TOHOKU UNIVERSITY

Distinguished Professors 2008

TOHOKU
UNIVERSITY

Distinguished Professors

an Address

President of Tohoku University
Akihisa Inoue

"2008": Tohoku University has taken a new step toward creating the next 100 years' history. In the context of rapid change in the environment surrounding the university, we who are entrusted with making a great contribution to humanity need to achieve innovation in the fields of research and education, to improve and advance ourselves through persistent efforts and profound study.

In these circumstances, I consider that the introduction of the system of Distinguished Professors is significant for the further development of this university, and a necessary step toward targeting "world-leading University" status in the future.

The system of Distinguished Professors is intended to honor those professors who play important leading roles in the fields of education, research and social contribution at this university. This system aims to support their activities, as well as to promote the recruitment of outstanding human resources by conveying our respect worldwide.

The Distinguished Professors selected in this system have outstanding achievements in each academic area based on their elite level of expert knowledge; in their research, they work with a philosophy comprising three key words: "Challenge", "Creation" and "Innovation". In a manner of speaking, they are the treasures of the University.

I believe that their achievements to date will serve as good examples and a source of encouragement for other faculty members and students throughout this university, so that one day the achievements of those they have inspired may lead to the contribution to improvement of human society.

I would like to ask the cooperation of the 30 elected professors' in participating in the events held by this university, such as the entrance ceremony and science cafe over the coming 3 years, as we have begun this year a new century of university history. Furthermore, I expect them to play an important leading role in disseminating their education and research activities, and in their contribution to society through daily activities.

Distinguished Professor System

The Distinguished Professor System is designed to support professors who are leading in the fields of education, research, social contribution. Tohoku University intends to show its appreciation of these distinguished professors to the world, and to increase the university's international profile, and to ensure world-class human resources.

Appointed as Distinguished Professors for the first time in this system are 30 professors (25 on April 1, 2008 and 5 on August 1, 2008) who have made great achievements based on the highest expertise. All of them have a research mentality of "Challenge," "Creation," and "Innovation," which are three keywords developed in Tohoku University.

The activities of the Distinguished Professors are expected to stimulate other teaching staff and be a model for students, and to encourage them to make a contribution to human society. During a term of three years beginning the academic year of 2008, when Tohoku University starts another 100 years of its history, they will spread various activities of the university throughout society.

CONTENTS

Teruo Asakawa ／ Professor ／ Center for the Advancement of Higher Education

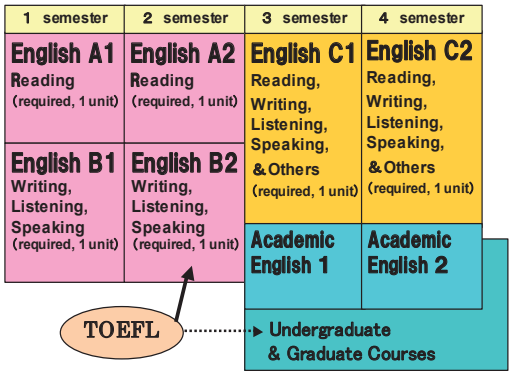
Profile

Professor Teruo Asakawa, Doctor of Informatics, was born in 1950. His major fields of study are English Linguistics and Teaching of English. He has been involved in studying English grammar and teaching college-level English for more than 30 years. After earning a master's degree at Tokyo University of Education, he began to teach English at Kitami Institute of Technology (1976-1980), followed by Kanazawa University (1980-1984). In 1984, he began work at Tohoku University. He studied Linguistics at the University of Massachusetts, Amherst as a Fulbright Fellow (1987-88). After ten years work in the Faculty of Liberal Arts and Sciences, which was reorganized in 1993, he was transferred to the Graduate School of Information Sciences (1993-2004). He worked at the Graduate School of International Cultural Studies from 2004-2007. In 2005-2007, he served as dean of GSICS and was a councilor of the Education and Research Council of Tohoku University. At the Center of Advancement of Higher Education, he is now analyzing the status quo and problems of English education at Tohoku University.

Research Activities

It is an unavoidable task in college-English teaching to address the issue of how to make substantial progress in the development of a new curriculum and / or improvement of English coursework. Teaching of English in Japan is supposed to have two purposes, i.e., teaching the English language and teaching other knowledge through English. The former means that students have sufficient language skills ability to understand and create English expressions, while the latter means that they acquire general knowledge which helps promote mutual understanding of different cultures and develop a skill of critical thinking. Ample grammatical knowledge and extensive vocabulary constitute an indispensable portion of basic research capabilities. One of the timeless missions for Japanese universities is to produce students who have a fertile international-mindedness, as well as the communication skills required in an academic environment. Therefore, the best practice in designing a curriculum is to maintain a proper balance between language teaching and language-based education. Universities today have to periodically review their current curriculum in order to develop a new program that implements innovative ideas of English teaching. A curriculum depends on a university's philosophy of education. A basic concept in curriculum design for a research-oriented university should be 'Teaching English for Academic Purposes.' With this concept, we would never lose sight of the essentials of any curricular reformation of English teaching.

English Curriculum in Tohoku University



CALL Room

Message

In Japanese universities, most teachers of foreign languages perform a double duty as a teacher of a foreign language and a scholar of an academic discipline. Regrettably, it was a Japanese tradition that teaching activity ranked lower than research activity among evaluation standards. I felt concerned about the possibility that the tendency for research-based evaluation would be reinforced through university reforms such as prioritization of graduate education. However, the situation seems to have changed. The importance of foreign language teaching has been increasingly recognized within the university and outside. I realize that now we have a greater role and responsibility in university education. But remember that curricula only set the foundation from which you could step into a higher stage.Thus, I always feel perplexed when I hear people say that English taught at school does not serve any useful purpose. Nobody could be proficient in English if they did not spend a lot of time and effort practicing English outside the class. No matter how well-designed it might be, a curriculum would not be a good one if it did not foster learners' positive attitudes toward a continuously self-directed learning. It is also imperative that instructors rethink what and how they teach, considering what students ask for in language learning.

Tatsuo Uchida ／Professor ／Graduate School of Engineering

Profile

Prof. Uchida received his BSc, MSc and PhD degrees in electronic engineering from Tohoku University in 1970, 1972 and 1975, respectively.

From 1975 to 1982 he was Research Associate, from 1982 to 1989 Associate Professor, and since 1989 he has been Professor in the Department of Electronic Engineering, Tohoku University. From 2002 to 2007 he was Leader of the 21st Century COE Program. Since 2006 he has been Dean of the Graduate School of Engineering and Faculty of Engineering, Tohoku University. He received the Award of the Science and Technology Contributor from the Director of the Science and Technology Agency in 1986, the Special Recognition Award from SID in 1988, the Niwa-Takayanagi Achievement Award from the Inst. Television Eng. Japan in 1990, The Achievement Award from Japanese Liquid Crystal Society in 2001, The Inoue Harunari Award from Japan Science and Technology Corporation in 2001, the Jan Rajchman Prize from SID in 2004, The Minister of Education, Culture, Sports, Science and Technology Prize in 2005, the Slottow-Owaki Prize from SID in 2008, and many other awards. Prof. Uchida is Fellow of SID, IEICE, and ITE.

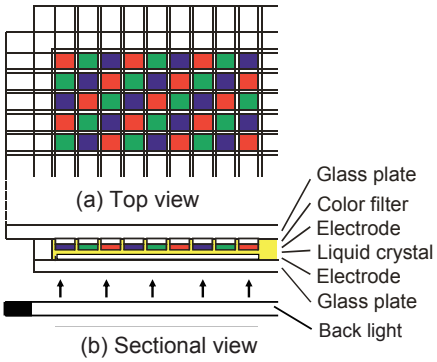
Research Activities

Prof. Uchida Started his research at the dawn of liquid crystal display (LCD) in 1970. It was an untrodden path for electronics because organic material as well as liquid phase had never been used in electronic active devices. He challenged in this field and has contributed to realize high performance liquid crystal displays as follows.

(1) He has analyzed the mechanism of molecular alignment of liquid crystal on substrate surfaces and has established a procedure to control the alignment, which was applied to the production process of the liquid crystal display, and has contributed to establish precise and reproducible manufacturing technology.

(2) He has devised and developed several new LCDs including color LCDs, reflective LCDs, wide-viewing angle LCDs and fast response LCDs.

Especially for color LCDs, he has first devised and developed color LCDs using micro color filters inside of the cell and reflective color LCDs without back light, which have been widely used in LCD televisions, notebook PCs, mobile phones, etc.



Color liquid crystal display

First trial color liquid crystal display

Message

When I was a high school student, I heard that the Department of Electronic Engineering of Tohoku University had the most excellent and strongest professoriate, and I decided to enter Tohoku University leaving Shizuoka Prefecture, far from Sendai. I measured in semiconductor and finished the undergraduate course and research. When I entered graduate school, so many students desired to major in semiconductor research that the students were selected by lot. As a result, I failed the selection and had to change my research theme to liquid crystals, against my wish.

I started my research on liquid crystals alone in the laboratory with almost no information, no know-how, no equipment and no liquid crystal material. First of all, I had to synthesize the liquid crystal material and purify it without sufficient chemical knowledge. It took more than three years to get satisfactory liquid crystal materials.

I took a roundabout way and wasted a lot of time, but I could meet and became intimate with many physicists and chemists besides electronic engineers. In addition, I could learn many things in the new field, especially the spirit of challenge. I also learned that in the field of Engineering just one person can change the world.

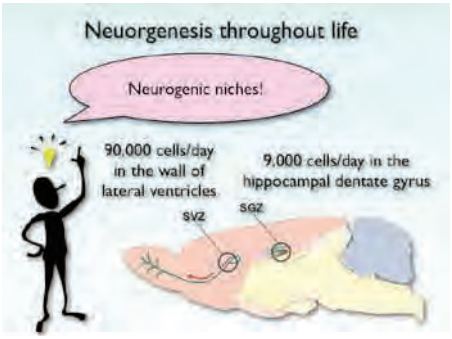
Noriko Osumi ／Professor／Graduate School of Medicine

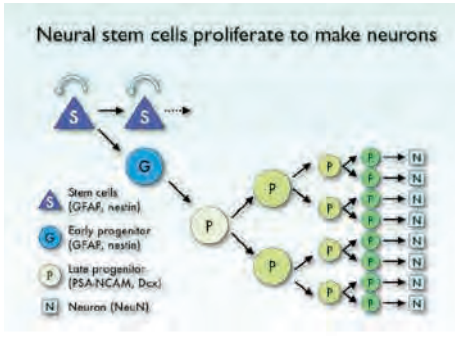
Profile

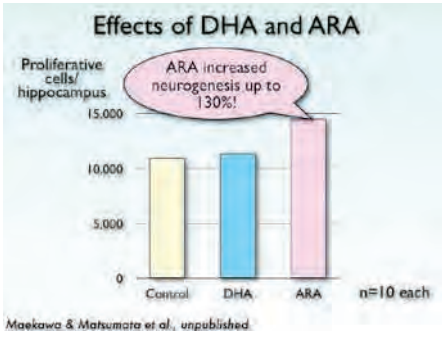
Prof. Osumi graduated Tokyo Medical and Dental University, was awarded her PhD thesis from the same university, and has been a professor of Tohoku University School of Medicine since 1998. She has been appointed in various governmental committees such as those addressing ethical issues, grant system development, and career paths for young scientists, and was also chosen as the youngest member of the Japanese Council Japan in 2005. Her research interest covers broad areas such as pre- and postnatal development of the brain and craniofacial region, and behavior of animals as models of psychiatric diseases. More specifically, she has recently been investigating the regulatory mechanisms of neurogenesis and the maintenance of neural stem cells at cellular and molecular levels both in embryonic and postnatal stages. Manipulating embryos and imaging brain cells are the specialism of her lab. She has translated two books into Japanese: *Essential Developmental Biology* by Jonathan Slack and *The Birth of the Mind* by Gary Marcus. She is a representative of the CREST project (2005-2009) supported by JST and of Global COE project (2007-2011) supported by MEXT.

Research Activities

Our brain functions are based on a huge number of brain cells, i.e., neurons and glia (astrocytes, oligodendrocytes, and microglia), and blood vessels that supply oxygen and nutrients to all the brain cells. During the development of the brain, neurons arise from neural stem and progenitor cells lining the ventricle of the neural tube (the ventricular zone). Subsequently, in the adult brain, a subset of astrocyte-like cells remain as neural stem cells in the subventricular zone of the lateral ventricle and the dentate gyrus of the hippocampus, giving rise to neuronal progenitors that in turn produce neurons throughout life. The understanding of embryonic and adult neurogenesis, and possible medical applications, are fields of highly active research. Our laboratory is working on both embryonic and postnatal neurogenesis at the molecular and cellular levels. We have recently revealed that polyunsaturated fatty acids such as arachidonic acid can promote neurogenesis. Since decreased neurogenesis seems to be associated with depression and other mental diseases, administration of arachidonic acid can be used as a therapy to prevent / treat mental illness.







Message

For scientists, nothing is more precious than the joy of finding truth. Each step on the path to discovery requires careful observation with eyes unclouded by preconceptions or bias. Each new discovery is made even more enjoyable when shared with other lab members or researchers in different fields. And indeed, exchanging information and ideas with people from different backgrounds may open up new key questions. It is also equally important and enjoyable to find ways to make use of discoveries in the world outside the lab. The benefits of scientific achievement should be returned to society whenever possible. Although it may sometimes seem difficult to share your findings with people who are unfamiliar with science and technology, such communication with the public may in fact tell you where you are and where you need to go, possibly leading you on the road to new endeavors. I sincerely hope that you will make good use of your power of peering deeply into things in making the future fruitful both for yourself and for society.

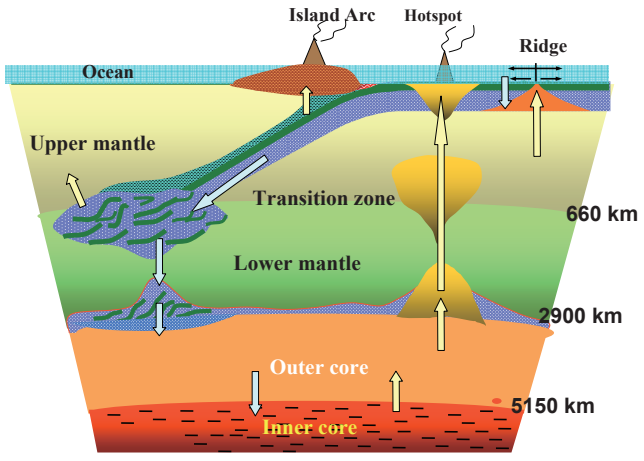
Eiji Ohtani ／ Professor ／ Graduate School of Science

Profile

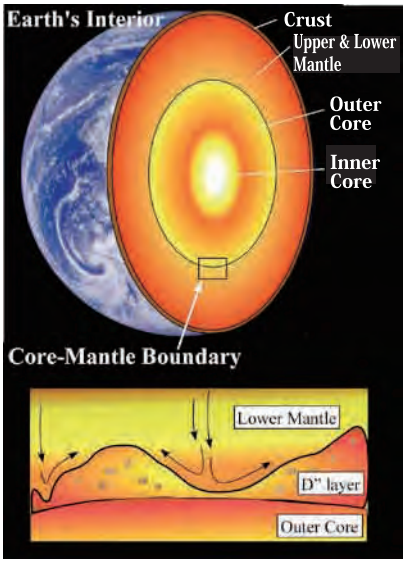
Born 1950; BSc Tohoku University (Mineralogy and Petrology), 1973; DSc Graduate School of Science, Nagoya University (Geophysics), 1979; Assistant Prof. of Ehime Univ., 1980; Research Fellow at Australian National University, 1981-1983, Associate Professor of Ehime Univ., 1988, Associate Professor of Tohoku Univ., 1989; Professor of Tohoku Univ., 1994- present. Awarded Mineralogical Society of Japan Award, 1997; Fellow of American Mineralogical Society, 2002; Fellow of American Geophysical Union (AGU), 2006; Awarded Norman L. Bowen Award from AGU, 2007: Leader of Tohoku Univ. 21st Century COE Earth Science Program, 2004-2008; Leader of Tohoku Univ. Global COE Earth Planetary Science Program, 2008-2012.

Research Activities

The earth and planetary interior is under high pressure and temperature conditions (365 GPa and 5000 K at the center of the earth). Our main research is to simulate the high pressure and temperature conditions in the laboratory and to clarify experimentally various processes working in the deep earth's interiors. We have currently produced the conditions of the earth core-270 GPa-3600K, and 375 GPa-700 K- and clarified the stability of the Fe-Si alloys, a potential candidate for the inner core. We clarified the reactions between molten Fe and silicates, and showed dissolution of O, Si, and K in molten Fe under the core–mantle boundary conditions. These results provide important constraints on the light elements and radioactive energy production in the core. We also clarified the global water circulation in the whole mantle from crust to core. We discovered a hydrous phase that is stable to the core-mantle boundary condition of 120 GPa and 2000 K. Thus, water can be transported into the deep mantle and into the core–mantle boundary region by slab subduction.



Global circulation of hydrogen in the Earth



The core and core-mantle boundary: Research frontier of the Earth Science

Message

As an undergraduate student at Tohoku University, I visited Hokkaido, Japan, in 1972 for a field survey. I was deeply impressed by the beautiful and fresh peridotite outcrops of the deep interior of the Earth's mantle, and I wanted to understand the mystery operating in the earth's deep interior. I was assured that high-pressure works are vital to clarifying the earth's deep interior. This is the reason why I am now working as a professional in studying the earth's deep interior. Since 1972 I struggled to develop high pressure generation techniques and facilities in several institutions in my career, such as Ehime University (Japan), Australian National University (Australia), and Tohoku University. Our experiments to generate ultrahigh pressures can be applied to a deep magma ocean and giant impact phenomena which created the earth and moon in the early solar system. My dream in my research is to reproduce the conditions of the center of the earth in my laboratory by developing the high pressure technology, and to clarify the materials composing the center of the earth. Currently, we have achieved the pressure exceeding the center of the earth, 375 GPa-700 K, 270 GPa-3600 K. Now, I am very close to my dream to achieve the center of the earth. I believe that I am now in one of the most fruitful and enjoyable times in my research career, and I am enjoying research here by intensive discussions with young active graduate students and post-docs. Finally, I would like to work as a program leader to create one of the centers of excellence (COE) in earth and planetary sciences in Tohoku University in the next five years of our global COE program. I am sure that we can achieve successfully our final goal of our global COE program.

Hideo Ohno ／ Professor ／ Research Institute of Electrical Communication

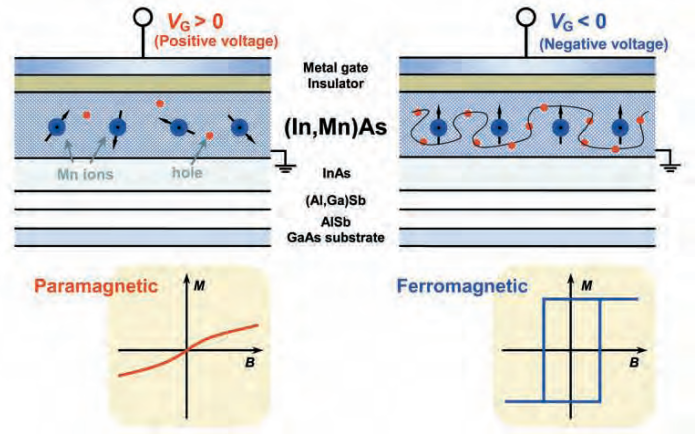
Profile

Hideo Ohno received his BSc, MSc and PhD degrees from the University of Tokyo in 1977, 1979 and 1982, respectively. He spent one year as a visiting-graduate student at Cornell University, Ithaca, USA from 1979. He joined the Faculty of Engineering of Hokkaido University in 1982. He was a visiting scientist at IBM T. J. Watson Research Center from 1988 to 1990. He moved to Tohoku University as Professor in 1994, where he is currently Director of Laboratory for Nanoelectronics and Spintronics, Research Institute of Electrical Communication. Professor Ohno received the IBM Japan Science Award (1998), the IUPAP Magnetism Prize (2003), Japan Academy Prize (2005), Presidential Prize for Research Excellence, Tohoku University (2005) and the 2005 Agilent Technologies Europhysics Prize. He is a fellow of the Institute of Physics (IOP) since 2004, an honorary professor of Institute of Semiconductors, Chinese Academy of Sciences since 2006 and a fellow of the Japan Society of Applied Physics (JSAP) since 2007.

Research Activities

Hideo Ohno has been involved in the research of spintronics, where both spin and charge are used to realize functionalities otherwise not possible. He has developed and studied III-V-based ferromagnetic semiconductors and heterostructures, in which rich spin-related phenomena have been discovered, and by doing so introduced a new degree of freedom associated with ferromagnetism in nonmagnetic semiconductor heterostructures. This freedom is utilized to electrically inject spin polarized currents in semiconductor heterostructures and, using an insulating field-effect transistor structure having a magnetic semiconductor channel, to demonstrate electrical control of ferromagnetism. This demonstration is the first of this kind to show that isothermal and reversible control of ferromagnetism is possible, something which has been elusive in the history of magnetism. His series of studies have led to worldwide spintronics research activities in physics as well as in those areas aiming at applications. He is also studying spin-coherence and the quantum mechanical nature of spin-related phenomena in nonmagnetic semiconductors. He is currently leading a project on magnetic tunnel junction / CMOS hybrid integrated circuits for developing novel nonvolatile memories and logic circuits.

Electric-field control of ferromagnetism



By applying electric-fields, carrier (hole) concentration was controlled in ferromagnetic semiconductor (In,Mn)As, which allowed demonstration of turning on and off the ferromagnetic phase reversibly without changing temperature for the first time.

Message

First, I would like you to develop your ability to write and speak logically, in your own language and in English. Top researchers can all write fast with a solid and clear logic. In order to be one of them or even better, you have to train yourself; it's simple: try to write logically and fast for five years and I promise you will notice a big difference. Secondly, I suggest you think of two things: optimize whatever you are doing within the given boundary conditions, and at the same time define a new and different set of boundary conditions yourself. By doing so you will find a lot of chances to discover new and different things that others don't see. Thirdly, very few people are given chances to study and work in the kind of environment you are currently enjoying. Think about others and use part of your time for others. Lastly, enjoy your life – literature, sports, music and much more – in addition to your science and / or engineering; after all, life is not that long.

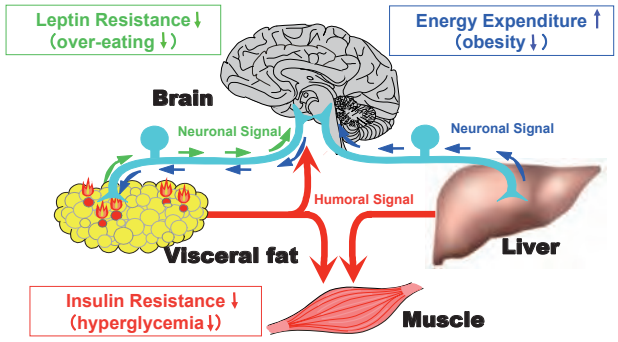
Yoshitomo Oka ／ Professor ／ Graduate School of Medicine

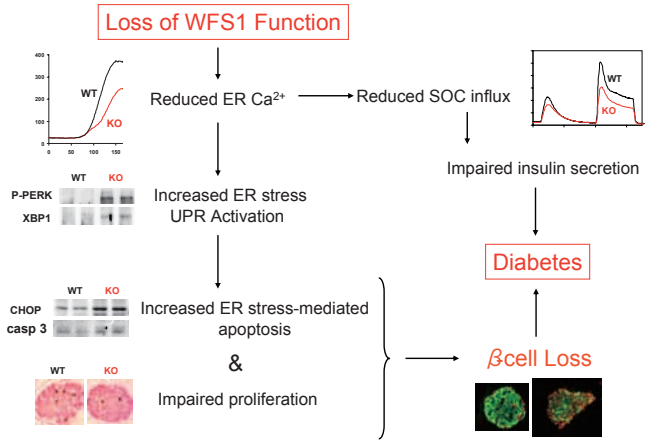
Profile

Yoshitomo Oka, MD PhD, is currently a professor of medicine and chief of the Diabetes and Molecular Metabolism division at Tohoku University Graduate School of Medicine and University Hospital. He graduated from School of Medicine at the University of Tokyo in 1974, and has since focused on life-style related diseases, particularly diabetes mellitus. His pioneering work on glucose transport is highly regarded world-wide. He has also conducted elegant experiments on genes causing diabetes and the mechanisms of pancreatic beta cell survival. He has received many awards including the Japan Diabetes Society Award (for a young investigator) in 1992, the Japan Endocrinology Society Award (for a young investigator) in 1994, and the Japan Diabetes Society Award (for an established investigator) in 2008. He was a chairman of the 50th Japan Diabetes Society Meeting in 2007 and has been nominated as chairman of the Japanese Society of Internal Medicine for 2009.

Research Activities

Metabolism is coordinated and regulated via interactions among different organs / tissues throughout the body. This coordinated metabolic regulation is apparently essential for maintaining systemic homeostasis, particularly glucose and energy metabolism. Therefore, communication among organs / tissues is extremely important and disturbance of this control system may lead to the development of metabolic disorders. Insulin secreted from pancreatic beta cells is one of the important humoral factors necessary for communication. In addition, Profesor Oka's research group has identified afferent autonomic nerve signals from intra-abdominal adipose tissue that modulate hypothalamic leptin sensitivity and regulate food intake. The research group has also found that metabolic information originating in the liver reaches the brain and increases sympathetic outflow into muscle and adipose tissues. Their findings indicate that, in addition to humoral factors including adipocytokines, neuronal circuits involving autonomic nerves constitute an important metabolic regulatory system. The brain obtains a variety of metabolic information from peripheral organs / tissues through these two avenues, resulting in cooperative metabolic regulation among tissues / organs throughout the body.





Message

Clinical medicine and the medical sciences in general are making rapid progress. Medical science researchers have contributed to this remarkable progress. I hope that you will be one of these medical science researchers.

An unexpected discovery can lead to extraordinary progress. Such discoveries are often a matter of "serendipity". Nobody truly knows what is required for "serendipity" to occur. The only thing I know is that "luck comes to scientists who make every effort to prepare themselves to recognize luck when it arrives."

We recently discovered the metabolic information highway, which is a neuronal network involved in the maintenance of systemic homeostasis. We are currently searching for the molecule(s) activating the nerve endings reflecting the metabolic states of organs. This discovery is anticipated to lead to novel therapies for diabetes associated with obesity, a major problem in this era of over-nutrition.

Ryuta Kawashima ／ Professor ／ Institute of Development, Aging and Cancer

Profile

Dr. Ryuta Kawashima was born in 1959 in Chiba, Japan. He has been a Professor of the Department of Functional Brain Imaging, Institute of Development, Aging and Cancer (IDAC), Tohoku University from 2006. He graduated Tohoku University School of Medicine in 1985, and finished the PhD course of the Tohoku University Graduate School of Medicine in 1989. His scientific interests are in functional brain mapping of higher cognitive functions of humans, and in dynamics of microstructures of the brain. He has also been paying his attention to returning the benefits of basic sciences to the public, so that he has proposed systems for improvement of the prefrontal functions of humans through industry-university cooperation. He has won the Japan Society for Nuclear Medicine Award in 1996, and the Minister for Public Management, Home Affairs, Posts and Telecommunications prize in 2008. His scientific output includes over 140 peer-reviewed papers and 100 books.

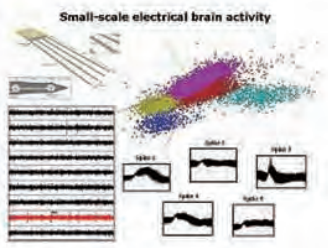
Research Activities

Researchers in our department have a variety of backgrounds including medicine, science, life science, engineering, pharmacy, linguistics, pedagogy, and the arts, and work energetically on a wide range of studies of brain science, from brain dynamics research, which is designed to determine the metabolism and circulation of brain cells in animals, to functional brain imaging research, which creates images of the working of the mind, to social technology study, which applies the findings of these studies to educational and welfare fields.

In brain imaging research, our interest is the "human mind." Pursuing research of the relationship between brain and mind, we are trying to find answers to eternal questions of both natural science and humanity, such as "What do humans exist for?" and "Where did humans come from and what is our future?" In brain dynamics research, we are elucidating the principles of brain activity by studying neuronal activity and metabolism, as well as microcirculatory dynamics in small animals. In social technology research, we will open a new possible approach to education and social welfare from the viewpoint of brain science. Since this is still a new and uncharted research field, we will face a bumpy road ahead in the near term.

Brain Dynamics Research

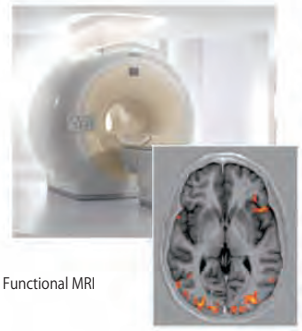
Two-photon laser microscope system



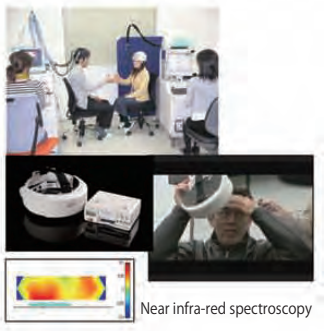
Multi-unit neuronal activity recording system

To investigate neuro-vascular coupling of the cerebral cortex, advanced brain imaging techniques have been applied for experimental animals.

Functional Brain Imaging Research



Functional MRI



Near infra-red spectroscopy

To investigate relationship between brain and mind, advance brain imaging techniques have been applied for human brain mapping

Message

When I was a junior high school student, I wanted to integrate my brain into a computer so that I could witness the downfall of mankind after my death. This is the reason why I decided to study the human brain. To fulfill this childhood dream, I studied at the Graduate School of Tohoku University and attempted to study human brains by positron emission tomography (PET). However, no one in the world had any idea of how to advance the study. I struggled for a few years without any progress, during which, however, I never gave up on my dream of visualizing brain activities. I found a research paper on imaging the mental functions of humans by PET, which I had wished to study, written by Professor Per Roland of the Karolinska Institute (Sweden), who has since become a mentor to me. Immediately, I wrote to him asking if I could study under him. I owe him greatly for what I have achieved. From my experience, I think that the most direct and the only effective way of realizing one's dream is to advance step by step with integrity without forgetting one's dream, even though it may be slow. I hope all of you will make a continuous effort to achieve your own dreams.

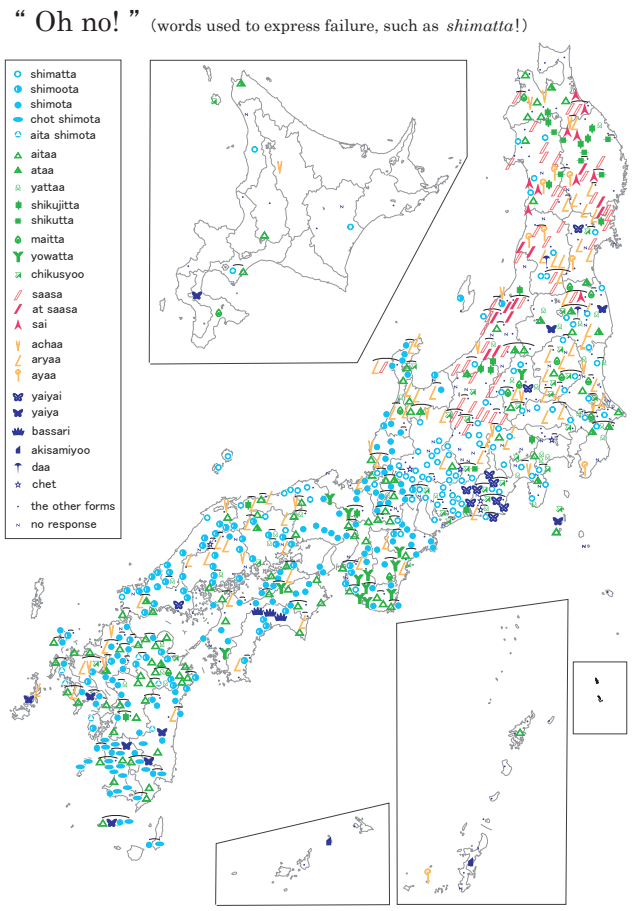
Takashi Kobayashi ／ Professor ／ Graduate School of Arts and Letters

Profile

Born 1957 in Niigata Prefecture. Studied Japanese Linguistics as an undergraduate, and later a graduate student, at Tohoku University. From 1983, worked as a researcher at the National Institute for Japanese Language and helped complete the *Grammar Atlas of Japanese Dialects*, a compilation of dialectal grammar from 800 locations across Japan. Became an Associate Professor of Japanese Linguistics at Tohoku University in 1994, and is currently a Professor at the same university. Specialty lies in dialectology; especially the reconstruction of historical Japanese through the so-called method of "Dialectological Study of the History of Japanese." Prizes include the 11th Kyosuke Kindaichi Prize (1986) and the 23rd Izuru Niimura Prize (2004). Publications include the 4 book series: *Shiriizu Hougen`gaku [Dialectology Series]* (2006-2007), *Gaidobukku Hougen`ken`kyuu [Dialect Research Guidebook]* (2003), and *Gaidobukku Hougen`chousa [Dialect Survey Guidebook]* (2007). Appears regularly on television programs such as *Shuukan Kotoba Magajin [Weekly Word Magazine]* and *Shittaka Sendaiben [Did you know? Sendai Dialect]* in an effort to increase the understanding of dialects.

Research Activities

In comparison to traditional philological methods, my research focuses on geography and topography in order to clarify the history of Japanese. When studying classical Japanese, we usually look to works such as the *Tale of Genji* and *The Pillow Book*, which contain the literary language of the nobility and clerisy of the central region. However, such language is only a fraction of classical Japanese. Through the study of dialects, it becomes possible to unearth the language of the common people in classical times. It can also be said that the language of antiquity did not simply die out, but was diffused into rural areas and survives in the form of dialects to this day. My research aims to uncover the mechanism in which archaisms are transformed and reborn into dialects. The achievements of my research can be seen in my books, *Hougengakuteki Nihongoshi no Houhou [Method of Dialectological Study of the History of Japanese]* (2004) and *Hougen ga Akasu Nihongo no Rekishi [The History of Japanese as Seen through Dialects]* (2006). It must be mentioned, though, that such research requires organized dialect surveys. The map that I have inserted here is part of a dialect survey of 2,000 locations across Japan that I am currently involved in. It displays the various forms of words used to express failure, such as *shimatta! (Oh no!)*. Even in such exclamations, there are geographical differences, which reflect vital information about the history of Japanese.



Message

Most people wouldn't think that there was a different history of Japanese from the one seen through literary works, or that there's a geographical variation for an exclamation such as *shimatta!* It might be said that through doubting common sense, one makes the first step towards discovery. It is also here that the true pleasure of research is born. While it is obvious that dialects are an important cultural heritage, for most people dialects are so close to them, that they don't realize their importance. Furthermore, traditional Japanese dialects are gradually being washed away by the waves of the common language and are currently at the verge of extinction. There remains little time to record for posterity what dialects we still have left. Researchers who have felt this air of crisis are embarking on the mission to record the dialects of Japan. In addition to the 2,000-location survey that I mentioned above, I am involved in local surveys of the Tohoku region with students each year (Center for the Study of Dialectology, Tohoku University website: http://www.sal.tohoku.ac.jp/hougen/). My wish is for everybody to hold an interest in dialects and to help record them. No matter how small your effort is, there's no doubt that it will be a valuable record, and will make possible many new discoveries.

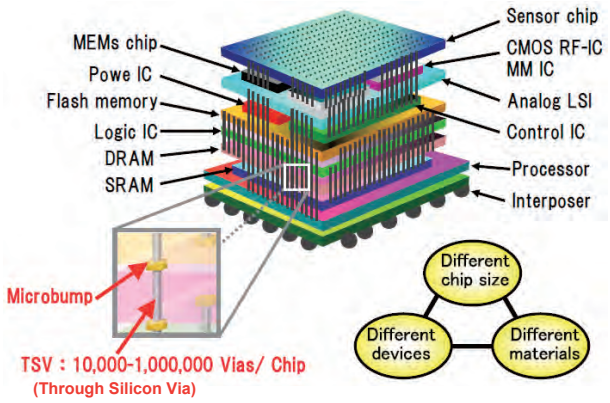
Mitsumasa Koyanagi ／Professor ／Graduate School of Engineering

Profile

Mitsumasa Koyanagi received his BSc degree from the Department of Electrical Engineering, Muroran Institute of Technology Japan, in 1969 and his MSc and PhD degrees from the Department of Electronic Engineering, Tohoku University, in 1971 and 1974 respectively. He joined the Central Research Laboratory, Hitachi Co. Ltd. in 1974, where he engaged in the research of semiconductor memory (DRAM) and invented a Stacked Capacitor DRAM memory cell which has been widely used in computer systems. In 1985, he joined Xerox Palo Alto Research Center, California, where he was responsible for the research of submicron semiconductor devices and analog/digital LSI design. In 1988, he became a professor in the Research Center for Integrated Systems, Hiroshima University, Japan, where he engaged in the research of sub-0.1um semiconductor devices, 3-D LSI, optical interconnection. Since 1994, he has been a professor in Intelligent System Design Lab., Department of Machine Intelligent and Systems Engineering, and currently Department of Bioengineering and Robotics, Graduate School of Engineering, Tohoku University. He was awarded the IEEE Jun-Ichi Nishizawa Medal in 2006, the IEEE Cledo Brunetti Award in 1996 and the Award of the Ministry of Education, Culture, Sports, Science and Technology (Japan) in 2002, in addition to the Ohkouchi Prize in 1992, the SSDM (Solid-State Devices and Materials) Award in 1994, and the Opto-Electronic Integration Technology Award (Izuo Hayashi Award) in 2004. He is an IEEE fellow and a Japanese Applied Physics Society fellow.

Research Activities

I have engaged in research of high-density semiconductor memories and ultra small semiconductor devices. I invented a stacked capacitor DRAM which has been employed as a main memory in computer system. This memory has been also widely employed in information processing devices such as a cellular phones and game machines. It is the key in scaling down the size of semiconductor device in order to increase the packing density and the capacity of semiconductor memory. I then aimed to create ultra-small semiconductor devices with a dimension of several atoms to several tens of atoms. In addition, I have proposed a new three-dimensional integrated circuit (3-D LSI) by stacking LSI wafers. A 3-D LSI enables us to achieve a new computer system with low power and high performance, since 3-D structure is suitable for highly parallel information processing. Whereas a conventional LSI is approaching technological limitation, 3-D LSI has attracted considerable attention due to the possibility of replacing conventional LSIs. I have applied this 3-D LSI technology to the biotechnology area and performed researches such as 3-D artificial retina chip implantation into eyes and 3-D brain-machine interface (BMI) module into brain cortex.



Structure of New Three-Dimensional LSI (Super-Chip)

Message

I entered the Masters course of Tohoku University, since I desired to receive the guidance of Professor Jun-ichi Nishizawa, who achieved outstanding results in the research area of semiconductors. I learned in Nishizawa's laboratory how important originality is in research and how important it is to aim to be the best of the world. These lessons were the origin of my research activities. I proceeded to the doctoral course in Nishizawa's laboratory. On the doctoral course, I was trained to think thoroughly, to challenge and never to give up. Two or three years after completing the doctoral course, I invented a new semiconductor memory which has significantly accelerated the development of the world's semiconductor industry. I could not have invented such a device if I had not trained in Nishizawa's laboratory and had not proceeded to the doctoral course. Therefore, I recommend those younger students who are considering a job related to research and development in the future to enroll in the doctoral course.

I also recommend younger people to have experiences of study or research abroad. To experience globally advanced environments and different cultures when they are young will significantly impact on their future. I was relatively senior when I moved to the United States and so I often regretted that I did not do when I was much younger. I joined the Xerox Palo Alto Research Center in the United States, which is located in the center of Silicon Valley. Silicon Valley is the place where many talented people gather from all the countries of the world. Therefore, I often felt that the energy to challenge new things was spontaneously generated in my heart. I hope that younger people will have such international experiences and challenge for their own dreams world-wide.

Eimei Sato ／Professor ／Graduate School of Agricultural Science

Profile

Dr. Eimei Sato was born in 1948 in Hokkaido, Japan. He graduated in Agricultural Science from Kyoto University in 1971 and gained his doctorate in animal reproduction in 1979. He was appointed as Assistant Professor of Functional Morphology and Physiology in Domestic Animals, Department of Animal Science, Faculty of Agriculture, Kyoto University. Next he worked for two and a half years at Rockefeller University, New York, from 1982 to 1985 as the post-doctoral fellow of the Rockefeller Foundation. In 1987, he was promoted to the post of Associate Professor in the Department of Animal Science, Kyoto University. He then moved to the Department of Reproductive and Developmental Biology at the Institute of Medical Science, The University of Tokyo, and worked for 5 years as Associate Professor. In 1997, he was appointed as full professor at the Laboratory of Animal Reproduction, Graduate School of Agricultural Science, Tohoku University.

He received the Distinguished Scientist Award from the Japanese Society of Animal Science in 1991, the Japan Prize of Agricultural Science in 2005, and the AAAP Animal Science Award in 2006, which are the most prestigious awards in the field of animal and agricultural science in Japan and the Asian-Australasian region.

He is an active member of several scientific societies, especially the Japanese Society of Animal Reproduction (JSAR), the Japanese Society of Fertilization and Implantation (JSFI) and the Japanese Society of Animal Science (JSAS). He has served as the president of JSAR from 2003 to 2006, while he currently serves as the presidents of the JSFI and JSAS (since 2006 and 2007 respectively).

Research Activities

Dr. Sato established a method for in vitro maturaion (IVM) of mammalian oocytes almost 30 years ago. Currently, in Japan, more than 2,000 bovine babies per year are produced using the IVM technique. Dr. Sato's group is now investigating sperm and oocytes for genetic improvement of animals (Fig.1) and the production of genetically excellent, cloned and gene-modified animals. (Fig.2) The recent progress in his group is as follows：

1) Molecular mechanisms for the acquisition of fertilization ability and reprogramming of somatic cells in oocytes: Hyaluronan-CD44 molecules are involved in the induction of meiosis resumption (Int.Rev.Cytol.,2004), and the phosphorylation patter of Akt is meiosis-specific (Dev.Biol.2008). A miniature cloned pig was produced from oocytes obtained using the IVM technique which was originally developed in his laboratory. (Cloning Stem Cell., 2008).

2) Molecular mechanism of oogenesis and apoptosis of oocytes: His group has managed to produce a baby from small (diameter ＜ 70μm) mouse follicles by using originally-developed techniques, and have produced mice and cattle offspring from cryopreserved oocytes by using newly-developed techniques (SWEID) (Biol.Reprod., 2004). New techniques for stimulating follicular development by using angiogenic factor genes have already been developed (Biol.Reprod., 2006).

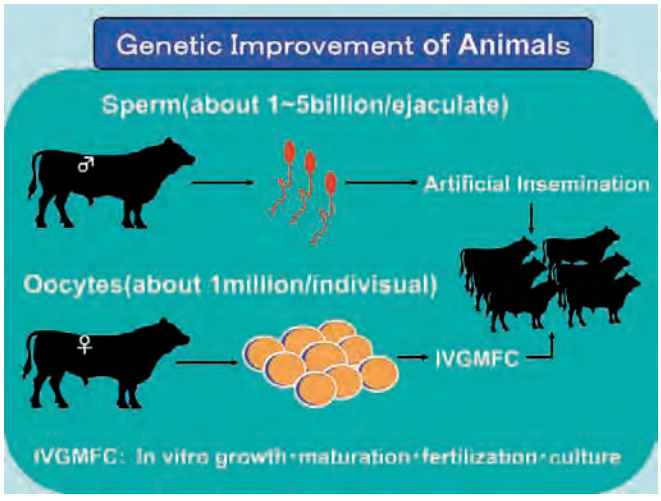


Fig.1

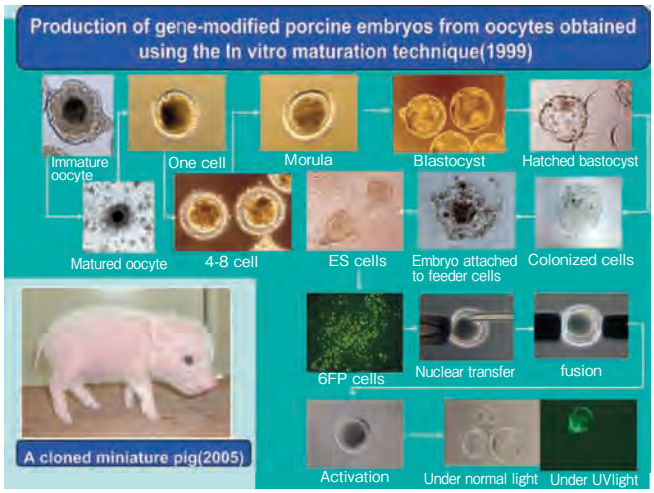


Fig.2

Message

I worked at the Institute in Moscow just before the collapse of the Soviet Union, just like many Russian scientists who concentrated on their research despite the dire circumstances. Scientists from Baghdad, Iraq presented their papers at the meeting that was held in Tehran, Iran. They said that they had continued their research even during the war. In the USA, I met senior scientists who have received the Nobel Prize, and who, at over 80 years of age, are still conducting personal research. My professor who was my supervisor at the Rockefeller University is now over 80 years old and still continues to do research by himself. I share their strong desire to make a contribution to science, because the prospect of research attracts the human mind and the passion for research enables a human to live under any circumstances.

Sendai is a clean and modern city and its climate is pleasant. It is a favorable city for scientists to conduct their research. I strongly support the proposal（Inoue Plan）of Dr. Inoue, the President of Tohoku University. In Sendai, new initiatives will be accelerated, especially in Tohoku University. By interacting with the students, I will earnestly try to carry on research and education at Tohoku University.

Shigeru Sato ／ Professor ／ Graduate School of International Cultural Studies

Profile

Professor Shigeru Sato received his BA degree in linguistics and phonetics from Tokyo University of Foreign Studies. He then furthered his studies in language at the Research Institute of Electrical Communication, Tohoku University, focusing on the quest for the mechanism of speech/language generation and natural language processing which led him to a PhD degree in speech science from the School of Engineering, Tohoku University. From 1980 through 1992 he worked as an associate and a full professor at Tohoku Institute of Technology. Since 1993 he has been with the Graduate School of International Cultural Studies, Tohoku University as a professor in linguistics and language education. From 2002 through 2007 he was an active member in the 21st Century COE Program in Language, Brain and Cognition, whereby he expanded his research areas into the study of the multilingual brain using fMRI facilities.

Research Activities

The knowledge accumulated in DNA over the last several million years in the path toward *homo sapiens* and the ceaseless process of the evolution of the brain nervous system; these are the basis of the language we see today. Looking into the language development in a child, you would wonder at the accuracy of programming of temporal timing in expanding DNA information throughout the entire growth process. Simultaneously, this program is flexible enough to accommodate whatever type of language it has to deal with. This regularity in language acquisition and the seemingly endless diversity of its form have constantly attracted our interest and made us wonder about the mechanism of how it all works. Now, our globalized modern society awaits the application of the achievements reached in studies of language.

Recently we carried out investigations into the brain activities of trilingual speakers whose native language is Korean and second languages are English and Japanese, where the duration of English study has been more than twice that of Japanese. What we wanted to find out is whether there is any difference in understanding a sentence according to the degree of similarity in syntactic structures. We found that for English, the load is heavier, with a broader range of the brain activated despite the longer time spent learning it (see figure). Our hypothesis is: the more remote the structure, the more difficult the learning.

We also conducted a study on learning foreign words and phrases in two different modes: text-based and situation-based. Here we found that for native users of Japanese, Korean words learned in these two different learning modes are stored in separate regions of the brain, causing delays in retrieval time when retrieved in the other mode. That is, it takes time to transfer what has been memorized in one part of the brain over to the other. One may surmise from this that the foreign language expressions you memorized the day before an exam may be reflected in the test results but not necessarily in the actual setting of language use.

In our study of language learning we have put effort into cooperating with scholars in related disciplines: computer science and medical science, which has been an enormous help in model building based on mathematical modeling and, in the form of brain activities, visualization of grammatical phenomena like scrambling, passivization, lexical access, etc., especially in multilinguals. Supported by rapid development in brain imaging techniques, efforts in linguistic observation combined with modeling/simulation techniques will hopefully soon bear fruit in uncovering the substantial parts of the uniqueness and diversity of human language.

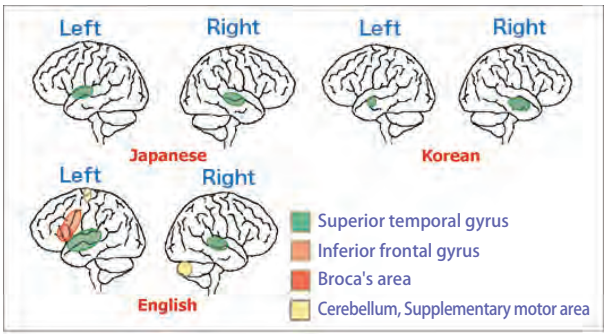


Figure : Brain areas activated in sentence comprehension by native speakers of Korean

Message

It was such a long time ago, but I recall it as if it were yesterday. I belong to the generation of the worldwide student riots of 1968-1970, during which period many university campuses were devastated. The season of student riots was also the time of the emergence of generative grammar and speech science based on acoustic theories of speech production. Those were the days when this field internationally attracted a lot of scholars and students wanting to investigate the human language. Today, in the midst of discussion with my students I sometimes feel I still keep track of the path I was on forty years ago; the old excitement immobilized and my problems unsolved after all these years. Whatever the problem you set up, I am sure that lasting concentration on what interests you in your younger days will guide you to a fruitful future.

Motoyuki Sato ／ Professor ／ Center for Northeast Asian Studies

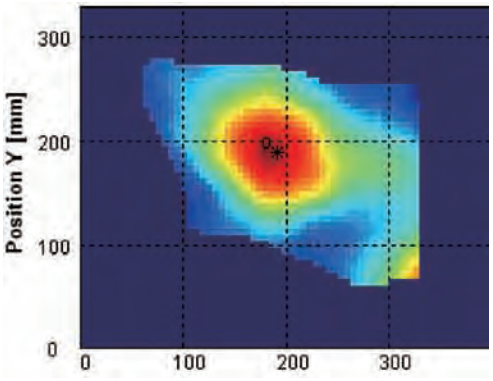
Profile

Prof. Motoyuki Sato graduated from Tohoku University, Faculty of Engineering, Dept. of Electrical Communication in 1980. He then studied Information Sciences at the graduate school of Tohoku University, and obtained the degree of Dr. Eng. in 1985. He started to work as a research associate for geothermal energy development at Tohoku University in the same year. After he spent one year in Germany at the Federal Institute of Geoscience and Mineral Resources, he was promoted to a professorship at Tohoku University, Center for Northeast Asian Studies, in 1997. His major is applied electromagnetic waves, and his research interests are the electromagnetic measurement of environment, especially by Ground Penetrating Radar (GPR). He has been involved in GPR researches including radar systems development, an archaeological survey in Sendai castle, a groundwater survey in Mongolia and a permafrost survey in Siberia. Recently, he has been developing GPR for humanitarian demining. At the same time, he is working toward remote sensing technology for environmental study in the North and East Asian regions using the Japanese earth observation satellite ALOS.

Research Activities

Humanitarian demining is an activity to clear buried landmines after conflicts, something for which interest is gathering in the world. The efficiency of mine detection by metal detectors, which have widely been used for humanitarian demining is low, due to their high false-alarm rate. Thus, new methodologies have been required. Prof. Sato has developed a hand-held sensor ALIS, which combines a metal detector with a GPR. GPR can visualize the buried mines, and can identify them, which metal detectors could not achieve. However, in order to deploy the technology developed in a laboratory, we must test them in real environments, to shorten the distance between the ideal situations in a laboratory to practical conditions in the real world. Prof. Sato has tested ALIS in some mine affected countries including Afghanistan, Cambodia, Egypt and Croatia. The key issues in these tests are not only technical, but also closely related to social problems. They include how science can contribute to international society, and we have to keep close contact with UN organizations and local demining action centers. ALIS has been used in Croatia for more than a half year, and it will be commercialized soon.

ALIS evaluation test in a mine filed in Croatia



Visualized image of anti-personnel Mine PMA-2 by ALIS.

Message

Unique ideas and creative research are essential at universities. At the same time, if the science and technology can be used in society, it inspires us to further work. I started the research on GPR for humanitarian demining, because applied electromagnetic wave technology is my original major. However, I realized soon that the ideal conditions in a laboratory are very far away from real environments such as the jungle in Cambodia. We have to visit the sites where the technology is required, and we have to understand what the local people are demanding. Then, the research work can be more fruitful. We had thought that international organizations such as the UN were very far removed from engineering, but we found that they work effectively in bringing our technology to people in mine-affected countries. Engineering is a science which contributes to society and living people. I found that close attention to society is one of the key issues in applications of engineering.

Seiji Samukawa ／Professor ／Institute of Fluid Science

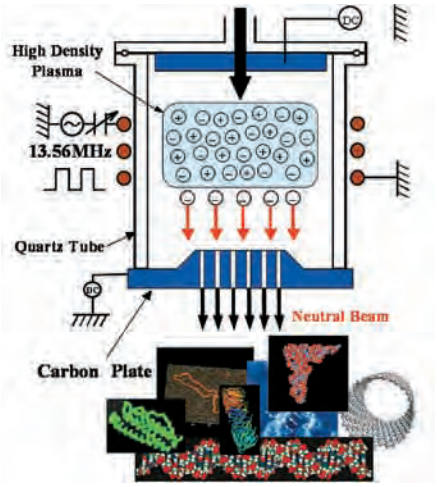
Profile

Professor Seiji Samukawa received a BSc in 1981 and a PhD in 1992 from Keio University. He joined NEC Corporation in 1981, where he was the principal researcher of a group doing fundamental research on advanced plasma etching processes for sub-0.1-μm technology. Notably, he received the Ishiguro Award, the most distinguished prize given by NEC Corporation's Research and Development Group and Semiconductor-Business Group, for his work in applying a non-damaging plasma etching process to a mass-production line. Since 2000, he has been a professor at the Institute of Fluid Science at Tohoku University where he has done fundamental research on plasma etching, plasma CVD, neutral beam etching / deposition, new "Bio-nanoprocess" technology and their applications to ULSI, Micro Electro Mechanical Systems (MEMS), solar battery cell and innovative forward-looking nano-scale devices. His motto is, "Responsibility for research until it is completely finished." As a consequence of his excellent achievements, he has been assigned as "fellow" of The Japan Society of Applied Physics from 2008.

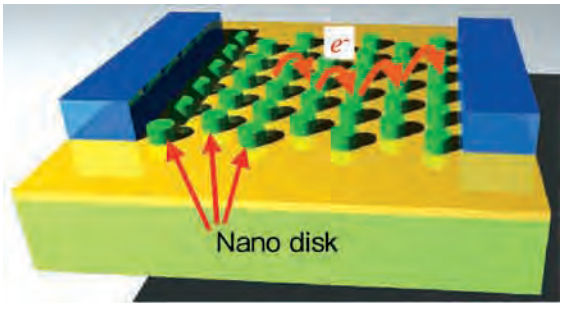
His significant scientific achievements have earned him many awards, including the Outstanding Paper Award at the International Conference on Micro and Nano-Technology (1997), the Best Review Paper Award (2001), the JJAP Editorial Contribution Award (2003), the Plasma Electronics Award (2004), the Best JJAP Paper Award(2008), the Fellow Award(2008) from The Japan Society of Applied Physics, the Distinguished Graduate Award from Keio University (2005), the Ichimura Award (2008) from the New Technology Development Foundation.

Research Activities

Ultra-high-functional semiconductor devices like ULSI, TFT and solar cells support the products, such as intelligent and networked household appliances, that embody the IT revolution of the 21st century. These semiconductor devices are manufactured by thin-film material deposition and processing technologies that use microparticles such as electrons, atoms, molecules, ions and photons. There are many serious problems with the conventional semiconductor manufacturing process. Namely, exposure to ultraviolet light and the accumulated charge degrades the semiconductor devices. Professor Samukawa proposed excellent new technologies such as "pulse-time-modulated plasma" and "neutral beam," and put them to practical use. Through these efforts, he is working to develop ultra-precise microfabrication technologies to make highly functional thin films. His experiments with the introduction of bio-technology into futuristic nano-devices have resulted in the successful fabrication of ultra-fine nano-structure at the sub-10-nm level.



Fusion of Biotechnology and nanotechnology and Development of Innovative Forward-looking Nano-scale Devices Using Neutral Beam Etching



Defect-free 2D Nanodisk Array using Neutral Beam Etching Process and Development of Stochastically Resonance Device with the Electron Current Percolation Path.

Message

On this earth with a history of some five billion years, what do people live for? People live to evolve, for without such effort life would cease to exist. It is important to always have a forward-looking attitude and strive to develop yourself. A true professional is a person with competence and skill and one who incessantly meets every challenge. Armed with a dream and the will to prevail, nothing is impossible. That's how people have survived and thrived from the ancient past to present. Until the day I die, I want to continue to meet every challenge. We only live once, so why don't we arm ourselves with a dream and together meet the stimulating challenges on the global horizon?

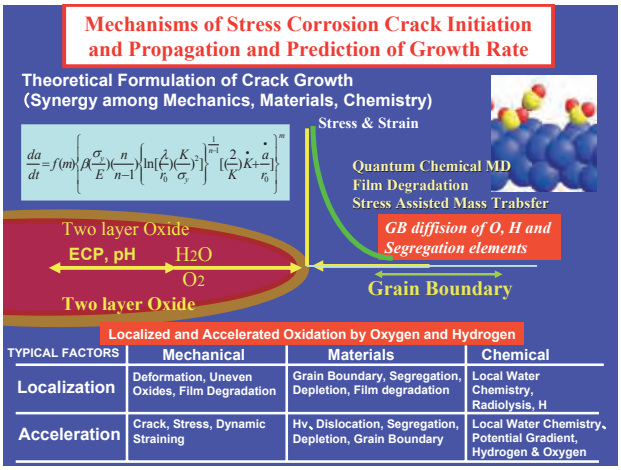
Tetsuo Shoji ／ Professor ／ Graduate School of Engineering

Profile

Prof. Tetsuo Shoji received a PhD in Mechanical Engineering, Graduate School of Engineering, Tohoku University, was appointed as a research associate then promoted to associate professor in 1984 and to full professor in 1986. Since then, he has held various posts, such as director of the Fracture and Reliability Research Institute, member of the University Council, Vice-Dean of Engineering (research), and Executive Vice-President of University (research and international affairs). He was a postdoctoral fellow at the Department of Metallurgy and Materials Engineering, the University of Newcastle Upon Tyne, and a visiting professor of the Department of Nuclear Engineering, Massachusetts Institute of Technology. Since 2002, he has been an extraordinary member of the General Natural Resource and Energy Council, METI and a member of various committees of Nuclear and Industry Safety Agency under the Council. He is also involved in various international activities, such as serving as an expert member of the United States Nuclear Regulatory Commission "Proactive Materials Degradation Assessment" project, a member of Scientific Advisory Committee of the European Commission PERFECT Project and a member of the SCC-WG of Stress Corrosion Cracking and Cable Aging Project, OECD NEA. He has received 13 national awards, and 6 international awards including W. R. Whitney Award from NACE-International in 1998 and the Lee Hsun Award, Institute of Materials Research, Chinese Academy of Science in 2007. He is a member of the Engineering Academy of Japan and an associate member of Science Counsil of Japan .

Research Activities

Prof. Tetsuo Shoji's research field is the "Physics and Chemistry of Fracture", combining mechanics and chemistry, so-called mechano-chemistry, which is necessary for the analysis of materials degradation and fracture mechanisms as an extension of strength of materials and fracture mechanics. This field has been receiving more and more concern from the point of view of a safe and reliable society, through a high quality safety system and the reliability of infrastructure, such as nuclear power plants and other energy conversion systems. For example, one of the factors degrading the safety and reliability in structures and components is crack initiation and propagation under the influence of chemical environments, and its mechanistic understanding is of extreme importance. By the use of better instrumentation and analysis, the following are his original works relating to the above problems: (1) Development of a recrystallization-etch technique and a unique evaluation procedure for crack tip intense strain region, by which ductile fracture can be quantitatively analyzed; (2) Proposal of a unique formulation of stress corrosion crack growth rate, based upon a mechanistic understanding of crack growth under a mechano-chemical reaction at a crack tip and its modeling. This proposal is the first proposal in the world giving a predictive capability of growth rate of stress corrosion cracking, taking into account both crack tip mechanics and chemistry; (3) Establishment of a predictive model and a capable procedure for aging degradation evaluation of plant components in energy conversion systems such as fossil and nuclear power plants and plant life time prediction and management. Based upon his varied original work, he also contributes to the establishment of a Center of Excellence for "Physics and Chemistry of Fracture", focusing on mechano-chemical phenomena and its relevance to failure in the field of operating plants. He is one of the pioneering leaders in this research field.



Message

My life work of physics and the chemistry of fracture originated during my research internship for 3 months one summer at one of the industrial research institutes when I was a first year PhD student working on Fracture Mechanics. During these days working on low temperature brittle fracture tests being performed near the extreme large capacity testing rig of 2,000 tonnes, I was exploring the laboratory keeping a pickled plum in my mouth, and met a typical cantilever type stress corrosion testing in sea water with a lot of salt and dirty rust on the specimens. At this moment, I received a strong message from the specimens that failure and / or fracture of structural components in service can gradually take place even at a lower stress than a design stress with the assistance of chemical environments. This encounter with stress corrosion was a crucial moment in determining my research field. I had to start to study the interaction of mechanics and chemistry, so-called Mechano-chemistry and also electrochemistry as a basis of corrosion. After struggling for several years, I succeeded with confidence in measuring an electrochemical polarization curve, and with my own hand made potentiostatt fabricated, based upon the electric circuit drawing provided by the circuit design office in the Institute of Materials Research (KINKEN). Both the late Prof. Emeritus Masahiko Suzuki and the late Prof. Emeritus Redvers Parkins had been encouraging me to challenge such a cross-disciplinary research field. The building up of continuous small challenges may lead to an innovative challenge and success in pioneering an original research field. I am still engaging with what I couldn't complete in my challenge in the past. *Curiosity-driven challenge and serendipity will never come to an end as long as Diversity is fundamentally acknowledged.*

Miyoko Tsujimura ／Professor ／Graduate School of Law

Profile

Miyoko Tsujimura is Professor of Constitutional Law and she received her PhD in Law from Hitotsubashi University in Tokyo. She held positions as professor at Seijo University in Tokyo from 1992~1999, was a Visiting Professor at the *Institut* de *Droit Comparée* de l`Université Paris II in 1999 and from 2002-2004. She was the recipient of the 7th Shibusawa-Claudel Prize in 1990 for her publication, *Furansu kakumei no kempo genri* ("Constitutional Principles in the era of the French Revolution"), Tokyo, Nihon-Hyôron-sha, 1989.

Dr. Tsujimura was the first woman to achieve the rank of professor of Constitutional Law at a national university in Japan. She serves as Vice President for the Japan Section of the International Association of Constitutional Law, and as Vice President for the Japanese Association of Gender and Law, and as President of the Subcommittee on Gender Equality for the Science Council of Japan. She was Program leader of the 21st Century COE (Centers of Excellence) Program (2003-2008), which has evolved into the subsequent Global COE Program (2008-2012).

Research Activities

Dr.Tsujimura's publications on Constitutional Law & Comparative Constitutional Law include: *Jinken no fuhensei to rekishisei* ("The Universality and the Historicity of the Human Rights"), Tokyo, Sobunsha, 1999; and *Hikaku kenpo* ("Comparative constitutional law"), Tokyo, Iwanami Shoten, 2003; *Kempo* ("The Constitutional Law"), Tokyo, Nihon-Hyôron-sha, 3rd ed. 2008.

Since her 1976 presentation of the *Declaration of Women's Rights* by Olympe de Gouges, she has likewise pursued the field of Gender Studies, publishing in Japanese, English and French, such as: M. Tsujimura, *Gender to hou* ("Gender and Law"), Tokyo, Fuma-shobo, 2005; *Gender to jinken* ("Gender and Human Rights"), Nihon-Hyôron-sha, 2008; *International Perspectives on* Gender Equality and Social Diversity (ed.), Tohoku University Press, 2008; and *Egalité des Sexes : La Discrimination Positive en Question*, Société de la Législation Comparée, 2006 (dir. avec D. Lochak).

There are many remaining aspects of gender discrimination within the law, legal studies and the judicial proceedings. To explore and document these contemporary challenges, Tohoku University's 21st Century COE Program (Gender Law and Policy Center) published a 12-book series (Tohoku University Press, 2004-2008).The fruits of these past publications, lessons learned and the exploration of best practices around the world will be re-invested in support of the activities of the new Global COE Program on "Gender Equality and Multicultural Conviviality in the Age of Globalization" (2008-2012 http://www.law.tohoku.ac.jp/gcoe/english).

Recent Major Publications

International Symposium in 2004

Message

When I was a graduate student, it was very difficult to get a position as a university lecturer because of sex discrimination and stereotypical attitudes (ie. "Women are not suited for Constitutional Law" etc.). In 2008, some 30 years later, the percentage of women researchers is still only at 12.4, and remains extremely low in the Sciences and Engineering in Japan. To ameliorate this situation, I am committed to promoting gender equality in the academic sphere, and to developing new theories and understandings of human rights and constitutional law which are enriched by the perspectives and research on gender equality.

Universities, in particular, have as their mission the development of the younger generation's talents to promote interdisciplinary research on gender equality. It is vital that they achieve a gender-equal society on university campuses, and in society at large. For this reason, Tohoku University is committed to promoting gender-equality through academic studies and internal policies, so that it may serve as a role model for other universities within Japan, as well as abroad.

It is our hope that we may work collaboratively, across sectors and disciplines, in the realization of a gender-equal society, one in which all individuals may develop their unique talents without discrimination on the basis of sex or race.

Tetsuya Terasaki ／Professor ／Graduate School of Pharmaceutical Sciences

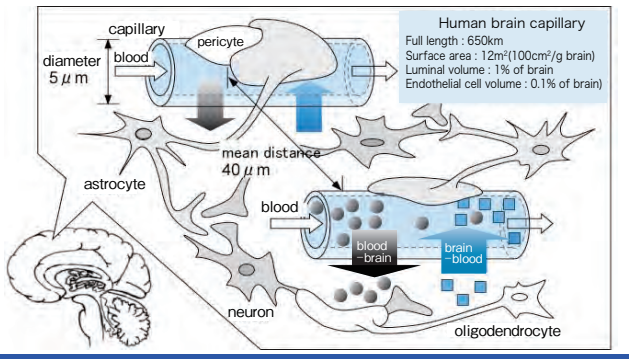
Profile

Dr. Tetsuya Terasaki received a BSc degree in Pharmacy from Kanazawa University in 1977 and a PhD degree in Biopharmacy from the University of Tokyo in 1982. He was appointed Assistant Professor at Kanazawa University in 1982, Associate Professor at the University of Tokyo in 1992, and a Professor at Tohoku University in 1996. He completed postdoctoral training in blood-brain barrier research and was a Visiting Assistant Fellow at UCLA School of Medicine from 1985 to 1987. He received three International Awards, the Ebert Prize from the American Pharmaceutical Association (APhA) in 1985, the Meritorious Manuscript Award from the American Association of Pharmaceutical Scientists (AAPS) in 1996 and the AAPS Fellow in 2004. He also received two Research Achievement Awards, the Academy of Pharmaceutical Science and Technology, Japan (APSTJ) Award in 2007 and the Japanese Society for the Study for Xenobiotics (JSSX) Award in 2007. He has been serving as Associate Editor of the Journal of Pharmaceutical Sciences and is a member of the Founding Council of the International Brain Barrier Society. At Tohoku University he has been serving as Special Adviser to the President since 2007 as well as serving as Vice-Dean of the Graduate School of Pharmaceutical Science since 2008.

Research Activities

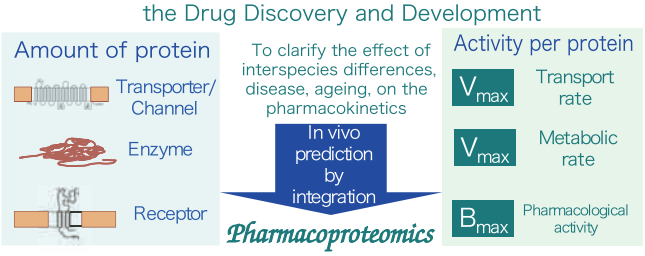
The brain closely controls the entry of xenobiotics via the blood-brain barrier (BBB) to maintain effective intellectual functions. Crossing the BBB is one of the most difficult problems to be solved for delivering a drug to the brain. Part of this is due to the lack of paracellular permeability of the brain capillary endothelial cells. In addition, brain-to-blood efflux transporter proteins operate at the BBB, and they are also known to play an important role in the apparent restriction of xenobiotic entry into the brain. We have developed the Brain Efflux Index (BEI) method and conditionally immortalized brain capillary endothelial cell lines. Using these methods, we have been able to show that the BBB functions as “a cerebral clearance system” for endogenous hydrophilic compounds, such as GABA, L-aspartic acid, homovanillic acid and indoxyl sulfate. The multiple brain-to-blood efflux transporters at the BBB are considered to act as part of the CNS detoxification system to allow normal cerebral function. Proteomic studies may also provide important insights into human BBB function. Constructing a quantitative transporter protein atlas of the human BBB would be a most important advance from the viewpoint of CNS drug discovery and drug delivery to the brain.

Structure and function of the blood-brain barrier



The blood-brain barrier (BBB) is formed by complex tight-junctions of the brain capillary endothelial cells and expresses various transport systems. These characteristics of the BBB make it possible to control selective transport across the BBB and to limit the non-selective brain distribution of drugs. Understanding the mechanism of BBB transport is important for improving the BBB permeability of Central Nervous System acting drugs.

Targeted Absolute Proteomics as A New Path for the Drug Discovery and Development



It is very important to develop a novel method to identify and quantify functional proteins such as transporter, channel, enzyme and receptors. This would open a new field, pharmacoproteomics, quantitative proteomics based pharmacokinetics and pharmacodynamics, allowing us to clarify the influence of changes in disease status, aging, and individual differences. Construction of a quantitative functional protein atlas in human will trigger significant progress in drug discovery and delivery in the near future.

Message

In scientific research it is very important to discover the truth, although this is rarely easy. You must be brave if you want to succeed. Once you achieve a taste for it, you will never forget it. There are equal opportunities for anyone. If you make steady and serious efforts, you will find a rational way to discover the truth. In addition, an analytical way of thinking, the ability to find solutions, and remain flexible and focused are all, I believe, very important. When you wish to become a researcher contributing to an international society, this will be the start of a very exciting and impressive career. When you want to discuss your research interests, you will find a world without language barriers, or culture gaps. Sometime, you may not be able to find the right answer. You may realize how big the nature is and how small human beings are. However, please do not forget the importance of the environment in which you were brought up. As you know, not only a seed but also its environment is very important for growing a delicious fruit. We are pleased to provide an excellent environment and a great opportunity for you, i.e., as a unique seed in the world.

Nobuhiko Terui ／ Professor ／ Graduate School of Economics and Management

Profile

I was born in Sendai, and graduated from Tohoku University, Economics Department, and then entered the Graduate School of Economics, Tohoku University to obtain a PhD in economics in 1990. In my academic career, I first worked at Yamagata University as lecturer and associate professor. Then I joined Tohoku University, Faculty of Economics as associate professor, and have been working as a professor at the Graduate School of Economics and Management since 1998. In addition to the above, I was appointed as a visiting associate professor at the Institute of Statistical Mathematics, Department of Prediction and Control (1993-1995), and worked overseas at the University of Minnesota (Department of Economics, 1990-1991), Texas A&M University (Department of Statistics, 1991-1992), Erasmus University (Tinbergen Institute, 1995-1996, 2000), and Ohio State University (Fisher College of Business, 2003). In 1992, the 2nd Tjalling C. Koopmans Econometric Theory Prize was awarded to the research by Hosoya, Tsukuda and Terui.

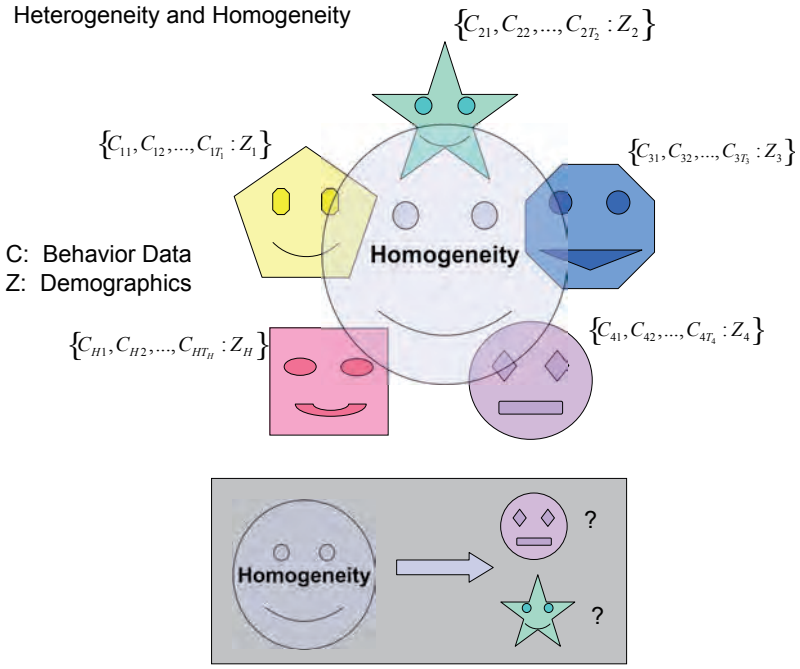
Research Activities

I have started the study of theoretical econometrics which investigate economic structure quantitatively, and now from the more micro viewpoint, I am doing research on the individual consumer and brand's behaviors to predict market performance by developing the modeling of them in marketing.

The present firms are automatically getting the consumer's purchase behavior data through POS or customer membership system and they are urged to analyze these data to extract useful knowledge from these large-scale data for efficient management.

"Customization" is a modern marketing practice which accommodates a consumer's taste and market response "One by One", and it operates marketing strategy efficiently customized to each consumer. Based on the large scale data on the market, I try to develop the model to predict an individual consumer's action for efficient management.

Figure ： Estimation on Heterogeneous Consumer



Message

In many developed countries, such as the United States and Japan, the weight of service industries compared with the manufacturing industry has increased up to about 60-70 percent of the gross domestic product (GDP). The high productivity of the manufacturing industry of Japan, represented in Toyota's KANBAN system, is widely recognized as at the top level in the world, but it is pointed out that the productivity of the service industry is still low compared with the U.S. and European countries.

Although it is necessary to maintain the comparative advantage in our country having no natural resources for manufacturing power, considering the change of industrial organization mentioned above, the pursuit of the higher productivity of service industries and the development of new service goods become very important.

Analyzing "information" accumulated with the development of information technology brings a very important meaning for this purpose. In order to extract the GOLD in the huge amount of extensive information, it demands specific knowledge or experience as background. As a compass for sailing "the open sea of information" in this meaning, I think the university has a mission to provide you with the extensive fundamental knowledge necessary for it.

Masataka Nakazawa ／ Professor ／ Research Institute of Electrical Communication

Profile

Prof. Nakazawa was awarded a doctorate in applied electronics by the Tokyo Institute of Technology and then joined the Nippon Telegraph and Telephone (NTT) Public Corporation in 1980. At NTT's Ibaraki and Yokosuka Electrical Communication Laboratories, he engaged in research on optical solitons, ultrahigh-speed optical transmission, erbium-doped fiber amplifiers (EDFA), and ultrashort pulse lasers. He was a Visiting Scientist at Massachusetts Institute of Technology (MIT) in 1984. He became the first NTT R&D Fellow in 1999. In 2001, he was appointed Professor at the Research Institute of Electrical Communication (RIEC), Tohoku University. Currently, he is engaged in research on ultrahigh-speed optical transmission, multi-level coherent optical transmission, and ultrahigh-speed and pulse lasers. He is a Fellow of the Institute of Electrical and Electronic Engineers (IEEE), the Optical Society of America (OSA), and the Institute of Electronics, Information, and Communication Engineers (IEICE) of Japan. He served as the President of the Electronics Society of IEICE in 2006. He has been on the OSA Board of Directors since 2008. He is the author or coauthor of over 370 papers and holds more than 100 patents. He has been honored with many awards, including the 2002 IEEE Daniel E. Noble Award, the 2005 OSA R. W. Wood Prize, and the 2006 Thomson Scientific Laureate.

Research Activities

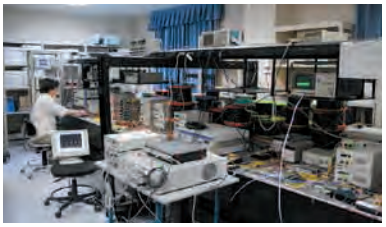
In 1989, Prof. Nakazawa succeeded in achieving a compact and highly reliable erbium-doped fiber amplifier (EDFA) for the first time, by employing a 1.48 μm InGaAsP laser diode as a pump source. He then used the EDFA to make substantial contributions to the advancement of optical transmission technologies.

The terabit wavelength division multiplexed (WDM) optical communication employed today could not have been achieved without this EDFA, and thus his pioneering work is widely recognized as an innovative driving force behind the growth of today's optical communications industry. Furthermore, he proposed a new optical soliton transmission system in which the EDFA is employed as an optical repeater, and succeeded in the first practical soliton transmission, which would have been difficult to achieve without the EDFA. In addition, he applied the EDFA to the development of an ultrashort pulse laser with a repetition rate of 10~40 GHz. He then used this laser to achieve an optical time division multiplexing (OTDM) transmission with ultrashort pulses at a record bit rate of 1.28 Tbit/s. These accomplishments have earned Prof. Nakazawa an enviable reputation throughout the world as a source of progress in optical communication, and they are widely used as fundamental technologies in constructing the next generation of optical communication.

Recently, he has developed a new frequency-stabilized erbium fiber laser operating at 1.54 μ m by using C_2H_2 molecules. With this laser, he is currently investigating a new type of optical coherent transmission with an ultrahigh multiplicity level and ultrahigh spectral efficiency that goes beyond wireless communication.

(a) The first prototype EDFA

(b) Compact, commercial EDFA



(c) Overview of ultrahigh-speed optical transmission experiment

Message

I think that the most important things when carrying out research are to respect the basics and never to stop. You may become depressed and discouraged by failure after failure, especially when you are engaged at the frontier of research, because you are breaking new ground. To keep moving forward in such a difficult situation, it is important for a researcher to have a philosophy or belief as a guiding principle. A new idea or innovative technology comes from just one mind, and eventually grows into a technology supported by research and development performed by many people. In general, a long journey must be undertaken to reach that stage, but a researcher must have the courage and belief to overcome many difficulties along the way.

It is sometimes said that to become professional in any field or job takes more than 10,000 hours (the equivalent of three hours of daily training for ten years). In my opinion, researchers and engineers are no different from artists and sports players. Even if they deal with completely different subjects, they share the same professionalism. The aim is accomplishment at a high level based on originality and creativity. To demonstrate Japan's technical leadership to the world, we must study hard, continuously motivated by professionalism and a pioneering spirit, to propel us ahead of the US and Europe.

Masahiro Hirama ／Professor ／Graduate School of Science

Profile

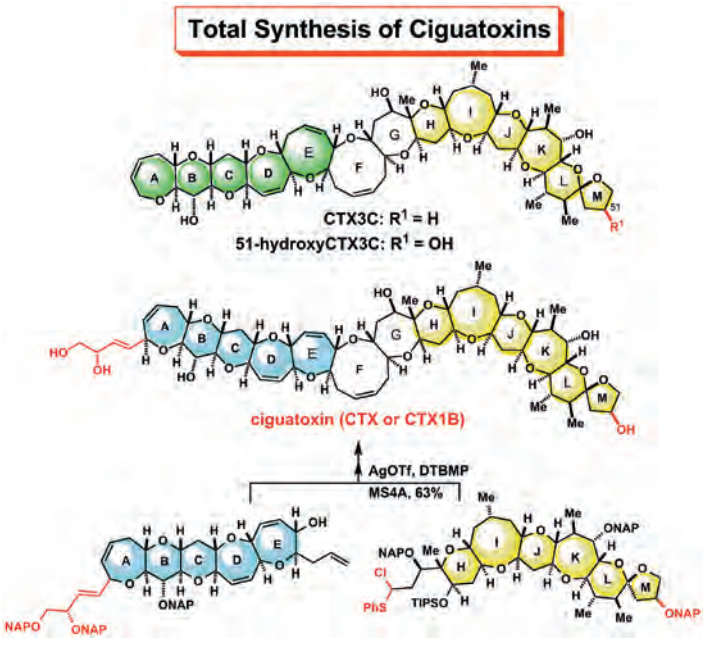
Masahiro Hirama studied for his PhD at Tohoku University, and did his postdoctoral studies at the University of Pittsburgh and at MIT. In 1980 he returned to Japan and joined Suntory Institute for Bioorganic Research (Nakanishi's Institute), where he completed the total synthesis of compactins. In 1983, he moved to Tohoku University and was promoted to Professor of Chemistry in 1989. His total synthesis of ciguatoxin in 2001 has been recognized as a landmark of the Art of Organic Synthesis in the world.

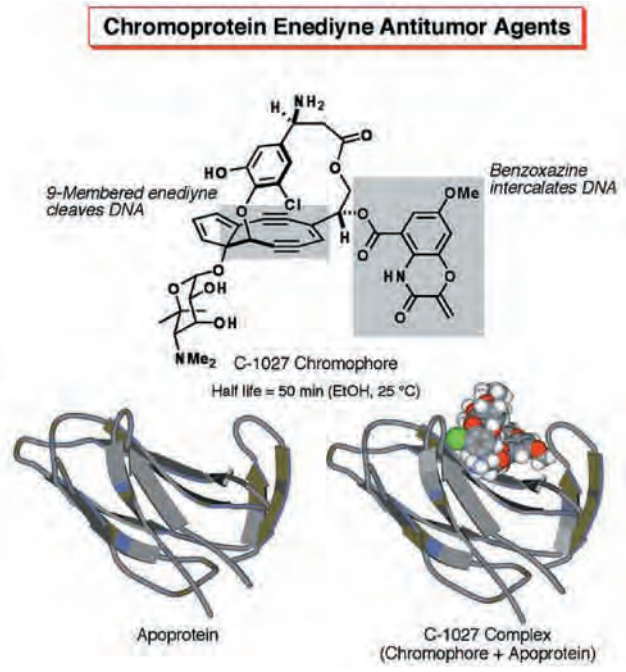
He has concurrently served as Director of the CREST and then the SORST Projects of JST, and the Research and Analytical Center for Giant Molecules, Graduate School of Science. He received the Incentive Award in Synthetic Organic Chemistry in 1986, the Inoue Prize for Science in 1997, the Synthetic Organic Chemistry Award in 1999, Roche Distinguished Lecturer Award in 2000, and the Chemical Society of Japan Award in 2003.

Research Activities

Ciguatera poisoning is an important medical issue in tropical and subtropical regions. We have been developing a general method for total syntheses of ciguatoxins, the causative toxins. We achieved the first total synthesis of ciguatoxin(CTX3C) in 2001, which has been recognized worldwide as a landmark of modern organic synthesis. Practical total syntheses of ciguatoxins allow us to use them for interdisciplinary research, such as unveiling the gating mechanism of voltage sensitive sodium channels.

Highly sensitive anti-ciguatoxins monoclonal antibodies are to be developed, and the immunoassay will be able to detect ciguatoxins at the level of pg/ml in poisoned fish. These antibodies will also be utilized for treatment of the human ciguatera poisoning. Furthermore, designed pseudo-ciguatoxins have been synthesized as bio-probes for understanding the biological mechanisms. Synthetic studies of extremely potent antitumor agents such as chromoprotein nine-membered enediyne antibiotics are also outstanding in the world.

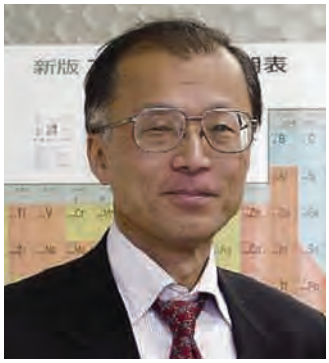




Message

Have a hungry curiosity about Nature and watch Nature carefully, so that you will find fascinating wonders. Always think of "why so?" Play with something you have made. Enjoy playing with friends, sports, music, traveling, learning, reading, writing, speaking, and so on. Never give up even if the things do not go as you desire. You will later realize that whatever has happened to you is valuable for your life, even though some experiences might have appeared useless at the time. Keep challenging!

Sadamichi Maekawa ／Professor ／Institute for Materials Research

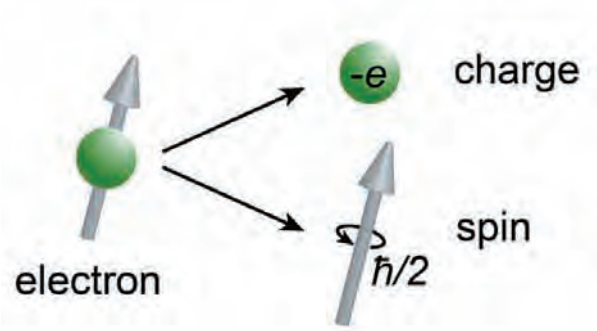


Profile

He was born in 1946 and received his Doctor of Science (Physics) degree from Tohoku University in 1975. He became a Professor at Nagoya University in 1988 and has been a Professor at the Institute for Materials Research, Tohoku University, since 1997. He has won several honors and awards: Humboldt Award (Germany), Magnetics Society of Japan Award, Fellow of American Physical Society and Fellow of Institute Physics (UK). He is the Chair of the Magnetism Commission in the International Union of Pure and Applied Physics (IUPAP). His research field is theory of condensed matter.

Research Activities

He is a condensed matter theorist, whose work is based on real materials and devices, and thus closely related to experiment. He has made a groundbreaking contribution to topics as diverse as spin-dependent transport in magnetic materials and nanostructures, high temperature superconductors, transition metal oxides, and numerical techniques of many-body physics for studying strongly-correlated electron systems. Two examples are the first reproducible demonstration of tunnel magnetoresistance(TMR) in 1982, and the first demonstration of spin-charge separation in strongly-correlated systems in 1996.



In strongly interacting electron systems, an electron falls apart into spin and charge.

Message

There are two kinds of physics; one is to search for elements in nature and the other is to examine the diversity of nature. Condensed matter physics is usually falls into the latter category, but it sometimes provides unique elements in complex materials. My research is in the latter and the aim of my research is to study theoretically electronic properties in materials and device application.

One of the mottos of Tohoku University is to emphasize “Practice-Oriented Research and Education” the so-called “Jitsugaku”. In my research, this is to study basic physics and at the same time, to examine its connection to the real world and society.

Kensaku Mizuno ／ Professor ／ Graduate School of Life Science

Profile

Dr. Kensaku Mizuno received his BSc in 1975 and MSc in 1977 in chemistry from Osaka University. After studying for a further two years in the Institute for Protein Research at Osaka University, he worked as an assistant professor during 1979-1990 in Miyazaki Medical College, where he studied the biochemistry of bioactive peptides and their precursor processing enzymes. He received his PhD in chemistry in 1983 from Osaka University. After working at the University of California, San Diego, during 1989-1990, he worked as an associate professor from 1990 to 1999 at the Faculty of Science, Kyushu University, where he studied growth factors and their receptors. He came to Sendai in 1999 as a professor at the Graduate School of Science and then the Graduate School of Life Science, Tohoku University. Dr. Mizuno's laboratory focuses on signaling mechanisms regulating cytoskeletal reorganization, cell migration and cell division. Dr. Mizuno received the Young Investigator Award from the Japanese Biochemical Society in 1988 and the Nikkei BP Technology Award in 1995.

Research Activities

In response to intracellular and extracellular stimuli, cells change their morphology and motility. Cell morphology and migration are fundamental in a variety of physiological and pathological processes, including wound healing, inflammation, embryogenesis, organogeneis, angiogenesis, and tumor metastasis. Actin cytoskeletal dynamics and reorganization play central roles in the regulation of cell shape change and migration. Prof. Mizuno and his group previously showed that cofilin, an actin-depolymerizing factor, is phosphorylated and inactivated by LIM-kinase, and that the LIM-kinase-cofilin signaling pathway plays a key role in actin filament dynamics and actin cytoskeletal reorganization. Mizuno's laboratory undertakes research on the signaling pathways that transduce extracellular stimuli to the machinery controlling actin filaments and the mechanisms by which cells spatiotemporally and coordinately regulate the actin cytoskeletal remodeling for cell migration, polarity formation, and cell division. Mizuno's laboratory also aims to elucidate the molecular mechanisms underlying chemotactic response of leukocytes, invasion and metastasis of cancer cells, angiogenesis, outgrowth of neuronal axons and dendrites, and mitotic spindle positioning and cytokinesis, all of which are regulated by cytoskeletal reorganization.

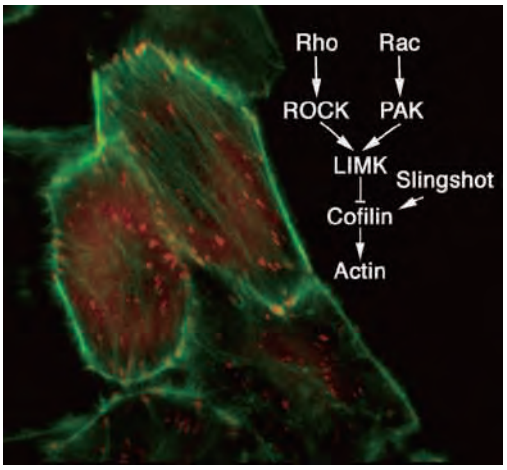


Figure 1.
Actin cytoskeleton in animal cells and its signaling pathway. Immunofluorescence image of actin filaments (green) and focal adhesion molecule vinculin (red).

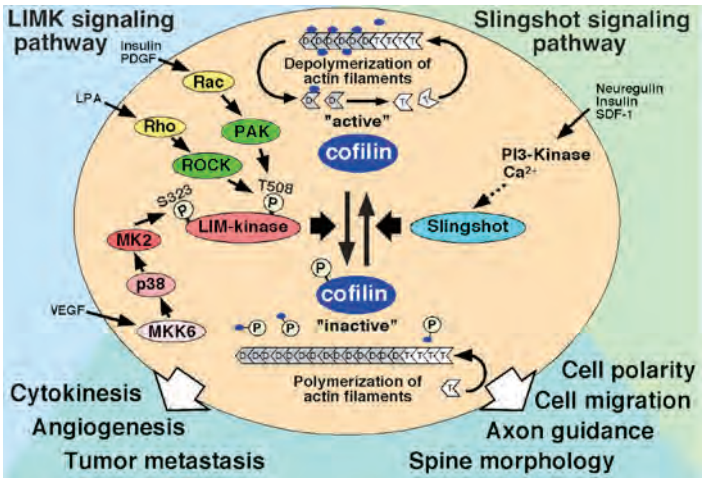


Figure 2.
Phospho-regulation of cofilin by LIM-kinase and Slingshot controls actin cytoskeletal dynamics and reorganization and thereby plays a key role in various pathophysiological processes, including chemotactic cell migration, cell division, axon guidance, and tumor invasion and metastasis.

Message

Our understanding of life had dramatically advanced late in the 20th century. The human whole genome sequence was determined at the beginning of the 21st century. In spite of the great advance in life science, most of the wonders of life are not scientifically explained. We still cannot answer the fundamental questions, such as how cells determine their shapes and sizes, how cells migrate, and how cells and organisms determine their life spans. Also we cannot explain the mechanisms of more complicated processes, such as embryogenesis and the formation of brain architecture. It is attractive and exciting for researchers to solve these many unanswered questions about the wonders of life. In scientific research, a small basic idea can often create a new field of science and make an advance in applied science and technology. It is very important for researchers to decide what theme they pursue. I strongly encourage young researchers to take pioneering and exciting themes, driven by their own interest.

Katsutoshi Mizuhara ／Professor ／Graduate School of Education

Profile

<Education> 1974: MA, Tohoku University; 1989: PhD, Tohoku University, (*Establishment process of the modern Japanese teacher training*).
<Professional Experience> 1977: Researcher, Japan Society for the Promotion of Science; 1978: Assistant Professor, School of Education (Educational Content Course), Tohoku University; 1983: Lecturer,School of Education (Educational Content Course), TohokuUniversity; 1985: Associate Professor, School of Education (Educational Content Course), Tohoku University; 1992: Visiting Scholar, Beijing University and the Beijing Normal University; 1994: Professor, School of Education (Educational Content Course), Tohoku University; 2000: Professor, Graduate School of Education (Instruction and Learning Course), Tohoku University; 2006: Special Advisor to the President, Tohoku University; 2007: Vice-Dean, Graduate School of Education; 2008: Professor, Graduate School of Education (Curriculum Design and Assessment Course), Tohoku University.

<Awards>2004: "*Presidential Prize for Educational Excellence*"; *2007: "Tohoku University Prize for the Encouragement of Gender Equality*".
<Professional Societies> Japan Society for the Study of Education, Director; The Japanese Society for Curriculum Studies, Chief Director; The Japanese Society for the Study on Teacher Education, Director; Tohoku Society for the Study of Education, Chairman; National Association for the Study of Educational Methods, Director.

Research Activities

I published the following three books: *Identify myself — I create myself* (2001), *Identify myself — I cultivate myself* (2003), *and Identify myself* Ⅲ*— expand my relationships* (2004). These works are the reports of my class by which I've received the "*Presidential Prize for Educational Excellence*" in 2004. This class was broadcasted by "Close-up Miyagi" of NHK (2002), and appeared in an academic journal of The Japan Society for the Study of Education (2006). More recently, I have challenged further to create a large class where students participate actively with teaching assistants. The challenge has been described in the book "*Thinking about the school is interesting*" (2006).

The purposes of my research are to find out effective methods to train excellent teachers, and to organize a school curriculum. To realize the purpose, I analyze the curriculum of elementary schools, junior high schools and high schools, and the teacher training university. As the result, I have published the following four books. *History of modern Japanese teacher training* (Kazama bookstore 1990), *Curriculum reform of present age in Japan* (1992 and Chinese 2005), *History of modern Japanese curriculum policy* (Kazama bookstore 1997), and, as a coauthor, *Curriculum in new age* (Yuhikaku 2005).

（1）The Class of "Identify Myself"

（2）The main publication books

Message

There are a lot of failures and frustrations in my younger days, for example about love and study. During my college days, I failed in the university examination and in love, therefore, I was driven in doing study and running marathons. Those years were also when I was absorbed in research and when I established my ability as a researcher.

My process of becoming a professor didn't go well. I couldn't find the meaning of life. So, I read a lot of books, and participated in the training camp of several groups. Although these were risky experiences (e.g. female relations), these enabled me to understand what human beings are.

It was when I was 29 years old that I could finally get out of such a dark tunnel, when my paper appeared in an academic journal. However, this was also the time when my anxiety as a researcher started. I was 40 years old when I finished writing my PhD thesis.

Anxiety in youth can only be overcomed when you fight against yourself. I would like to recommend you to make full use of the experience and enjoy your valuable lives.

Tokuji Miyashita ／ Professor ／ Institute of Multidisciplinary Research for Advanced Materials

Profile

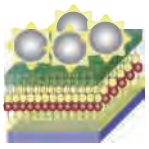
Tokuji Miyashita is currently a Professor and the Deputy Director of the Institute of Multidisciplinary Research for Advanced Materials at Tohoku University. He graduated from Tohoku University in 1971 and received his PhD from Tohoku University in 1976. He began his career as a Researcher at Sagami Chemical Research Center and then joined Tohoku University as a Research Associate. He was promoted as a Professor in 1993 at Tohoku University. He majors in polymer materials chemistry, especially preparing a variety of functional polymer nanomaterials. Recently he has focused on the field of bottom-up nano-technology using polymer ultra-thin film (polymer nano-sheets) and the fabrication of soft nano-devices composed of various functional polymer nano-sheet assemblies. Moreover, he has developed novel hybrid polymers as a project leader in NEDO (Government support). He has received several awards, including the award of The Society of Polymer Science Japan in 1997 and the award of The Society of Pure & Applied Coordination Chemistry in 2004.

Research Activities

The major research field is polymer nano-material chemistry. It is well-known that many kinds of materials in surroundings such as proteins, cellulose, silk, DNA, fibers, plastics, rubber are composed of polymer compounds. In his research group, studies on the preparation of ultrathin polymer film with one molecule thickness (about 1 nm) and polymer assemblies aiming at the creation of new polymer nano-materials applicable to “Nanotechnology” are carried out. He employs the Langmuir-Blodgett technique, utilizing water surface as molecular architecture technology to fabricate tailor-made polymer nano-sheet assemblies. Very stable, uniform, and widely applicable polymer nano-sheets have developed in his group and various functionalities for molecular electronics, photonics, sensor, and plasmonics can be incorporated into the polymer nano-sheet assemblies.

The following are current topics:

- ▸Tailor-made fabrication of 2D and 3D nano-structures using polymer nano-sheet assemblies.
- ▸Optical waveguide sensor and molecular sensor
- ▸Organic transistor and photodiode composed of polymer nano-films
- ▸Hybrid assemblies of metal nanoparticles and polymer nano-sheets
- ▸Fabrication of new nano-devices utilizing surface plasmon resonance produced on hybrid nano-assemblies.
- ▸Preparation of novel thermal resistance, transparent hybrid polymer film applicable to film electronics



Polymer hybrid nano-assemblies with nanoparticles

Film electronics

Polymer nano-sheet

Ordered 3D organized assembly

Message

It is a great honor for me to receive the Distinguished Professor Prize from Tohoku University. I believe that the prize is a result of collaborative work by all the members of Miyashita research group. Although it is important for research work to pick up excellent researching targets with novelty, uniqueness, and expansibility, it should also be essential to assemble a good research team with many colleagues and to enjoy the research work together. I intend to request my students to do research and study with an open mind, deep emotion, and a great dream. I hope students fall in love with study and research. A great result will come out after conducting research work with the simplicity and enthusiasm of childhood.

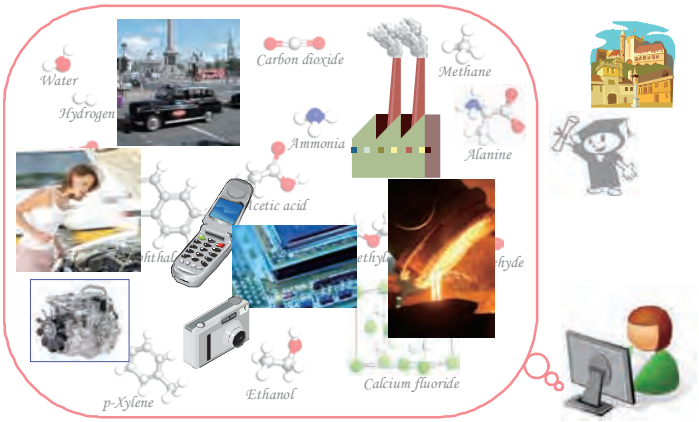
Akira Miyamoto ／ Professor ／ New Industry Creation Hatchery Center (NICHe)

Profile

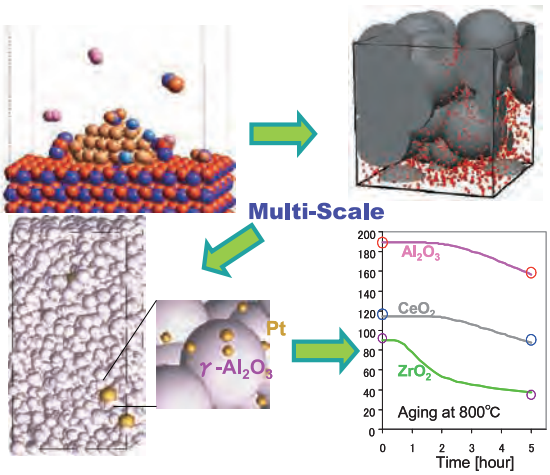
Dr. Akira Miyamoto graduated from Suzuka College of Technology in 1968. He was incorporated into the Department of Applied Chemistry, Tohoku University where he completed his studies and was awarded a Doctor of Engineering degree in 1975. The same year he joined the Department of Synthetic Chemistry, Nagoya University, where, as a research associate, he was engaged in catalyst research for environmental clean-up. He then joined the Department of Hydrocarbon Chemistry, Kyoto University to finally become a full Professor at the Department of Molecular Chemistry & Engineering, Tohoku University in 1992. After more than 20 years dedicated to the experimental study of catalysts, he threw away all the apparatuses he had been using so far to undertake a brand new research project in the nascent field of computational chemistry. In 2002 he also became a full professor at the New Industry Creation Hatchery Center (NICHe), and in 2004 he led the installation of the industrial endowed chair for Combinatorial Chemistry at Tohoku University.

Research Activities

The human race is being challenged by global problems such as environmental change, food supply and many others that are dynamically changing through time. Under these circumstances, I believe that the role a university must accomplish in our days is to create new areas of study to keep pace with our changing times. With this idea in mind I have been aiming for the creation of the field of computational chemistry as a new and necessary field of study. Computer chemistry is a field that takes advantage of the calculation and graphic abilities of modern computers to represent chemical compounds and materials at the atomic and molecular level, in order to analyze and predict chemical phenomena according to the laws that govern the natural world. Besides developments aiming at solidifying the basics of computational chemistry in my laboratory, we are making indefatigable efforts to bridge the gap between the micro world (the world of atoms and molecules) and the macro world (the actual industrial product). The results are used by a variety of industries like the car, electronics, electric power, and gas industries and our originally developed chemistry software is also being used by different companies and enterprises in these areas. With the slogan “Science at the service of society, and original technologies give birth to new scientific fields”, we aim to contribute to the strengthening of the technological bases of the industrial sector as well as to further advancement of the field of computer chemistry which in recent years has undergone unprecedented development.



Solution from computational chemistry to various kinds of industrial issue.



Catalyst design integrated microscopic and macroscopic simulation techniques.

Message

In getting to know that molecules are the cause of color differences in the natural world I felt a keen interest in chemistry from a very young age. Research that started from this interest would make me get acquainted with the new field of computational chemistry and allow me to lead a group that can boast members exceeding 200 people at present, one of the largest in this field around the world. With computational chemistry gaining status as a routine problem solving tool in the industrial sector, interest in the field has also increased both nationally and internationally, and a large number of eager international students are gathering to pursue research in computational chemistry in our laboratory. With one research objective in mind, constructive competition can only add to self improvement as individuals, and it will undoubtedly result in benefits for society as a whole. A university is in fact able to create study fields that can transform dreams into reality. Therefore, I wish that each and every one of you may join us at this institution full of intellectual stimulus, and, embracing a big dream, you can also create a new scientific field.

Hiroshi Yoshino ／Professor ／Graduate School of Engineering

Profile

Professor Hiroshi Yoshino was employed as a research associate by the Institute of Industrial Science of the University of Tokyo in 1974 while he was a PhD candidate. Subsequently he received his doctorate in 1976. He joined the Department of Architecture in the Faculty of Engineering of the Tohoku University as Associate Professor in 1978, and was promoted as a full Professor in 1992. In 1997, Professor Yoshino was assigned to the Department of Architecture and Building Science in the Graduate School of Engineering of Tohoku University. He was invited to be a Concurrent Professor of Hunan University (Changsha City, China) and Advisory Professor of Tongji University (Shanghai City, China) in 2002. Professor Yoshino has done a vast number of research studies in the field of building environmental engineering, especially on thermal environment, indoor air quality and energy conservation in residential buildings. He has received various awards in his research field: among these awards are the Award of the Architectural Institute of Japan, the Award of The Society of Heating, Air-Conditioning and Sanitary Engineers of Japan (fives time), The Best Paper Award of the International Journal of Asian Architecture and Building Engineering (twice), and the Fellow Award of The American Society of Heating, Refrigerating and Air-Conditioning Engineers. As for international contributions, Professor Yoshino served as chairman and vice chairman for numerous international conferences. In 2007, he was the Chairman of the 6th International Conference on "Indoor Air Quality, Ventilation & Energy Conservation in Buildings" (200 participants from Japan and 200 participants from overseas). In the same year, the IPCC (Intergovernmental Panel on Climate Change) was awarded the Nobel Peace Prize, in which Professor Yoshino was one of the authors of the IPCC Fourth Assessment Report.

Research Activities

Professor Yoshino specializes in the field of building environmental engineering, particularly on thermal environment, indoor air quality and energy conservation in residential buildings. Recently, the prevention of global warming has become a major issue all over the world. Professor Yoshino has carried out numerous basic and applied research projects in various aspects with the aim of reducing the energy consumption to a maximum extent without compromising comfort and a healthy living environment. The use of natural potentials has become one of the most important concerns. Experimental studies using the test house together with numerical simulations have provided useful data for the design of a passive solar system (shown in photo), a semi-underground house, night-time ventilation to reduce the energy consumption for cooling, and the effect of using exterior thermal insulation etc. Buildings are constructed airtight in order to reduce energy consumption. However, indoor air can be easily polluted because of the lack of natural ventilation. In order to prevent any occurrence of adverse health effects from the house, research projects from multilateral viewpoints as shown in the figure have been put together, with contributions from various experts in the fields of Medicine, Epidemiology and Chemistry. Recently, research related to the prevention of global warming issues has been carried out, for instance: the investigation of future energy consumption trends in Japanese and Chinese residential buildings, and the research and development of desiccant cooling technology using solar energy, etc.

Photo: Experimental house for various research purposes

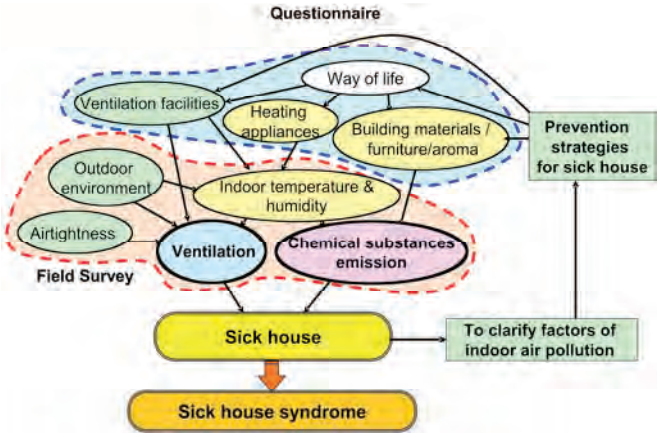


Figure: Sick house syndrome and its influencing factors

Message

Looking back, I took up the position as an associate professor at Tohoku University 30 years ago. I have found great interest in understanding the indoor environment of residential buildings and have been devoting most of my efforts to study within the scope of building environmental engineering since then. I am always keen to acquire new knowledge and I approach my work with enthusiasm. When I come across a problem, I always start from looking into the present conditions of the problem. From my various investigations in the main cities of the Tohoku district, various indoor environment problems have been clarified, for example, air temperatures in the non-heated rooms are very low, the vertical temperature differences in the heated rooms are huge, and so on. How to improve such indoor environments is a wide research topic. It has led to my research on the relationship between the occurrence of stroke and indoor temperature, the possibility of using solar energy in the Tohoku district, the effect of insulation and airtightness, the state of "sick" houses, and the assessment of ventilation performance, etc. Thus, I would say that understanding the root of a problem is the basis of academic research. Besides, continuity is also very important. In order to become an expert, it is necessary to devote at least ten years to one research subject. Another important point is to produce international publications. In my opinion, no matter how fascinating the research is, Japanese written papers cannot be understood outside Japan. Hence, we should publish our papers in the international arena more actively, and focus our research targets on a global scale.

Kunio Inoue ／ Professor ／ Graduate School of Science

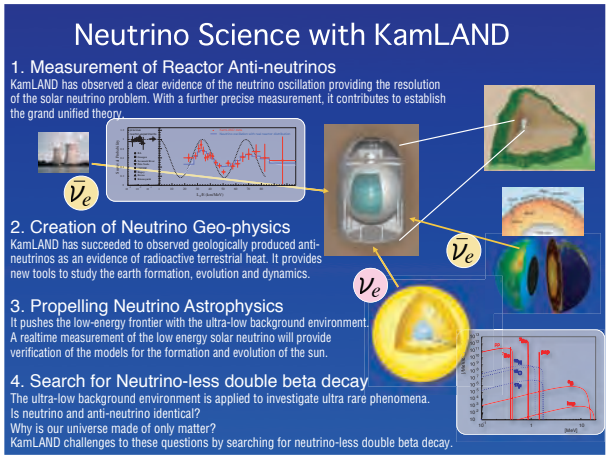
Profile

He started to address the solar neutrino problem in the Graduate School of Science, Osaka University in 1988. He moved to the University of Tokyo in 1990 and joined Kamiokande and continued Super-Kamiokande afterward. He focused on the observation of solar neutrinos. He was appointed research associate of the Institute for Cosmic Ray Research, University of Tokyo, in 1992, and completed his dissertation in Physics in 1994. He was awarded the Asahi prize (1998) for "the discovery of neutrino mass" as a member of the SK group. He moved to RCNS, Tohoku University as an associate professor in the same year for starting the KamLAND experiment. He won the first Koshiba prize (2004) in connection with the resolution of the solar neutrino problem and was promoted to a full professor in the same year. He has been the director of RCNS since 2006 and is propelling neutrino geophysics and astrophysics with KamLAND. He has also been contributing to nurture young talents as a leader of the global COE program "Weaving the Science Web beyond the Particle Matter Hierarchy" since 2008.

Research Activities

One of the matter particles, "neutrino" is a neutral and very light particle, and it exists in many orders of magnitude more abundant than any others in the universe. Unveiling neutrino properties is connected with understanding our universe and establishing the grand-unified theory of elementary particles. Neutrinos scarcely interact with matter and are hardly detected. KamLAND, holding 1000 tons of liquid scintillator at 1000 meters underground, observes those elusive neutrinos. It has found that anti-neutrinos from nuclear power reactors continually vanish and reappear. This clear evidence of neutrino oscillation resulted in the resolution of the solar neutrino problem, which concerns why neutrino flux from solar fusion reaction is significantly smaller than that expected from solar luminosity. Utilizing the elusiveness of neutrinos for looking into opaque objects, KamLAND has succeeded in observing geologically produced anti-neutrinos and opened a new field of "Neutrino Geophysics." It also applies to a precise observation of the interior of the sun. A neutral matter particle, neutrino, may not distinguish particles and anti-particles. The fact is a key in solving why we born from nothing in the Big Bang are made of just matter. A search for neutrino-less double beta decay directly connects to the resolution. The ultra-low background experiment, KamLAND, accords with the study and vigorous research and development is going on regarding the search.

Inner view of KamLAND taken at the construction. Fifty centimeters diameter photo-sensors are installed inside the 18-m diameter sphere.



Message

I have been focusing on solving the solar neutrino problem in my research career. At the beginning, I committed myself to works far from particle physics such as crystal growth or metal dope in organic liquid for developing a neutrino detector. Then, I became deeply devoted to the observation of solar neutrinos with Kamiokande and Super-Kamiokande, looking for smoking-gun evidence of neutrino oscillation as a solution for the solar neutrino problem. But no evidence was found. I began to think the resolution could be my lifework. All of a sudden, the solar neutrino problem was solved by taking a different approach, the measurement of reactor anti-neutrinos with KamLAND. The construction of KamLAND was my fourth experience of photo-multiplier-tube installation. I'm quite skilled in this heavy physical task. It also required continual cleaning work for four months, in order to have the world cleanest detector. I learned what is indispensable for opening a new frontier is to pursue unpleasant work and to have a wide view. Neutrino observation with KamLAND is expected to apply to other fields, such as neutrino geophysics and astrophysics. Investigating new possibilities is really interesting, and I'm willing to share such fascinating experience with students. I'm leading the global COE program in order to achieve this. I'm anticipating collaboration with many more students who will strengthen the scientific base of Japan.

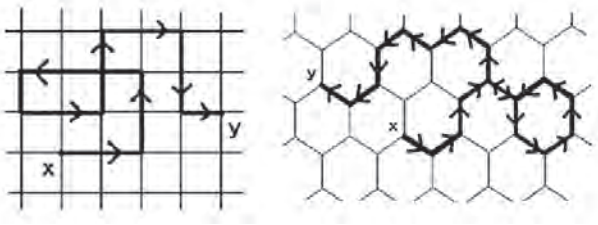
Motoko Kotani ／Professor ／Graduate School of Science

Profile

Motoko Kotani graduated in mathematics from University of Tokyo in 1983, and received the degree of Doctor of Science from Tokyo Metropolitan University in 1990. She became an associate professor in the Department of Mathematics at Tohoku University in 1999, and was then, promoted to professor in 2004. In her career, she has studied at the Max-Planck Institute in Germany (September 1993 – August 1994), the IHES in France (April 2001 – November 2001), the Isaac Newton Institute in Britain (February 2007 – March 2007 and May 2007), and at other foreign institutes, being recognized as a mathematician of worldwide reputation. In 2005, for her contribution to "Discrete geometric analysis on a crystal lattice", she was awarded the 25th Saruhashi Prize, which is given to a female scientist who has produced outstanding achievements in natural science. She greatly contributes to the promotion of mathematics in Japan by taking an active part in a variety of committees of the Mathematical Society of Japan.

Research Activities

Her main research field is Geometry, studying symmetries of figures. Symmetry is described by "Group" in Mathematics. Geometry in the 20th century has been developed mainly in connection with Group Theory. Understanding of a discrete group has been accelerated by introducing geometric structures into it, although it had remained almost untouched until recently, due to lack of appropriate tools. She employed the concept of random walks to investigate discrete groups, which raised her interest in the interplay of Geometry and Probability Theory. Probability Theory provides a useful tool to understand random and complex phenomena in the physical world. She now works to establish a mathematical theory by using Discrete Geometric Analysis to clarify how macroscopic dynamics, such as an electric current or a heat flow in materials, are controlled by their microscopic geometric structures.



random walk

$$p_n(x,y) \sim \frac{1}{(4\pi n)^{d/2}} e^{-\frac{d_0(x,y)^2}{4n}} \left(c_0 + \frac{c_1}{n} + \frac{c_2}{n^2} + \cdots\right), \quad (n \to \infty)$$

central limit theorem

Message

Albert Einstein said, "The most incomprehensible thing about the world is that it is comprehensible." It gives us great pleasure to understand the universe, which ranges from invisible microscopic regions to unreachable boundaries of space, by our own ingenuity and imagination. Why it is possible is, I think, a miracle, but I don't know any other thing which gives me such a keen sense of joy than to discover an appropriate "word" or "concept" that describes a simple principle hidden in a seemingly complex chaotic phenomenon. This is what mathematics does.

When I was a university student, the forefront of mathematical research looked far out of my reach. I was almost crushed by a sad and hopeless feeling, accepting the fact that I was not able to participate in the creation of a beautiful, attractive world of mathematics that only geniuses were allowed to do. However, I was wrong. I felt relieved when I found that mathematics is full of richness, and accepts all varieties of ideas, offering me complete freedom to pursue my own interests, driven by curiosity.

If you encounter a world you devote yourself to work for, I truly believe that you will be welcomed to join there.

Yoshimichi Sato ／ Professor ／ Graduate School of Arts and Letters

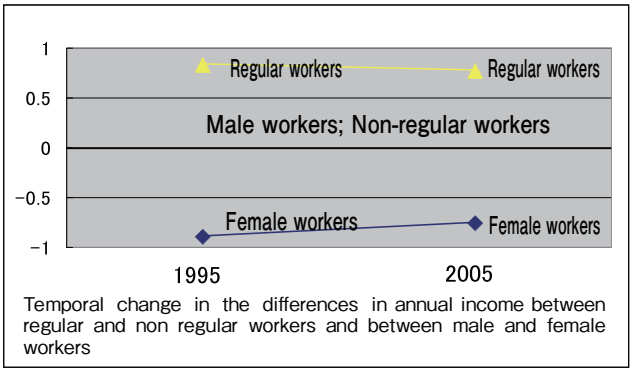
Profile

Professor Yoshimichi Sato took up an assistant professorship at Yokohama City University after finishing his course work at the Graduate School of Sociology, University of Tokyo, and was then promoted to associate professor. He joined Tohoku University as associate professor in 1992. After conducting his research as a visiting scholar at the University of Chicago and Cornell University he was promoted to professor in 2002. As the director of the Center for the Study of Social Stratification and Inequality (CSSI) under the 21st Century COE Program, he established an international research and education center and promoted interdisciplinary research projects on social stratification and inequality. He succeeded in getting a five-year grant for the CSSI in 2008 and is advancing studies in this field. He is also internationally active, being designated president of the Japanese Association for Mathematical Sociology, executive member of the International Sociological Association (ISA), and president of Research Committee on Rational Choice of the ISA.

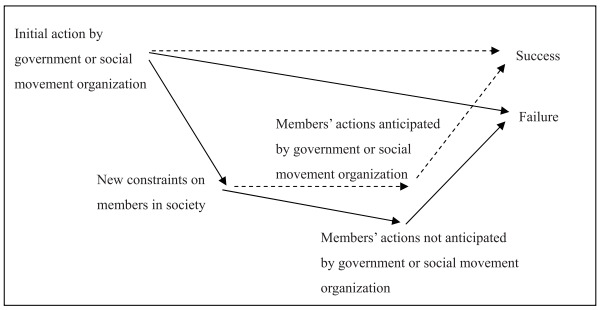
Research Activities

I have been exploring two research topics : social stratification and social change. In the study of social stratification I studied the disparity in income between regular workers and non-regular workers, which is often talked about in the mass media. My analysis of the data of the 2005 Social Stratification and Social Mobility Survey (SSM Survey) shows that the average income of regular workers is 2.13 times as large as that of non-regular workers after controlling for age, gender, and occupation. However, it is not necessarily the case that the disparity has been widening. A comparison of the 1995 and 2005 SSM Survey data indicates that the disparities in income between regular and non-regular workers and between sexes have slightly decreased over the decade.

In the study of social change I have analyzed the mechanism that determines success/failure of "intentional social change", such as social planning and social movement in which governments and social mobility organizations try to change society. My analysis has revealed that intentional social change fails, because the reactions of people in society to the actions of governments and social mobility organizations accumulate to produce results that were not anticipated by governments and social mobility organizations.



Temporal change in the differences in annual income between regular and non regular workers and between male and female workers



Message

I would never have thought that I would become a scholar, not to mention becoming a sociologist. I was so attracted to radio-controlled airplanes when I was a kid that I dreamed of becoming the owner of a shop of this kind. However, I began to appreciate the beauty of mathematics while I was working out calculations necessary for crafting radio-controlled airplanes. Thus I determined to study mathematics at college. Then after entering college I found myself surrounded by geniuses in mathematics, and understood my limited talent for mathematics would not lead to my being an excellent mathematician. Fortunately, I was also interested in the study of society, so I decided to apply mathematics to it, and have conducted research in the fields of mathematical sociology and quantitative sociological analysis. As regards my character, I am not a born leader with strong leadership skills. However, I have directed the CSSI for five years.

Looking back on my life history, I would say I have developed a career that is different from what I originally intended, and I do not regret that. Having a flexible attitude toward your career is important in order to enrich your life. A mind open to various opportunities will lead you to the higher levels. Do not miss great opportunities by defining yourself narrowly.

Tohru Nakashizuka ／ Professor ／ Graduate School of Life Science

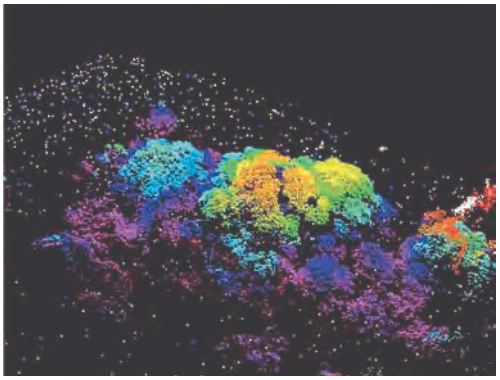
Profile

He was born in Niigata Prefecture in 1956, graduated from Chiba University in 1978, and received his PhD degree from Osaka City University. He started to work for the Forestry and Forest Research Institute, Forest Agency Japan, in 1985, and moved to the Japan International Research Center for Agricultural Sciences in 1992. Then he became a professor in the Center of Ecological Research, Kyoto University, in 1995, and moved to the Research Institute for Humanity and Nature, when the institute was founded in 2001. After 5 years of project leading in the RIHN, he became a professor in the Graduate School of Life Sciences, Tohoku University, in 2006. He won the Award of The Japanese Forest Society in 2003, the Konosuke Matushita Memorial Award of Flower Exposition in 2004, and the Midori Scientific Award, Cabinet Office, Government of Japan, in 2007.

Research Activities

Nakashizuka has firstly studied the dynamics and life history of forest tree species. Natural forests have been thought stable for thousands of years, though they require regeneration for long-term continuation. He demonstrated the importance of natural disturbance in forest regeneration and community organization. He also took an initiative to establish forest sites for long-term studies in Japan and tested hypotheses in relation to tree life history and mechanisms of multi-species coexistence. Secondly, he studied the canopy biology and function of tropical rain forests. He established a canopy crane in a tropical forest in Borneo to enable direct observations and experiments at the 50-60 high top of the forest. His project contributed to the understanding of forest functions, such as gas exchange between the atmosphere and the forest ecosystem, and maintaining the mechanism of biodiversity in tropical rain forest. The studies in tropical rain forest have been enlarged into studies on sustainable use and conservation of biodiversity. Particular foci of his project are the change in forest use and its effects on biodiversity and ecosystem services. Recently, he has started a program to establish a global center on ecosystem adaptation to changing environment (GCOE), as the program leader.

A canopy crane established in Sarawak State, Malaysia



Three dimensional architecture of the canopy of a tropical rainforest

Message

Recent science has been emphasizing the importance of the ‘uniformity’ or the ‘unity principle’, though I think ‘diversity’ is another important concept, not only in biology but also in many sciences. There is always some diversity for organisms with a function in an ecosystem, and it is the same for industrial products. Imagine if there were only one design of mobile phone, if you had only one choice for dinner every day, or if every local region produced the same souvenir for tourists. A world without diversity may not work in a sound way, and you may not feel happy. In a sense, my research is an attempt to discover the significance of diversity. In my youth, I visited many forests and was surprised by the uniqueness and diversity of the forests every time. The ability to recognize diversity and the ability to abstract the uniqueness seem to be ones which the modern human has been loosing. However, such abilities must be necessary for the resolution of environmental problems in the future. I hope that young people will improve their abilities in this regard.

Shigenao Maruyama ／ Professor ／ Institute of Fluid Science

Profile

After graduating from the School of Engineering, Tohoku University, in 1977, Professor Shigenao Maruyama received his MSc degree from Imperial College, London University in 1989 and his Master of Engineering from Tohoku University in 1990. He obtained the degree of Doctor of Engineering from Tohoku University in 1983. Since then, he has been a faculty member of Tohoku University. He was promoted to the position of full professor in Institute of Fluid Science, Tohoku University, in 1997.

Throughout his academic career, Professor Maruyama has been engaged in promoting research and development in the area of Thermal Engineering. For his contributions, he received the JSME Medal for Outstanding Paper (1999), the Award for Academic Achievements of Thermal Engineering Division (2001) from the Japan Society of Mechanical Engineers, and the Award for Scientific Contribution (1998), and the Award for Technical Contribution (2002) from the Heat Transfer Society of Japan. He is the recipient of many other prestigious awards of Japanese and overseas academic societies.

Professor Maruyama has published many textbooks, handbooks and research papers. He has co-authored and edited the JSME Text Series "Thermodynamics", which is one of the best selling books on thermodynamics for mechanical engineering students in Japan.

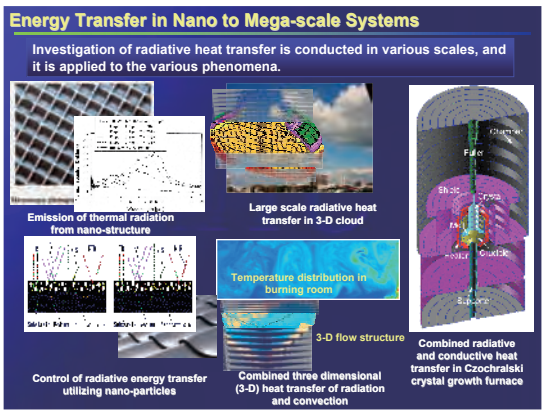
Professor Maruyama was a project leader of the 21st Century COE (Center of Excellence) Program (2003-2008), and is currently the leader of the Global COE Program (2008-2013). He has contributed to Tohoku University as a Councilor, a Special Advisor to the President, and as one of the Special Advisors for Centenary Events and the Alumni Association of Tohoku University.

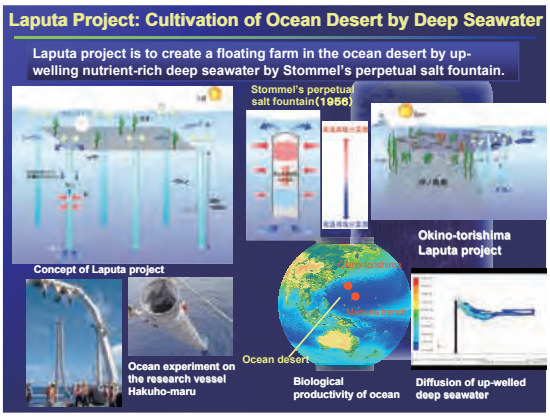
Research Activities

Professor Shigenao Maruyama specializes in thermal engineering. He has made detailed investigations of various aspects of fluid flow and energy exchange. Conventional heat transfer and thermal control focus on the enhancement of heat transfer and temperature control of equipments. Prof. Maruyama has proposed a novel concept of heat-transfer control, in which the heat transfer of the matter is enhanced or reduced actively. The proposed active thermal insulation system and a heat-transfer control device utilizes Peltier effects.

Prof. Maruyama's work utilizes knowledge from various academic disciplines, and his research is interdisciplinary. Some aspects of his research activities are as follows:

1. **Radiative Heat Transfer**: Radiative heat transfer, which is energy transfer by infrared or electro magnetic waves, has been investigated. A generalized analysis method to calculate radiative heat transfer was proposed, and the method was applied to analyze heat transfer in semi-conductor processes and industrial furnaces. This method was applied to large-scale environmental energy transfer, such as heat transfer in fogs and clouds. Thermal emission from nano-scale structure has been investigated. These results were published in a monograph, *Light Energy Engineering*, (Yokendo, 2004), written by Prof. Maruyama, which is the first general textbook of radiative heat transfer in Japan.
2. **Natural Convection**: Natural convection, which is induced by temperature difference in fluid and gravity force, has been investigated, and generalization and optimization formulae were presented. These results were applied to the cooling fins of electronic devices. This research has been extended to a large-scale natural convection in oceanography. Up-welling velocity of deep seawater in the ocean which was proposed by Stommel as a perpetual salt fountain was successfully measured for the first time in the world.
3. **Active Heat-Transfer Control by Peltier elements:** The peltier element, which has been used as cooling equipment, has been applied to a heat-transfer control device. This device has been applied to heat-transfer control of equipment in the microgravity environment, an active catheter and artificial heart muscles. Furthermore, heat-transfer control has been applied to the oriental medicine and cryosurgery, and it has been expanded to fusion of thermal engineering and medical engineering.





Message

Curiosity and imagination are essential for the development of science. The first step of the science is to observe carefully natural and social phenomena or the movement of machinery, and to have an interest in why the phenomenon happens or how the machine works.

Do not blindly trust the principles and rules just because "the teacher says it" or "everyone believes it". The thing that is thought to be common sense is not necessarily true when one considers it deeply. It is important to ask the question, "Why does it happen?" until you think you have understood the phenomenon. Keep in mind what Bernard Baruch said: "Millions saw the apple fall, but Newton was the one who asked why."

When you have understood the phenomenon within your ability, the next step is to derive or to create a new discipline or new equipment, and then to imagine its extension. I like the moment of creation and imagination. This process of creation is similar to the joy and agony of the process of creating a novel or art.

Why don't you enjoy the fun of the intellectual creation process?

Name	Organization	Reason for appointment
Appointed on April 1. 2008		
Teruo Asakawa	Center for the Advancement of Higher Education	He has been contributing to the promotion of English teaching at the university by playing a leading role in innovation, associated with constructing course contents and curricula of English teaching.
Tatsuo Uchida	Graduate School of Engineering	He has followed an untrodden path in the research of liquid crystal display, and has achieved outstanding results through a great contribution to the practical application of high performance liquid crystal displays.
Noriko Osumi	Graduate School of Medicine	She has played an active role in the most advanced research field as the representative for the center of the global COE in the field of life science, as well as taking a leading role in social contribution.
Eiji Ohtani	Graduate School of Science	He has contributed to both education and research through publishing a number of world-class articles, and played a role as the representative for the center of the 21st century COE program.
Hideo Ohno	Research Institute of Electrical Communication	He has achieved excellent results in the new research area of fused semiconductor physics with magnetism, and has been developing world-leading research in the new field of semiconductor spin-electronics.
Yoshitomo Oka	Graduate School of Medicine	He has been greatly appreciated in the field of internal medicine, especially regarding his research into diabetes and life-style related disease, and has been played a leading role in internal medicine in Japan.
Ryuta Kawashima	Institute of Development, Aging and Cancer	He has conducted groundbreaking research in brain function imaging and achieved the most advanced research results in the world, as well as enthusiastically making a great contribution to society with his achievements in research.
Takashi Kobayashi	Graduate School of Arts and Letters	He has achieved outstanding results in the research of dialectology and has conducted remarkable research as the top dialectology researcher, receiving awards including the “Kyosuke Kindaichi Prize” and the “Isuru Niimura Prize”.
Mitsumasa Koyanagi	Graduate School of Engineering	He has contributed to the improvement of research in semiconductors through his advanced research, leading the field associated with large integration / high-capacity semiconductor memory, both in Japan and worldwide.
Eimei Sato	Graduate School of Agricultural Science	He has been highly praised for his outstanding research in agricultural science, especially in animal reproduction, and has also been highly acclaimed among educationists both inside and outside the university.
Shigeru Sato	Graduate School of International Cultural Studies	He has conducted advanced research into the neuroscience of language associated with the multi-lingual brain, and has also contributed to practical education related to foreign languages.
Motoyuki Sato	Center for Northeast Asian Studies	He has developed next-generation landmine detectors in the field of demining detection / development of demining technology, and has contributed to internarional demining activities indispensable for reconstruction and development in the conflict-affected regions in the world.
Seiji Samukawa	Institute of Fluid Science	He has achieved world-leading research concerning plasma process in the field of semiconductors, and has greatly contributed to society by realizing the practical application of technologies such as pulse-time-modulated plasma.
Tetsuo Shoji	Graduate School of Engineering	He has achieved outstanding research results associated with the breakthrough in aging degradation of energy conversion in plants, and methodology for plant life-time prediction and management. He has also has contributed to society in the practical aspect of degradation diagnosis.
Miyoko Tsujimura	Graduate School of Law	She has played an important role as a top constitutional scholar in Japan, and at the same time, she was the program leader of the center for the 21st century COE. She has conducted research into the world view of laws and policy for gender-equal society.

Name	Organization	Reason for appointment
Tetsuya Terasaki	Graduate School of Pharmaceutical Sciences	He has achieved outstanding results in his research for pharmacy and pharmaceutical studies on a world basis, especially in his research into blood-brain barriers, and has been actively promoting research in leading pharmaceutical studies nationally and internationally.
Nobuhiko Terui	Graduate School of Economics and Management	He has achieved world-class research in theoretical econometrics, and has been developing leading research activities as one of the international front-runners in this field.
Masataka Nakazawa	Research Institute of Electrical Communication	He has succeeded in achieving a number of the world's first research projects in the field of optical communication technology, and has contributed significantly to innovational research and development, leading the world in electrical communication.
Masahiro Hirama	Graduate School of Science	He has developed leading research in the field of organic chemistry / synthetic organic chemistry, and has achieved outstanding research which has received great attention worldwide.
Sadamichi Maekawa	Institute for Materials Research	He has been leading the world in the research field associated with magnetic conductors, including the effect of tunnel magnetoresistance, and he has achieved world-leading results in the research of electric property centered in the property of magnetism and the phenomenon of conductors.
Kensaku Mizuno	Graduate School of Life Science	He has published a number of research articles in the world's leading journals in the field of cell biology, and in life science he has been recognized as one of the leading researchers in the world.
Katsutoshi Mizuhara	Graduate School of Education	As a consequence of the implementation of educational reforms changing the curriculum to students' participatory education, he has received the 1st Tohoku University chancellor award, and has widely contributed to society and the education administration among local regions, such as Miyagi prefecture and Sendai city.
Tokuji Miyashita	Institute of Multidisciplinary Research for Advanced Materials	He has succeeded in being the first in the world to develop a polymer ultra thin nano-film, and he has achieved conducting outstanding research in polymer nano-material chemistry, especially in the field of new polymer nano-sheets materials, on an international basis.
Akira Miyamoto	New Industry Creation Hatchery Center	He has succeeded in developing chemistry software based on original mathematical logic, and he has contributed socially to the realization of innovational material design and process design through university-industrial cooperation.
Hiroshi Yoshino	Graduate School of Engineering	He has achieved great results in building environmental engineering, particularly concerning issues of thermal environment, indoor air quality and energy conservation in residential buildings, and he has made a remarkable contribution to society in various fields.
Appointed on August 1. 2008		
Kunio Inoue	Graduate School of Science	He has revealed the solution of the solar neutrino problems as a result of measurement of reactor anti-neutrinos with Kamland, and developed the research field in neutrino geophysics and astrophysics. He has propelled world-leading research into neutrinos as a director of RCNS and a leader of the global COE program.
Motoko Kotani	Graduate School of Science	She received the 25th Saruhashi Prize for her contribution to "Discrete geometric analysis on a crystal lattice", achieving discrete geometric analysis which connects Geometry and Probability Theory, and she has been recognized as a mathematician of worldwide standing. At the same time, she has been playing a leading role in social contribution and the project for a gender equal society.
Yoshimichi Sato	Graduate School of Arts and Letters	He has achieved outstanding research associated with the analysis of social stratification and social changes. He has been contributing to research achievement through propelling worldwide research leads to Japan as a leader of the 21st Century COE program and the global COE program.
Tohru Nakashizuka	Graduate School of Life Science	He has achieved research of international repute in the field of forest ecology and received the Midori Scientific Award. He has also propelled global research associated with global environmental problems, ecosystem management and ecosystem integrity as a leader of the global COE in the area of interdisciplinary Composition, New Field.
Shigenao Maruyama	Institute of Fluid Science	He has achieved a number of outstanding research results in wide areas relating to thermal engineering and thermodynamics. As a leader of the 21st Century COE program and a leader of the global COE program, he has been promoting the expansion of research to fuse interdisciplinary areas. He has played a remarkable leadership role in conducting world-leading research.

(In the order of Japanese syllabary)

Tohoku University

1-1 Katahira 2-chome,Aoba-ku,
Sendai 980-8577 Japan
URL:http://www.tohoku.ac.jp/

Public Relations Division,
General Affairs Department
TEL：+81-22-217-4977