



# TOHOKU UNIVERSITY

WORLD-CLASS EXCELLENCE IN CUTTING-EDGE RESEARCH AND INTERNATIONALLY BASED EDUCATION



AKIHISA INOUE, PRESIDENT

Tohoku University is a research-oriented institute located in Sendai—the ‘City of Trees’—in the heart of the Tohoku (northeast) region of Japan. The university was established in 1907 as Japan’s third Imperial University, and today its researchers are internationally recognized for their outstanding contributions especially in materials science, physics, chemistry, engineering, and medicine.

## CONTRIBUTING TO HUMANITY AS A WORLD-CLASS UNIVERSITY

“By applying the knowledge we have accumulated over the past century and encouraging innovative research and education, our university is committed to playing a leading role as a ‘world-class university’ to overcome the challenges faced by humanity today,” says Akihisa Inoue, the 20th president of Tohoku University, appointed in 2006. “Since the university was established in 1907, the philosophy has always been to put ‘Research First’ while maintaining an ‘Open-Door’ policy to emphasize ‘Practice-Oriented Research and Education.’”

Tohoku University is a comprehensive university comprising 10 undergraduate faculties, 16 graduate schools, 3 professional graduate schools and 5 research institutes. It is one of Japan’s leading universities, with approximately 5,700 faculty and staff and 18,000 students. As a research university, it embodies the notion that good teaching practice is founded on advanced research capabilities.

“According to a survey by the *Asahi Shimbun* [newspaper], Japanese high schools chose Tohoku University as the best Japanese university in both the ‘overall assessment’ and ‘academic and personal development’ categories,” says Inoue.

Sendai has been a thriving center of culture, scientific discovery, and entrepreneurship since the samurai Lord Masamune Date laid his castle’s foundations there. The city has been internationally active for more than 400 years, with records showing that in 1613 Masamune dispatched a samurai named Tsunenaga Hasekura on a diplomatic mission to Spain and Rome. Like Masamune, Tohoku University continues to reach out to the world in the pursuit of truth. Intriguingly, the university’s main campus is located in Aobayama, the site of Masamune Date’s Sendai Castle.

Modern Sendai has a population of approximately one million, with about 80,000 students attending 13 universities, and 6 junior and technical colleges in the area.

Logistically the city is less than 100 minutes from Tokyo and less than one hour from hot springs, ski resorts, and the stunning scenery of Matsushima Bay. Daily life in Sendai is quiet, peaceful, and cultural. The commute from home to lab is less than 30 minutes for most students and academics alike. The moderate cost of living offers a high quality of life in an environment conducive to creative thought.

## THE INOUE PLAN 2007

In March 2007, with a view to enhancing Tohoku University’s standing as one of the world’s premier institutes of education and research, the university launched the ‘Inoue Plan 2007’. “This plan has five pillars,” says Inoue. “Education, research, social contribution, campus environment, and organization/management. The key words are ‘challenge’, ‘creation’, and ‘innovation’.”

The Inoue Plan introduces a new, innovative liberal arts curriculum, which includes an overseas internship program. The university has also launched the Institute for International Advanced Research and Education and the Advanced Institute of Materials Research. The latter is one of the Japanese government’s World Premier Research Center Initiatives and is searching for breakthroughs by fusing multiple conventional research fields and nurturing world leaders in the field of materials science. Specific targets of the Inoue plan include increasing the number of international teachers from the present 130 to 300, and increasing the number of international students from 1,500 to 3,000 by 2022.

Notably, the world academic citation rankings compiled by Thomson Scientific for January 1999 to December 2009 placed Tohoku University third worldwide (first in Japan) in materials science, tenth (second in Japan) in physics, and 18th (fifth in Japan) in chemistry.



CLOCKWISE FROM LEFT: Research Laboratory; University House Sanjo; Japanese Archery Club; International Festival

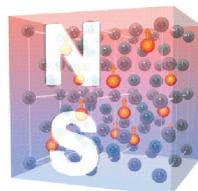
"The key words are 'challenge', 'creation', and 'innovation'."

## RESEARCH HIGHLIGHTS

Tohoku University is acknowledged as being the birthplace of ideas and inventions that led to the creation of new industries. In 1932, the pioneering work of Kotaro Honda—the first director of the Institute of Materials Research—led to the invention of 'KS magnet steel', at the time the strongest permanently magnetic material. Other innovative contributions include the Yagi-Uda antenna proposed by Hidetsugu Yagi and produced by Shintaro Uda; Fujio Masuoka's flash memory; and in 2002, the development of the soft laser desorption/ionization method for mass spectroscopic analysis of proteins by Nobel laureate Koichi Tanaka, a graduate of the Tohoku University's Department of Electrical Engineering.

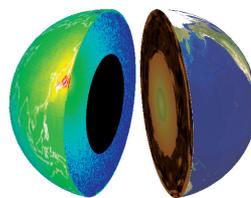
There are also a myriad of examples of current cutting-edge research at Tohoku University:

**HIDEO OHNO** is the Director of the Center of Spintronics Integrated Systems. In his research on 'spintronics' he is devising ways of controlling the spin of electrons to realize new functionalities in semiconductors and metals. Ohno has succeeded for the first time in electrically controlling the magnetic phase of a ferromagnetic material, leading to a new paradigm of low power functional devices. Ohno also fabricated a magnetic tunnel junction device exhibiting an 'on/off' resistance difference of 600%—the largest reported to date. These spintronic devices offer a promising route to resolving high power consumption and interconnect delay issues of current integrated circuits.



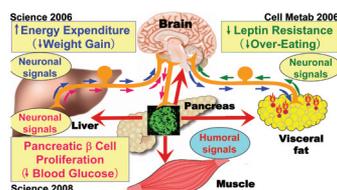
Electrical control of magnetic phases in ferromagnetic semiconductors

**KUNIO INOUE** is the Director of the Research Center for Neutrino Science. In 2005, he observed so-called 'geoneutrinos' using the KamLAND antineutrino detector. Geoneutrinos result from the decay of radioactive elements deep within the earth. This new observation will provide a deeper insight into heat generation inside the earth. Inoue is also the head of the 'Weaving Science Web beyond Particle-Matter Hierarchy' Global Center of Excellence (GCOE) program launched in 2008. This international and interdisciplinary project aims to formulate a unified understanding of the universe via collaborative research in fields of mathematics, physics, and astronomy.



Neutrino geophysics pioneered by KamLAND

**YOSHITOMO OKA** is the head of the GCOE on 'Conquest of Signal Transduction Diseases with Network Medicine'. Oka is renowned for his pioneering work on glucose transport. In collaboration with Hideki Katagiri, Oka discovered that metabolic information is delivered to the brain, which transmits signals to maintain the homeostasis of the whole body also via neuronal routes—metabolic information highways. This concept led to the 'Network Medicine' GCOE project for exploring the concept that both the onset and progress of disease are governed by a breakdown of the body's system of networks. The project members are developing multilevel, temporal, and spatial integration models to investigate unknown links among diseases—the so-called 'diseaseome'—and consequently innovative diagnostic, therapeutic, and preventive strategies.



Metabolic information highways  
~Inter-organ metabolic communication~

## GLOBAL NETWORKS AND SUPPORT FOR INTERNATIONAL STUDENTS

Enhancing international exchanges and global networks is a high priority for Tohoku University. To promote academic and industrial collaboration globally, it actively participates in three inter-university consortia: APRU (Association of Pacific Rim Universities); T.I.M.E. (Top Industrial Managers for Europe); and AEARU (the Association of East Asian Research Universities). Furthermore, the university has exchange agreements with 445 institutions in 45 countries and regions and has 16 overseas offices in nine countries.

Tohoku University offers excellent support for its international students and researchers. The Center for International Exchange assists international students with Japanese language courses, finds accommodation at both university dormitories and private apartments, and promotes exchanges with local students and the people of Sendai.

The university also has a wide range of scholarships for international students including the President Fellowship program launched in April 2010. When it's time to graduate, the university offers career advice for international students, as well as job fairs and workshops on Japanese culture and communication skills.

## INNOVATIVE EDUCATIONAL PROGRAMS AND STRONG LEADERSHIP

In 2009, Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT) selected Tohoku University as one of 13 centers as part of the Global 30 Project for Establishing Core Universities for Internationalization (G30). The main goal of this initiative is to give international and Japanese students the opportunity to study courses taught in English. "We are seizing this opportunity to promote the internationalization of education," says Inoue. "We are developing degree programs offered completely in English to meet all international student needs."

Tohoku University has a history of strong leadership based on its 'Open Door' policy. In 1913, it was the first of Japan's universities to admit female students—Chika Kuroda, Ume Tange, and Raku Makita. Needless to say, Tohoku University is still a leader in supporting female researchers.

Another example is the Chinese writer Lu Xun (1881-1936), who in 1904 was the first foreign student admitted to Sendai Medical College—the predecessor of the School of Medicine at Tohoku University. Later, in 1906 Lu Xun withdrew from medicine to study literature and returned to China where he wrote many influential works, including 'The True Story of Ah Q'. Lu Xun is also remembered for his story entitled 'Fujino Sensei', a fictionalized account of his experiences with his mentor, Professor Fujino, at Tohoku.

Now, in the 21st century, Tohoku University is setting new standards as an open, dynamic, and innovative world-class university. "We welcome talented people from all backgrounds and all over the world to join us," says Inoue.

### Tohoku University

<http://www.tohoku.ac.jp/english/>

### The Inoue Plan 2007

[http://www.bureau.tohoku.ac.jp/president/open/plan/inoue\\_Plan\\_2009.pdf](http://www.bureau.tohoku.ac.jp/president/open/plan/inoue_Plan_2009.pdf)

### Global COE

<http://www.bureau.tohoku.ac.jp/kenkyo/global-coe/global-coe.html>

### Global 30 Project (G30)

<http://www.fgl.tohoku.ac.jp/>

### Advanced Institute for Material Research (WPI-AIMR)

<http://www.wpi-aimr.tohoku.ac.jp/en/index.php>

### Hideo Ohno

<http://www.csis.tohoku.ac.jp/english/>

### Kunio Inoue

<http://www.awa.tohoku.ac.jp/rcnse/>

### Yoshitomo Oka

<http://www-nm.gcoe.med.tohoku.ac.jp/english/investigators/oka/index.html>