, a fully supported system to enable female researchers to do both tasks, in collaboration with the Committee on Equal Opportunity for Women Physiologists. The system involves dispatching a technical assistant/secretary selected from among applicants to female researchers who are rearing children, and providing financial support for the cost of hiring baby-sitters. Further developments of this program in collaboration with the Gender Equality Committee are a shortened work-time system and an improved system for extended terms of positions involved in taking child-rearing leaves, which creates an environment where female researchers are allowed to fully exhibit their abilities.

#### ■Environmental Improvement Program

To ensure that female researchers can continue their research activities, various appropriate environments need to be in place. Child-care facilities for ill children in Tohoku University Hospital, which have operated since 2001 under space limitations, were granted an increase in staff members by this project in FY2006, so that they can now be used by the entire university. Now every graduate school of natural science/natural science laboratory has a lounge for women under this program.

#### ■Next-generation Support Program

Science Angels is organized by women students who belong to graduate schools of natural sciences of Tohoku University. It was organized to nurture female researchers of the next generation and enlighten young women on selecting natural science courses for their future. The Science Angels work in scientific seminars/events outside the campus to convey the attraction and pleasure of science and research.

A Science Angels activity

**Forming a Tohoku University community where the students, graduates and staff of Tohoku University join together**

# Tohoku University Shuyukai

The Tohoku University alumni association, called Shuyukai, was inaugurated in 2007, the centenary year of the foundation of the university. The Shuyukaii is a Tohoku University community, having a membership of as many as 140,000 graduates, about 18,000 current students, a staff of about 6,000 people, and the families of the current students. The members interact with each other and promote friendship, and contribute the development of the university, with close communication between the members and the university. It aims to develop and strengthen the sense of solidarity among the members.

Shuyukai held Home Coming Day, an Exchange Meeting in Kanto, and an Exchange Meeting in Kansai as events where Tohoku University alumni and other concerned people could have friendly exchanges with one another. FY2009 graduate alumni secretaries were elected from among those graduates of each faculty who organize alumni meetings for graduates.

## Tohoku University 102nd Anniversary Home Coming Day

Sendai Seminar "New Region Creation – Basic Strategies for Self-Supportive Development –"

■(Saturday) October 10, 2009

Venue: Centennial Hall (Kawauchi Hagi Hall) and Kawauchi-Kita Campus (Kawauchi Gymnasium)

11:00–12:00 General Meeting of Shuyukai
13:00–15:30 Sendai Seminar "New Region Creation – Basic Strategies for Self-Supportive Development –"
12:00–1900 Friendly Exchange between students and graduates

■(Sunday) October 11, 2009

Venue: Centennial Hall (Kawauchi Hagi Hall)

### Autumn Cultural Festival

Friendly Exchange between students and graduates

◎Performances
Time: 13:00–15:00
Place: Centennial Hall (Kawauchi Hagi Hall)
Performers: Mandolin Club, Jazz ORCHESTRA, Glee Club, *Rakugo* Study Club, Traditional Japanese Music Club, Cheering Squad, Brass Band, Broadcasting Association (MC)

◎Exhibition
Time: 10:00–16:00
Place: Conference rooms in Centennial Commemoration Hall
Exhibitors: Movie Making Club, Photography Club, Japanese Calligraphy Club, Art Club, Mountain Climbing Club

### Concert in commemoration of Tohoku University 102nd Anniversary Home Coming Day

◎Performances
Time: 18:00–20:00
Place: Centennial Hall (Kawauchi Hagi Hall)

Concert in commemoration of Tohoku University 102nd Anniversary Home Coming Day

Autumn Cultural Festival (performance)

Autumn Cultural Festival (exhibition)

## Tohoku University 102nd Anniversary Exchange Meeting in Kanto

■(Sunday) August 2, 2009

Venue: Sapia Tower
(5F, Tokyo Station Conference)

15:00–17:30 Lecture
18:00–19:00 Networking Reception

Lecture

Networking Reception

## Tohoku University Exchange Meeting in Kansai on the 103rd Anniversary

■(Saturday) February 6, 2010

Venue: Creation Core Higashi-Osaka
(3F, South Building)

13:00–14:20 Science Café
14:30–17:00 Lecture
17:30–19:30 Kansai Branch Alumni Meeting and Networking Reception

Science Café

Kansai Branch Alumni Meeting and Networking Reception

## Alumni secretaries of the 103rd graduating class were elected by confidence vote

In FY2009, 26 members of the 103rd graduating class were elected as alumni secretaries by confidence vote on the occasion of the commencement ceremony on March 25, 2010.


Election of alumni secretaries of the 103rd graduates

## Tohoku University Silvester Concert

The second Tohoku University Silvester Concert was held. This new year countdown event featured performances by Mr. Eijiro Kai, a soloist of the Vienna State Opera, Mr. Satoshi Nakagawa, a popular tenor singer, Ms. Kaori Nakazawa, a soprano singer as a representative of Sendai City, and Mr. Fumiaki Miyamoto, an orchestra director, who was familiar with this kind of event in Europe. Many guests fully enjoyed their gorgeous and splendid performances on New Year's Eve.


■(Thursday) December 31, 2009

◎Bizet: Prelude to the first act of *Carmen*
◎Stravinsky: Suite from *The Firebird*
◎Mozart: Overture and "Non più andrai farfallone amoroso" from *The Marriage of Figaro*
◎J. Strauss: Czardas from *Die Fledermaus*
◎Verdi: "La donna è mobile" from *Rigoletto*
◎Verdi: "Libiamo ne' lieti calici"and "Di provenza il mar, il suol" from *La traviata*
◎Rodgers & Hammerstein: from *The Sound of Music*
◎Khachaturian: "Waltz" from *Masquerade Suite*
◎Puccini: "Nessun dorma" from *Turandot*

## Tohoku University New Campus Plan

# Each Campus environment now being developed based on the master plan

### Katahira Campus

### Extended Education & Research Building completed

As a facility mainly for professional graduate schools, the Extended Education & Research Building was completed in August 2010 on the site of the old Administrative Building Annex.

Created in order to draw the eye when viewed from the Main Gate, the building is covered with tiles and features the Tohoku University Logo on the tower. This outstanding design has made it a new landmark on the Katahira Campus.

### The Project Research Laboratory completed

The Project Research Laboratory, next to the University Archives near the Main Gate, was completed in December 2009.

Following the design of a historic building on the Katahira Campus, this building faces the road leading to the Main Gate, and is decorated with tiles forming conspicuous vertical lines. Its wall is aligned with those of the adjoining buildings while the higher stories are recessed, to allow the landmark Archives building to stand out.

### Construction started on Integrated Education & Research Building

Construction was started on the new Integrated Education & Research Building. The old building of the Department of Metallurgy of the School of Engineering in the former Tohoku Imperial University, adjoining the North Gate, which has been a familiar symbol of the Katahira Campus since 1925, will be renovated into the new building. Its outer tile walls will be preserved and reused, and some extensions of modern glass walls will be added to provide new functions. Thus, the old building will be revived, while preserving its historic design.

### Kawauchi Campus

### Remodeling and extension of the Welfare Facilities Building

The Welfare Facilities Building, which has a history of more than 40 years since it was built in 1969, has been completely renovated and extended with a new wooden cafeteria with a gentle arc shape facing the Kawauchi Campus Plaza, constructed in 2008.

This new cafeteria serves various meals from colorful kitchenettes. As a new feature of the Kawauchi Campus, it also creates a busy place to talk and get together, or a great place to just relax.

### Aobayama Campus

### Book café, "BOOOK," opened

As a part of the developments underway at the welfare facilities in the Aobayama East Campus, the BOOOK facility was opened. It contains a book café, the first of this kind in Tohoku University, store and travel counter. You can drink a cup of coffee brewed with a genuine espresso maker, surrounded by 25,000 academic books.

### New Aobayama Campus

### New campus under construction

The New Aobayama Campus is now under construction. It is designed to be a campus that maintains harmony with the rich natural environment that symbolizes the city of Sendai and is cherished by the people. The construction is progressing well.

The Fluctuation Free Facility for New Information Industry of the New Industry Creation Hatchery Center (NICHe) was opened in April 2010. This building is equipped with flexible laboratories that can accommodate diverse research, and bright spaces for resting.

The new campus will include the Aobayama Station (tentative name) of the Tozai Line of the Sendai City Subway, which is under construction and scheduled to open in 2015. The Tozai Line will run from near the Yagiyama Zoological Park in the southwest of the city to the East Interchange on the Sendai Tobu Road and on to Sendai Port via Aobayama Hill, Kawauchi and JR Sendai Stations. It will provide easy access to the campus from the center of the city.

### Booklet on the Tohoku University Campus Master Plan created

Topics

A booklet titled "Tohoku University Campus Master Plan," which has been sequentially reviewed and developed by the campus construction committees since 2007, was prepared in March 2010. Based on "Triangle Vision – Tohoku University New Campus Plan," this Master Plan deals with open spaces, facilities and transportation. It reorganizes the campuses in view of the opening of the Tozai Line of the Sendai City Subway in 2015.

**The Tohoku University New Campus Plan can be downloaded from the following web page.**
**http://campus.bureau.tohoku.ac.jp/tu_keii.html (Japanese only)**

| Divisions | Achievements |
|---|---|
| Graduate School / Faculty of Arts and Letters | Professor Kaneko Yoshiaki was awarded the Ichikawa-Sanki Prize.<br>Associate Professor Shimoebisu Miyuki was awarded the Sawayanagi Prize. |
| Graduate School / Faculty of Education | International Symposium and International Seminar: "New Challenges of Teachers and Schools in Asian Countries (Singapore, China and Korea)." |
| Graduate School / Faculty of Law | Global COE International Seminar 2009: Gender Equality in Multicultural Societies.<br>Global COE Hagi Seminar. |
| Graduate School of Economics and Management / Faculty of Economics | Assoc. Prof. Yasumasa Matsuda was awarded "the Japan applied statistical association prize."<br>Associate Prof. Yuko Nishide received the 8th Japan NPO Research Association Award of Excellence for her book "Social Capital and Civil Society in Japan." |
| Graduate School / Faculty of Science | Prof. Takakiyo Nakazawa was awarded the Purple Ribbon Medal for his research achievement of geophysics.<br>Prof. Hirokazu Tamura was awarded Nishina Memorial Prize 2009 for his research on Hypernuclear Gamma-Ray Spectroscopy.<br>Prof. Takayoshi Ogawa was awarded 2009 Analysis Prize for his research on Real analysis and its applications to the nonlinear partial differential equations in the critical function spaces.<br>Prof. Takeaki Iwamoto was awarded The Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology, The Young Scientists' Prize.<br>An international research team of Prof. Masashi Chiba has discovered new stellar streams the Andromeda Stellar Halo. |
| Graduate School / School of Medicine | Professor Emeritus Kazuo Sugamura received the Hideyo Noguchi Memorial Award for Medical Sciences.<br>Research Student Tokiko Saita received the 42nd Florence Nightingale Medal.<br>Dr.Toru Naganuma received JASSO's Student of the Year 2009.<br>Eradication of insulin resistance [The Lancet, Volume374, Issue9685, Page264] (Prof. Hideki Katagiri).<br>Keap1 is a forked-stem dimer structure with two large spheres enclosing the intervening, double glycine repeat, and C-terminal domains [PANS 2010 107 (7) 2842-2847.] (Prof. Masayuki Yamamoto･Senior Assistant Prof. Hirofumi Kurokawa). |
| Graduate School / School of Dentistry | Professor Emeritus Yorio Hinuma received the Order of Culture.<br>Training Course for Oral Cancer Screening started.<br>Publication of "Interface Oral Health Science 2009."<br>Selected for MEXT Research and Education Funding "Highly-functional Interface Science: Innovation of Biomaterials." |
| Graduate School of Pharmaceutical Sciences / Faculty of Pharmacy and Pharmaceutical Sciences | Professor Hideo Takeuchi has been awarded The Spectroscopical Society of Japan Award.<br>Professor Yutaka Imai has been awarded 2009 Prevention Prize from Japan Heart Foundation. |
| Graduate School / Faculty of Engineering | Profs.Makino, Saka, Inomata, Omata, Yamanaka were awarded the Commendation for Science and Technology by the Minister of Education,Culture, Sports, Science and Technology (Public Understanding Promotion Category) according to the practice based education using advance technology.<br>Prof. Keisuke Asai received Kenneth, Harris James Prize and Thomas Hawksley Gold Medal from the Institute of Mechanical Engineers for his paper on Pressure-Sensitive Paint.<br>Associate Prof. Qiang Chen, Prof. Kunio Sawaya et.al. received the Zen-ichi Kiyasu Award on 23 May, 2009 from the Institute of Electronics, Information and Communication Engineers (IEICE).<br>The title of the paper is "Galerkin's Moment Method Analysis for Dielectric Scatterers-Single Integral Expressions of Mutual Imepedance between Sinusoidal Monopole Blocks with Consideration of End Point Charges-."<br>Prof. Hitoshi Mimura was awarded the Japan Association of Ion Exchange • Society Prize for developing highly functional microcapsules.<br>Prof. Tatsuo Uchida received the 59th KAHOKU News-Paper Award for his fundamental researches of liquid crystal and development of high performance liquid crystal displays.<br>Prof. Takumi Fujiwara received the Ceramic Society of Japan (CerSJ) Award for academic achievements in ceramic science and technology: "Fabrication of novel nonlinear optical glass and development of fiber-type active devices."<br>Prof. Hiroshi Yoshino (Chair) and other members of a committee were awarded by contribution for The Society of Heating and Air-Conditioning and Sanitary Engineers of Japan (SHASE) and excellent achievement through the activity of SHASE research committee. |
| Graduate School of Agricultural Science / Faculty of Agriculture | Innovative Research Center for Agricultural Sciences was established to conduct challenging research.<br>Prof. Eimei Sato was awarded Purple Ribbon Medal for his achievements on animal reproduction.<br>Emeritus Prof. Hiroshi Ohrui was awarded Japan Academy Prize for his contribution to synthesis of functional molecules. |
| Graduate School of International Cultural Studies | The 2nd Asian Automotive Environmental Forum.<br>Associate Professor Ichiroh Daitoh received the Kojima Kiyoshi Award for outstanding paper from the Japan Society of International Economics. |
| Graduate School of Information Sciences | "The Information Literacy Education Professional Program" supported by MEXT Program for Improving Graduate School Education.<br>3rd seminar of OB and incumbent faculty cooperative work on "Science Integration" was held. |
| Graduate School of Life Sciences | Identification of Varp as a novel regulator for trafficking of melanogenic enzymes.<br>Discovery of a role for a neo-sex chromosome in stickleback speciation. |

| Divisions | Achievements |
|---|---|
| Graduate School of Environmental Studies | Realtime visualization system on emission of $CO_2$.<br>A group led by Prof. Hiroshi Takahashi received the International Symposium on Earth Science and Technology Best Paper Award. |
| Graduate School of Biomedical Engineering | Started the 2nd term of the REDEEM (Recurrent Education for Development of Engineering Enhanced Medicine). |
| Graduate School of Educational Informatics Research Division | Development of ICT Experts using ISTU and Center for Innovations and Support in Education. |
| Institute for Materials Research | Spin current and electric signal transmission in insulator (Prof. Saitoh's Group).<br>Win the Eighth Industry-Academia-Government Collaboration Promotion Award "Minister of MEXT Award" for developing cryogenfree hybrid and superconducting magnets (Prof. Watanabe's Group).<br>New complex hydrides exhibiting lithium fast-ion conduction at room temperature(Prof. Orimo's Group). |
| Institute of Development, Aging and Cancer | The symposium entitled "SMART Aging" and open to public was organized on Oct. 9th, 2009.<br>Development of a new disinfection method to kill Pseudomonas aeruginosa. |
| Institute of Fluid Science | Prof. Seiji Samukawa received "The Commendation for Science and Technology by MEXT (Research Category)."<br>Sixth International Conference on Flow Dynamics was held with 448 participants from 16 countries. |
| Research Institute of Electrical Communication | Selected for "Funding Program for World-Leading Innovative R&D on Science and Technology", establishment of "Center for Spintronics Integrated Systems" (Prof. Hideo Ohno).<br>Prof. Junichi Murota was awarded "The Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology."<br>Associate Prof. Toshihiko Hirooka received 2010 The Young Scientists' Prize, the Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology. |
| Institute of Multidisciplinary Research for Advanced Materials | The establishment of Network Joint Research Center for Advanced Materials and Devices.<br>Prof. Takashi Kyotani received 2009 Prize for Science and Technology (Research Category), the Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology.<br>Prof. Hidetoshi Oikawa received the 27th CSJ Award for Creative Work from the Chemical Society of Japan.<br>Prof. Tadafumi Adschiri and Shigefusa Chichibu received 2010 Prize for Science and Technology (Research Category), the Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science andTechnology. |
| Center for Northeast Asian Studies | Survey of a missing car by landslide due to Iwate-Miyagi Nairiku Earthquake by Advanced Electromagnetic Methodology (Prof. Motoyuki Sato, Graduate School of Science and Ass. Prof. Miura, Resarch Ass. Ohta). |
| Research Center for Neutrino Science | Detached from Faculty of Science as new facility for research and common use.<br>Selected for MEXT special funding: investigation of neutrino mass structure. |
| Center for the Advancement of Higher Education | Publication of two written/edited issues by the Tohoku University Press including *"Current Class Evaluation by Students."*<br>Approved by MEXT as "Joint Educational Development Center" for "Educational Development Core in International Cooperation." |
| The Center for Academic Resources and Archives | 50th anniversary: opening ceremony, exhibition and symposium at Botanical Gardens. |
| International Advanced Research and Education | Nurturing for excellence young researchers in interdisciplinary areas by selection of Doctoral and Master's course students of the institute and employment of Research Fellows and etc. |
| Center for Information Technology in Education | Total replacement of the information systems for education. |
| Cyclotron and Radioisotope Center | Assoc.Prof.Tashiro received 20th Clinical Pharmacology Encouragement Award (Society Award) in Japanese Society of Clinical Pharmacology. |
| Center for Interdisciplinary Research | Prof. Tetsuo Endoh has promoted a joint research on a Green Innovation Device based on Vertical Structured Device with Taiwan National Nano Device Laboratory, which led a reciprocal department agreement with Taiwan National Nano Device Laboratory. |
| Cyberscience Center | Cyberscience Center has been approved by Information Processing Society of Japan as "The Satellite Museum of Historical Computers." |
| Tohoku University Library | The prolongation of hours of the Main Library resulted in 100,000 increase in the visitors from 530,000 of 2008.<br>"Wasan (Japanese mathematics) Portal" received Publication Prize from Mathematical Society of Japan. |
| Tohoku University Hospital | Approach beginning for Developinng an Assisted Career Promotion System for Nurses (2009"A plan for Building a Career System for Nurses"in Ministry of Education,Culture,Sports,Science and Technology).<br>Establishment of a coordination system for perinatal emergency and transport(The project of a coordination system for perinatal emergency and transport in Miyagi prefecture).<br>Completion of new outpatient clinic.<br>Opening of Hoshinoko Nursery School. |
| Institute of Liberal Arts and Sciences | Carrying out comprehensive courses from more professors by presidential appointment. |
| WPI Advanced Institute for Materials Research | WPI-AIMR Director Y.Yamamoto was awarded "Royal Society of Chemistry (RSC) Centenary Prize 2009."<br>Professor M. Esashi was selected as a leading researcher under the Advanced Research and Development Support Program. |

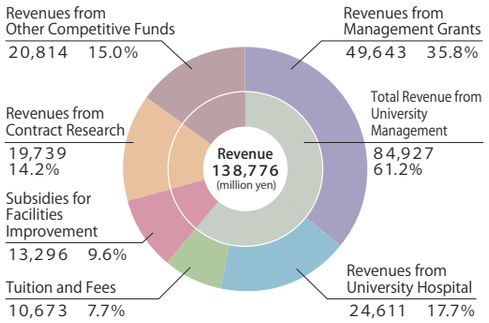
## ■ Data and Overview of Tohoku University

### ●Number of Students (as of May 1, 2010)

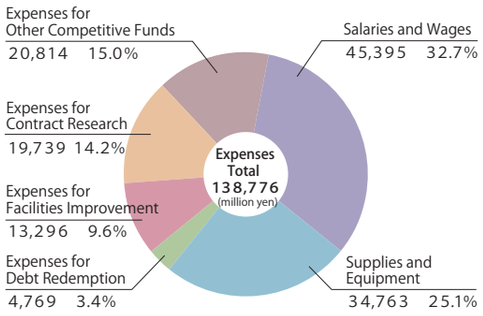
| | School enrollment | International students |
|---|---|---|
| Undergraduate students | 10,997 | 133 |
| Graduate students (Master's course, Professional Degree Program) | 4,402 | 464 |
| Graduate students (Doctoral Course) | 2,734 | 501 |
| Students at Affiliated Schools | 34 | 0 |
| Research students/Others | 633 | 413 |
| Total | **18,800** | **1,511** |

### ●FY2009 Financial Summary

• Revenue FY2009




• Expenditure FY2009




### ●Number of Faculty and Staff Members (as of May 1, 2010)

| | | |
|---|---|---|
| President | | 1 |
| Board of Directors | | 6 |
| Auditors | | 2 |
| Faculty Members | | 2,892 |
| | Professors | 832 |
| | Associate Professors | 692 |
| | Senior Assistant Professors | 149 |
| | Assistant Professors | 1,093 |
| | Research Assistant | 126 |
| Administrative/Technical staff/Others | | 2,927 |
| **Total** | | **5,828** |

### ●Agreements on Academic Exchange (as of May, 2010)

| | | |
|---|---|---|
| Agreements on the University Level | 28 countries/regions | 144 institutions |
| Agreements on the Department Level | 41 countries/regions | 301 institutions |

### ●Overseas Office (as of May, 2010)

| | | |
|---|---|---|
| Liaison offices | 9 countries | 14 centers |
| Overseas offices | 2 countries | 2 offices |

### ●Number of International Students (as of May 1, 2010)

| | | |
|---|---|---|
| | 76 countries and regions | 1,511 |

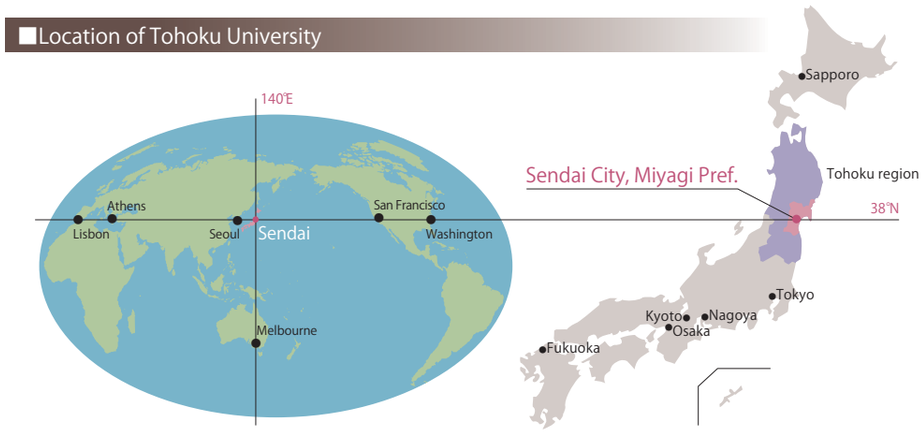
### ●Number of Exchange Students Based on Academic Agreements (FY2009)

| | | |
|---|---|---|
| To Overseas | 9 countries | 31 |
| From Overseas | 15 countries | 169 |

### ●Endowed Chairs and Research Divisions (as of May 1, 2010)

| | |
|---|---|
| Endowed Chairs | 29 |
| Endowed Research Divisions | 16 |

## ■Location of Tohoku University

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