

## Research Programs

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

The "Global Centers of Excellence (COE) Program" was based upon and established by Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT) with results carried out on assessments and verifications of the FY2002, "21<sup>st</sup> Century COE Program". The program provides for funding support and for establishing educational and research centers which perform at the apex of global excellence, elevating international competitiveness of universities in Japan. The program is aimed to strengthen and enhance the educational and research functions of graduate schools. It is also to foster highly creative young researchers, those who become world leaders in their respective fields; through experience and practical research in the highest of world standards.

FY 2007

Program Leader	Research Fields	Program Title	Contents
<b>Life Sciences</b> Professor Noriko Osumi	Neuroscience	Basic & Translational Research Center for Global Brain Science	<p>The mission of this center is to educate and produce academics that are capable of integrating brain sciences, solving the fundamental problems of life science and/or solving various problems of social base. To accomplish our mission, we shall promote new brain science fields within and out of Japan through our cooperative research programs: (1) "Genomic Behavioral Neuroscience," ranging from genes to the behavior of animals, (2) "Embodied Cognitive Neuroscience," as understood from the mutual operations of brain functions and the body, and (3) "Interdisciplinary Brain Science," which encompasses a range of areas from environments surrounding people to the relationships among people. Moreover, we will provide outcome-oriented educational programs for the participating students to present achievements of individual goals in the fields of neurosciences. It will promote the fostering of human resources in new disciplines in Japan; researchers in the fields such as brain imaging diagnostic, mathematical neuroscience, mental illness diagnostic treatment, and neuroeconomics, educators and welfare/care workers, the developers of new drugs and health care devices, and workers in health services, who can link advancements in neurosciences to the education of society.</p>
<b>Chemistry, Material Sciences</b> Professor Masahiko Yamaguchi	Chemistry	International Center of Research & Education for Molecular Complex Chemistry	<p>The characteristic features of chemistry, in fields of natural science and technology, are its capability to adopt a bottom-up methodology regarding sizes of substances. This program is aimed at proposing various research studies, of larger molecular systems ranging from 10nm to 0.1mm, by establishing giant molecules and complex systems. The programs focus upon the study of three-dimensional and time-dependent functions of various molecular systems, and are called the research fields of "Molecular Complex Chemistry". Chemists who participate in this research field and along with this program will be involved in the next generation PhD educated of chemists, who take on leadership roles in both national and international fields of advanced chemistry and their various related sciences.</p>
<b>Chemistry, Material Sciences</b> Professor Takashi Goto	Materials Science	Materials Integration International Center of Education and Research	<p>Materials science covers the infrastructure of every industry and without its development, our society cannot progress. Tohoku University has been a world leader in materials science. However, in today's society, more global competition and collaboration in research and development are inevitably urged. The Global COE focuses on the following four research fields: (A) infrastructural and bio-materials, (B) electronic materials, (C) energy and environment-related materials, and (D) those of basic materials science. It also carries out educational activities based on materials integration concepts (creation of fields for interdisciplinary research collaboration in materials science). This education aims to foster young researchers with a multilateral viewpoint who will form the next generation of researchers. We aim to innovate new functions and materials, and to develop new materials science.</p>
<b>Information, Electrical and Electronic Sciences</b> Professor Fumiya Adachi	Electrical and Electronic Engineering	Center of Education and Research for Information Electronics Systems	<p>Believing that education and research are equally important disciplines, this center aims to foster young researchers who have a broad outlook, can create innovative science and technology, and conduct ground-breaking world-class research in wide ranging areas from basic science and technology to system applications. We will also conduct a wide range of collaborative NT/IT research from devices to information systems in order to realize a global network for human-centric communications.</p>
<b>Interdisciplinary, Combined Fields, New Disciplines</b> Professor Takami Yamaguchi	Biomedical Engineering	Global Nano-Biomedical Engineering Network Centre	<p>As is widely recognized, nano-biomedical engineering is a major key to 21<sup>st</sup> century world civilization. Tohoku University's Global COE programme, "Global Nano-Biomedical Engineering Network Centre" aims to organize nano-biomedical engineering activities within East Asian and Pacific Rim countries. While this is not literally restricted to those areas, our intention is to start organizing the most active institutions in the hope that eventually worldwide collaboration will be implemented in the most rapidly growing areas of the globe, not only in terms of economics but also science and engineering. In order to maintain that infrastructure and growth, our country and partner countries need to encourage our younger scientists and engineers to participate in the global environment.</p>

Total: 5 programs

(FY=Fiscal Year / Financial Year)

## Research Programs

FY 2008

Program Leader	Research Fields	Program Title	Contents
<b>Medicine</b> Professor Yoshitomo Oka	Internal Medicine · Diabetes and Metabolism	Global COE for Conquest of Signal Transduction Diseases with "Network Medicine"	Signals function in a network rather than in a cascade, and that human homeostasis is maintained by networks. We therefore see networks in multiple levels encompassing molecules to organs, even in interactions with the environment. We will further integrate these multilayered networks in time and space, and develop innovative medicine, a new way of understanding health and diseases, which is referred to as "Network Medicine". We will strive to bring up young scientists who have a broad perspective and to go beyond existing frameworks with a pioneer spirit.
<b>Mathematics, Physics, and Earth Sciences</b> Professor Kunio Inoue	Physics	Weaving Science Web beyond Particle Matter Hierarchy	Based on the experiences of propelling international cutting-edge research in a wide range of hierarchies in the universe, this program attaches great importance to weaving interconnections between those hierarchies using the common language, mathematics, which we call "Science Web". We develop new science fields under the Science Web and also extend our interests to fields in between the hierarchy such as chemistry, biology and geoscience. We ultimately aim to understand the entire particle matter hierarchy and cooperation with Philosophy will bring a wider view necessary to reach this goal. This active collaboration and development is used to nurture talented students. Students grown with the education will create a new academic culture and contribute to a social innovation.
<b>Mathematics, Physics, and Earth Sciences</b> Professor Eiji Ohtani	Earth and Planetary Science	Global Education and Research Center for Earth and Planetary Dynamics	Tohoku University has conducted globally recognized research into the Earth and planetary science. It has many faculty members whose research interests cover a great variety of topics within these fields. In our Global COE program, we will focus on research targets in Earth and planetary dynamics and Earth environmental change through a combination of multiple disciplines. The Global COE program aims to build upon the achievements of the 21 <sup>st</sup> Century COE program (2003-2007), and to further advance our knowledge in the critical areas of Earth and planetary dynamics and Earth environmental change.
<b>Mechanical, civil engineering, architectural and other fields of engineering</b> Professor Shigenao Maruyama	General Engineering	World Center of Education and Research for Transdisciplinary Flow Dynamics	The objectives of the Global COE is to establish a world center of education and research for flow dynamics that will create unique research activities and attract and educate talented students who meet the global standard. In order to establish the world center, we will develop new fields of trans-disciplinary flow dynamics. The concept includes the integrations of different academic fields, countries, and cultures. Furthermore, we aim to train young researchers and PhD candidates that contribute to the world community of flow dynamics by developing global perspectives and academic abilities that transcend the global standard.
<b>Social Sciences</b> Professor Yoshimichi Sato	Sociology	Center for the Study of Social Stratification and Inequality	The COE is designed to expand education and research on social stratification, inequality, and disparity internationally based both on the outcomes of the Center for the Study of Social Stratification and Inequality, which was formed by the 21 <sup>st</sup> Century Center of Excellence Program, and on the Social Stratification and Social Mobility Research Project. The COE will work on four research objectives through multi-disciplinary approaches: (1) Developing exact measures of disparity; (2) Analyzing social mechanisms that produces disparity; (3) Advancing the study of the effect of disparity; and (4) Making policy recommendations to reduce disparity. The COE will cultivate young, creative scholars who are globally competitive.
<b>Social Sciences</b> Professor Miyoko Tsujimura	Law and Politics	Gender Equality and Multicultural Conviviality in the Age of Globalization	Our Global COE Program aims to establish a world-class network for education and research on the theme: "Gender Equality and Multicultural Conviviality in the Age of Globalization". Mobilizing an inter-disciplinary approach to social sciences, the strategic orientation of this Program is on public policies and policy-development, thus enabling us to build upon the substantial contributions and fruits of its predecessor, the 21 <sup>st</sup> century COE program "The Law and Policy of Gender Equal Society". Furthermore, in cooperation with the Institute of Social Sciences at the University of Tokyo, and other research centers abroad, it aims to nurture the careers of emerging researchers, lawyers and policy-makers through exposure to international and interdisciplinary perspectives on the contemporary challenges of gender equality and multicultural conviviality.
<b>Interdisciplinary combined fields, new Disciplines</b> Tohru Nakashizuka	Environmental Science	Center for ecosystem management adapting to global change	We propose a new research domain based around the ecosystem principle, ecosystem technology and a socio-economic system for the adaptation of ecosystems to the unavoidable global environmental change. We plan to train not only a highly specialized scientists but also Professional Ecosystem Managers with specialized knowledge and skills to plan and manage ecosystems. We will also establish three scientific field centers for the interdisciplinary collaboration and education, and a consortium among environmental organizations for the collaboration in researches, education and outreach.

Total: 7 programs

(FY=Fiscal Year / Financial Year)

## Research Programs

### Special Coordination Funds for Promoting Science and Technology

This is a Special Coordination Fund which is based upon the strategies of the Council for Science and Technology Policy. The Funds are established for, and initiate the promotion of science and technology; they are used in coordinating the comprehensive areas which arise in the key issues of science and technology. Selected programs, which utilize this Promotion Fund, show and produce effective results with government-led supports. These Programs are A) original and novel efforts found in the policies of Offices and Ministries, B) having difficulty within existing organizations due to the limits of departmental remits, C) expected to generate synergy effects, in cooperation with different organizations, D) focused on rapid and flexible actions, etc.

#### FY 2006

Program	Department	Our Designated Program Title	Contents
Independent Research Environment Promotion Program for Young Scientists	Graduate School of Engineering Institute of Development, Aging and Cancer	Program for Exploring Advanced Interdisciplinary Frontiers	This program aims to train researchers with the ability to conduct world-class research in cutting-edge fields in the competitive global environment.

#### FY 2007

Program	Department	Our Designated Program Title	Contents
Creation of Innovation Centers for Advanced Interdisciplinary Research Areas	University-wide Graduate School of Engineering	R&D Center of Excellence for Integrated Microsystems	By integrating machinery, electrics/ electronics, materials, chemistry, electron chemistry, biotechnology, medical science, etc, with its core on an integrative micro-system, the program aims to create an innovative production headquarter for the next century, in addition to establishing a research development system and a new industrial-academic collaboration model for the innovation.

#### FY 2009

Program	Department	Our Designated Program Title	Contents
Innovative Training System for Future Leaders Future Leaders Training Program for New Innovation	University-wide	ILP Innovative Leaders Platform	Having established the ILP Innovative Leaders Platform Center, this program aims to nurture doctoral and post-doctoral students with practical professional skills and interpersonal skills. Furthermore, it aims to instill practical knowhow in students through long-term internship programs at companies both inside and outside Japan, and to foster and produce human resources able to develop innovations from the results of their research.
Innovative Supporting System for Female Scientists Accelerating Innovation of Training System for Female Scientists	University-wide Office for Women Researchers	Tohoku Leading Women's Jump Up Project for 2013	This program aims to raise the skills and position of female scientists, and to foster pioneering female scientists with the broad vision over a wide range of academic fields necessary to become world leaders.

#### FY 2010

Program	Department	Our Designated Program Title	Contents
Creating Local Activate Human Resources Fostering Institutions	Graduate School of Engineering	Sendai School of Design	The Sendai School of Design was launched by the Department of Architecture and Building Science at Tohoku University in cooperation with the City of Sendai. The main objective of the Sendai School of Design is to nurture collaborative creators and producers as personnel who will help activate the local area.
Asia and Africa S&T Strategic Cooperation Promotion Program International Environment Leaders Training Program	Graduate School of Environmental Studies	Strategic Energy and Resource Management and Sustainable Solutions	This program aims at the development of a center for nurturing international environmental leaders capable of formulating international energy and resources policy and corporate strategy from wide global perspectives. Master's and doctor's students from Asia and Africa, and regional administrative officers are considered as candidates for the program.

## Education Programs

Tohoku University promotes the following educational programs with support from the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

### Project for Fostering High-level Professionals and Technicians for University Hospital (Training of Distinguished Specialists by Mutual Cooperation between University Hospitals)

- ※ University Hospitals Cooperated Highly Skilled Professionals Training Program in FY2008-2009
- ※ Training of Medical Specialists Utilizing University Hospital to Ease the Shortage of Doctors in FY2010 (Training of Distinguished Specialists by Mutual Cooperation between University Hospitals)

We aim to cultivate medical practitioners who will work in medical fields in the future. To achieve this, we promote stimulation in university hospitals and our local community by providing financial support to high standard practitioners and clinical researchers training programs. Programs will be selected from candidates who submit applications from national, public and private university hospitals.

Year	Department	Program	Contents
FY 2008 – FY 2012	University Hospital	Highly qualified medical specialists career path supporting system in Tohoku direct (The hub and university hospitals alliance medical specialists training plan)	This program aims to train highly qualified medical specialists efficiently in the Tohoku region and streamline a consistent lifetime career path supporting system for medical practitioners. These range from medical students to trainee doctors, specialist trainee doctors and postgraduate medical students mainly based in Medical Practitioners Career Path Support Centers of University Hospitals.

## Education Programs

### Project for Fostering High-level Professionals and Technicians for University Hospital (Training of Specialized Staff for Perinatal Care)

- ※ Environmental improvement project for perinatal care (Professionals training) in FY2009
- ※ Training of Medical Specialists Utilizing University Hospital to Ease the Shortage of Doctors in FY2010 (Training of Specialized Staff for Perinatal Care)

Faced with the pressing issue of a shortage of pediatricians and obstetricians, this program aims to establish projects to train specialist perinatal staff, to provide support for university hospital initiatives, and to foster talented medical specialists and nurses with high-level knowledge and skills.

Year	Department	Program	Contents
FY 2009 – FY 2012	University Hospital	Project to Support Young / Female Perinatal Doctors	There are two purposes to this program: to actively encourage medical students and trainee doctors in order to increase the number of obstetricians and pediatricians; and to provide support for female doctors enabling them to continue working during pregnancy or return to work after childbirth. The "Birth of a New Life Project" aims to encourage medical students and trainee clinical doctors to move into perinatal care in the future through experiencing dealing with childbirth. The "Tohoku Lady Obstetrician 2009 (TOL09) Project" aims to improve working environments for female doctors enabling them to continue their careers during pregnancy, childbirth and childcare. The project also aims to realize safe and high quality perinatal care by drawing on the personal experiences of female obstetricians.

### Project for Fostering High-level Professionals and Technicians for University Hospital (Establishing System for Training of Nurses)

- ※ Plan for establishing a career system for nursing jobs in FY2009
- ※ Training of Medical Specialists Utilizing University Hospital to Ease the Shortage of Doctors in FY2010 (Establishing System for Training of Nurses)

Faced with the pressing issue of a shortage of pediatricians and obstetricians, this program aims to initiate projects to train specialist perinatal staff, to provide support for university hospital initiatives, and to foster talented medical specialists and nurses with high-level knowledge and skills.

Year	Department	Program	Contents
FY 2009 – FY 2013	University Hospital	Development of Supporting System for Nurse Career Promotion	This program aims to improve the education and practical skills of nurses through cooperation and academic discussion between the University Hospital and the School of Medicine and the development and implementation of a clinical training system. The program also aims to help nurses establish their own system to promote their career by defining a career path which enables them to remain active throughout their working life.

### Personnel recruitment to improve conditions for working conditions for doctors in university hospital

This program supports university hospital initiatives that aim to ease the workload of doctors and nurses by hiring clerical assistants for doctors and by promoting the sharing of duties between related jobs.

Year	Department	Program	Contents
FY 2011	University Hospital	Operational Improvement of University Hospital Program	Through hiring clerical assistants for doctors and helpers for nurses, this program aims to improve the safety and quality of medical treatment and reform the work sharing system of doctors and nurses. By doing this, the program aims to not only ease the workload of doctors and nurses but also establish an environment that allows them to focus on their primary work.

### Cancer Professional Training Plan

This program aids in fostering intelligent, highly-skilled medical professionals who specialize in the field of cancer; those who become carcinoma doctors, etc.

Year	Department	Program	Contents
FY 2007 – FY 2011	Graduate School of Medicine	Tohoku Cancer Professional Cultivation Plan	In order to enhance cancer treatment, the plan introduces a holistic educational program which trains the potential cancer specialists who are intelligent and highly skilled; it also assists those with abilities to pursue and promote practical research, both academically and holistically, and also to attain a medical license.

### Science and Mathematics Students Support Project

In order to cultivate potential science technologists, this project has been entrusted to the university's science department by the Ministry of Education, Culture, Sports, Science and Technology. It aims to establish and to facilitate the ability and knowledge of highly motivated students in the field of science and mathematics.

Year	Department	Program	Contents
FY 2008 – FY 2011	Faculty of Science	Special education for advanced mathematics and physics	The program aims to educate students with special knowledge in science and mathematics, and from an early stage, provides special education for small groups specialized in mathematics and physics; preparing them for further study in the graduate program.

We also have the original program:

### Initiatives for Distinctive Education

This is an extra-curricular course for undergraduate and graduate students aimed at enhancing practical English communication skills.

Year	Department	Program	Contents
FY 2005 –	Center for the Advancement of Higher Education	Practical English Course	This course, taught by native instructors, will help students further develop English communicative abilities required in academic and social situations through activities including discussions and oral presentations.

This is an extra-curricular course with a small group offering high-level mathematic lessons to highly-motivated undergraduate students.

Year	Department	Program	Contents
FY 2007 –	Center for the Advancement of Higher Education	Advanced Mathematics Course	This course will help students acquire improved abilities in mathematics, which is a basic language for not only science and technology but for all academic fields.

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