Global COE
Materials Integration
Tohoku University

Newsletter

Vol.1

Materials Integration International Center of Education and Research held its first Global Center of Excellence (COE) Symposium:

Citizens and Science for a Sustainable Future

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The First Global Center of Excellence (COE) Symposium
Citizens and Science for a Sustainable Future

Materials Integration International Center of Education and Research,
Tohoku University, Japan
Tuesday, January 29, 2008

Symposium Poster

President's Welcome

Akihisa Inoue, President of Tohoku University

Akihisa Inoue

Leader's Welcome

Takashi Goto, Professor, and Leader, Materials Integration International Center of Education and Research, Tohoku University

Takashi Goto

Convener's Welcome

Stephen Hesse, Senior Environmental Columnist, The Japan Times, and Professor, Chuo University

Stephen Hesse

Keynote [video conference]

Globalizing the Scientist: Issues and Challenges

Dr. Nina V. Fedoroff, Science and Technology Adviser to the US Secretary of State

Nina V. Fedoroff

Panel Discussion

Keynote Presentation

Artists Engaged with Science and the Challenges of Global Sustainability

Nancy Selvage

Nancy Selvage, Director, Ceramics Program, Office for the Arts at Harvard (USA)

Panel Discussion

Exploring a Sustainable Future

Kathy McGlauflin, Senior Vice President, American Forest Foundation (AFF), and National Director, Project Learning Tree (PLT)(USA), on:

Sustainability: The Global Challenge of Development and the Environment

Kathy McGlauflin

Oliver Kellhammer

Oliver Kellhammer, Land artist (Canada), on:

Land Recovery as a Vehicle for Community Empowerment

Ruth Ozeki, Novelist and Filmmaker (Canada/USA), on:

Understanding Difference and Diversity

Ruth Ozeki

Nicolas Clough, Director, Initial Teacher Training Progamme (Primary), University of the West of England, and Trustee, the World Studies Trust (UK), on:

Values and Skills for Intercultural Dialogue

Nicolas Clough

With **Nancy Selvage** and **Takashi Goto**

Presentation

A Citizen's View on Science for a Sustainable Future

Shin'ichiro Shozawa, Sendai Branch, Kyodo Wire Service

Shin'ichiro Shozawa

Presentation

The Global Scientist: Efforts for a Common Ground in the World

Kathy McGlauflin, American Forest Foundation (AFF), Project Learning Tree (PLT)

Presentation

Science and Technology for a Sustainable Future

Yoshiyuki Kawazoe, Professor, Tohoku University

Yoshiyuki Kawazoe

Presentation and Closing Statement

Our Global COE and the Challenge of Science for a Sustainable Future

Takashi Goto, Tohoku University

Interpreter/Translator : Noriko Seki, COE Fellow

We had the honor of a very special guest joining us:

Dr. Nina V. Fedoroff,

Science and Technology Adviser
to the US Secretary of State

Dr. Nina V. Fedoroff

Takashi Goto

Today, our guests from overseas will tell us about different views and experiences. We want to learn from their great expertise.

On behalf of Tohoku University

Takashi Goto
Professor, and Leader, Materials Integration International Center of Education and Research, Institute for Materials Research, Tohoku University

Good morning, ladies and gentlemen,

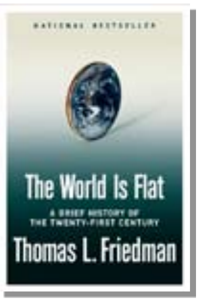
On behalf of Tohoku University and my colleagues, I would like to welcome you all. Thank you for coming today to the first symposium of the Materials Integration International Center of Education and Research. Our Materials Integration International Center of Education and Research is a Global Center of Excellence, in short a Global COE, for materials integration. We want our researchers have a broad perspective and work with others in a better way.

Today we have guests from three different countries. Our very special guest is Dr. Fedoroff. She is Science and Technology Adviser to the U.S. Secretary of State. All the guests will tell us about different views and experiences. We want to learn from their great expertise. We hope you will find them inspiring, engaging, and entertaining. Let us think about our common future and enjoy ourselves today. Thank you.

Globalizing the Scientist: Issues and Challenges

Dr. Nina V. Fedoroff
Science and Technology Adviser to the US Secretary of State

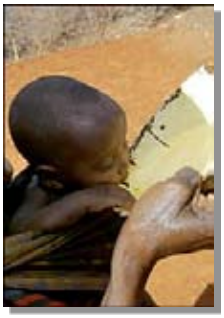
I am deeply honored that you have asked me to open your conference (Slide 1). I am pleased to speak about the challenges of globalizing the scientist. Indeed, I believe that truly globalizing science and scientists is one of the most important challenges facing us in the 21st century.



Today we have a group of countries whose science is already largely global – and I count Japan and the U. S. among this number. The international language of science is English today – although that may change in the future, as it has in the past. Collaborators can be anywhere in the world and in constant contact by email and through face-to-face meetings at a distance, just as I am addressing you. Indeed, the

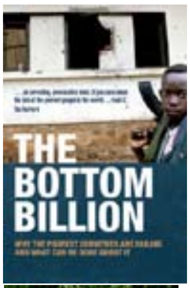
At the Symposium - Dr. Fedoroff is speaking to the audience on the right screen live and on-line from the State Department, Washington D.C., USA.

American journalist Tom Friedman published a book which declares the world to be flat (Slide 2). By this he means that the Internet revolution and globalization have put all peoples of the world on an equal economic footing.



And yet, despite the extraordinary increase in our ability to communicate and access information, we all know that the world is far from flat. Perhaps the most poignant disparities exist between the countries of the developed world and much of Africa, where climate, disease, soil exhaustion and many other problems conspire to keep most people trapped in poverty (Slide 3).

There is a profound gap between those with excellent educational opportunities and access to up-to-date technology in wealthy developed countries and those who live in the poorest countries of every continent. The technology gap has been labeled the "digital divide" – perhaps more like the chasm (Slide 4) – and a great deal has been written about it. Some think the problem is simply solved by providing inexpensive computers that can be used even in places that lack electricity. But the problems are much deeper and more stubborn than simply providing access to computers.



In his book titled "The Bottom Billion" (Slide 5), Economist Paul Collier offers an insightful analysis of the many factors that contribute to trapping the poorest nations in continuing cycles of poverty and unrest. One of the contributing factors, of course, is the generally low educational capacity and level of the poorest nations.

But here there is a paradox: sending the best students to be educated in more developed countries often further exacerbates the problem because the education itself – whether it is a teacher's certificate, a nursing degree, or a PhD – makes it easier for individuals to find employment and a more stable life in a developed country. This "the brain drain" and has robbed – and is continuing to rob – many poor countries of their educated people.

and schools and clinics. More than that, they are the professors and researchers who generate and propagate the knowledge – the science and technology – that are essential in every aspect of life and that are the driving force of today's economies.

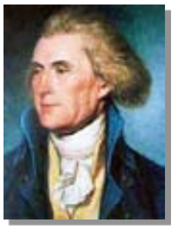
What I mean by "globalizing science" is using science, engineering and technology to truly flatten the world, to create world in which

all people have the opportunities now available almost exclusively in the developed world. The "global scientist," then, is one who is engaged in using his or her specialized knowledge to address these disparities.

Let me show you what I mean. I begin with something very familiar and prosaic: food. Human civilizations rest on their ability to produce food. Early humans, like the members of most animal species, spent most of their time procuring food. Over a period of some 50,000 years, we have become extremely efficient in producing, processing, storing and distributing food. Over the ages, fewer and fewer farmers have found ways to feed more and more people, freeing the rest of us to make and sell each other houses, hats, and video games, to be scientists and politicians, artists, teachers, doctors, and talk-show hosts.

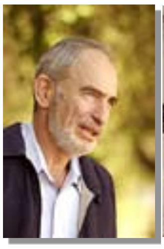
In some parts of the world, not one person in a hundred is growing plants or raising animals for food. In my country – and in yours – we buy what we eat in stores (Slide 6). And if you went to the farm, you are more likely to see this (Slide 7) than this (Slide 8).

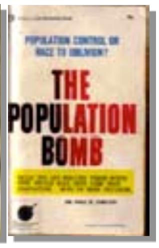
Science began to make significant contributions to agriculture just a few centuries ago. In 1772, Joseph Priestley (9), widely regarded as the father of chemistry, grew mint in a sealed jar and observed that even after months, the air inside the jar would "...neither extinguish a candle, nor was it at all incöonvenient to a mouse," inferring that plants give off oxygen. In the succeeding half century, scientists understood that plants require simple inputs, the most critical of which are nitrogen and phosphorus, to make complex molecules out of air and water.



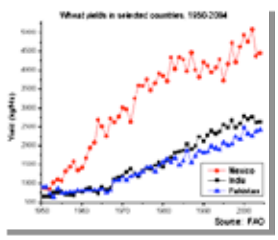
In 1828, Friedrich Wöhler understood that the simple chemical compound urea was exactly the same as the compound that animals excreted, previously believed to be somehow special and different because it was produced by a living creature. Thus began the fertilizer industry. But it was not until the early 20th century that scientists overcame the barrier to creating nitrogen fertilizer out of the abundant nitrogen in air. Fritz Haber and Carl Bosch developed what is now known as the Haber-Bosch process for fixing nitrogen (Slide 10). Today this is done in huge plants around the world.

It was these scientific advances, together with farm mechanization and advanced plant breeding, that pushed agriculture in the developed world to its contemporary level of productivity. Yet half a century ago, there were increasing predictions of mass famines in the populous countries of Asia – India, Pakistan, China and many others. One of the most vocal was Dr. Paul Ehrlich, a Stanford professor, who wrote a book titled "The Population Bomb" (Slide 11). Yet a handful of scientists, particularly plant breeder Norman Borlaug – now called the Father of the Green Revolution – were able to avert the famines by developing improved strains of wheat and rice and promoting their rapid adoption (Slide 12).





The ability to grow more food than is required to feed one's own family is the first step out of poverty today. The vast majority of the poorest people are rural farmers. Moreover, the Green Revolution largely missed Africa.



Robert Zoellick, President of the World Bank, has said "We need a 21st Century Green Revolution designed for the special and diverse needs of Africa, sparked by greater investments in technological research and dissemination, sustainable land management, agricultural supply chains, irrigation, rural microcredit, and policies that strengthen market opportunities while assisting with rural vulnerabilities and insecurities." (Slide 13).

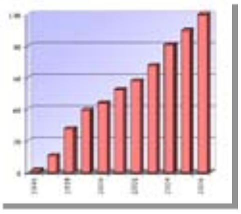
Current investments, including the Gates Foundation's roughly $900 million dollars, are largely focused on improving depleted soils, improving access to markets, and controlling pests and diseases and increasing stress resistance through traditional breeding technology.

These will work incrementally, but contemporary molecular tools are needed for the kinds of dramatic increases that are needed. And we have those tools (Slide 14). Molecular

techniques have been used to introduce genes into plants that confer insect resistance and herbicide tolerance, as well as enhance nutritional qualities. Crops modified in this way are referred to as genetically modified organisms (GMOs) or genetically modified (GM) crops.

What is shown here is Golden Rice, modified

to produce a precursor of vitamin A. Rice cannot make vitamin A and in parts of the world where it is a significant fraction of the diet, children and adults alike suffer from vitamin A deficiencies, which can kill children and cause night blindness in adults. On the left is Ingo Potrykus, the



Swiss scientist who led the team that developed Golden Rice, currently undergoing testing. GM crops, so far primarily cotton, corn and soybeans, but also some vegetables and fruits, are being adopted the world over at a truly astonishing pace (Slide 15). From 1996 through 2006, the total area planted in GM crops increased 60-fold, today exceeding 100 million hectares in 22 countries. Although it is widely believed that GM crops pose unacceptable risks of many kinds, there is absolutely no evidence that they do.

94-year old Norman Borlaug grows impatient: "We need sophisticated scientific technology to boost our production," he said at a conference convened in Kenya last summer in his honor. He sums up more than a decade of experience with GM corn, soybeans, corn and other crops, including papaya, saying "There is no evidence to indicate that biotechnology is dangerous." Indeed, he is confident that biotechnology is the surest way to ensure food security in Africa and other developing countries.

And yet, although some European countries, particularly Spain, are growing GM crops, much

of Europe – and Japan – remain adamantly opposed to crops improved using molecular techniques (Slide16). The

persistent public perception that GM crops are dangerous and the attendant excessive regulation of such crops are two interconnected barriers to crop improvement using modern molecular techniques.

These unfounded concerns have proved to be serious impediments to developing and growing GM crops is most parts of Africa – and even to importing them. With almost 3 million people at

risk of starvation as the result of drought, President Mwanawasa of Zambia refused to accept shipments of corn from the U.S. in 2002 (Slide 17). "There's no justification for feeding people poison" he said. But many

suspect that the real reason was the fear that accepting the GM corn would jeopardize Zambia's ability to export baby vegetable to GM-phobic Europe. Whatever the real reason, it is unimaginable

that Mwanawasa's decision could have had worse health consequences, as it led to the deaths by starvation of thousands of Zambians deprived of food aid.

Thus one of the challenges to scientists in developing a global perspective is at home: scientists who understand the science have a responsibility to explain it to their fellow citizens and to work with their officials to develop regulations that are based on scientific evidence, not popular misconceptions.

My own globalization as a scientist began many years ago when I served on the founding board of the International Science Foundation, established by financier George Soros to assist scientists in the countries of the former Soviet Union after its demise.

But I had a striking experience in what I have come to call "science diplomacy" several years ago after I wrote a book about GMOs in which I sought to explain the science behind the contemporary molecular modification of crop plants (Slide 18). I was invited by a Foreign Service Officer serving in the American Embassy in Dhaka, Bangladesh, to come and speak about

GMOs.

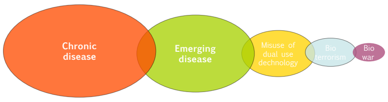
Bangladesh is a poor country which has a small area of arable land, often submerged by flood waters. Government officials found the differences in attitude between Europe and the U. S. confusing and had not developed a policy toward GM crops. Our embassy invited several speakers to address the scientific basis of GM crops and speak about the real – and the perceived – risks that they posed (Slide 19).

The conference was attended by government officials, scientists, diplomats and the press. It opened channels of communication between scientists in Bangladesh and scientists in the US and Europe. As well, it opened discussions between scientists, reporters and politicians – an important dialog in moving forward with controversial technology.

Since coming to the State Department last year to serve as the Science and Technology Adviser to the Secretary of State, I have seen many more examples of science diplomacy. I will introduce you to several science diplomats.

Dr. Jason Rao is a molecular biologist (Slide 20) who came to the State Deparment as a Science

Diplomacy Fellow of the American Association for the Advancement of Science, more generally known as the AAAS. Jason went to work in the Office of Cooperative Threat Reduction, which was originally funded by the US Congress



to help redirect the efforts of Soviet scientists who worked in weapons development before the disintegration of the Soviet Union.

Dr. Rao's Bioindustry Initiative (Slide 21) funds

large-scale projects in Russia, Georgia, and Kazakhstan to transform facilities previously engaged in biological warfare to institutes that enhance public health capacity in vaccine production, research and development, and disease surveillance. More recently, Jason has developed a Biosecurity Engagement Program, whose objective is to increasingly engage public health laboratories in Asia and the Middle East to strengthen their ability to detect and deal with both known pathogens and emerging pathogens, whatever their origin. Jason is currently spending 6 months in Pakistan developing collaborations and training programs

with biological laboratories.

Dr. Alex Dehgan first earned a law degree from the University of California and then a Ph D from the University of Chicago studying the effect of forest fragmentation on the extinction of lemurs in Madagascar (Slide 22). He, too, joined the State

Department as a AAAS fellow and soon found himself in Iraq (Slide 23). There he worked to identify and redirect weapons scientists, dodging bombs and attacks in and out of the Green Zone.

He realized that with libraries destroyed, Iraqi scientists and engineers were cut off from the progress of science. Returning to the State Department, he worked with several others to create an Internet portal through which Iraqi scientists could access the scientific literature (Slide 24). This

sounds simple, but it isn't. It meant raising the money to both develop the software and negotiating with publishers to give deep discounts – on average more than 97% – to electronic journal subscriptions.

Alex then left the State Department to work with the Wildlife Conservation Society in Afganistan (Slide 25). There he participated in creating the first protected wildlife reserve and trained Afgans to recognize and protect their endangered wildlife species.

Alex's formulation of the importance of globalizing the scientist is both profound and elegant: "Science provides us with common language, culture, and passions to engage other countries. It has within it inherent notions of democracy and values education and knowledge."

"Science frequently addresses issues affecting the survival of people. All scientists should take a Hippocratic oath to improve the societies in which they are working, but even beyond this, we should look to the larger role that we may play in global engagement."

Alex has recently rejoined the State Department to work in my office on science and technology diplomacy.

The final challenge of globalizing the scientist that I will briefly address is precisely how to make global science pay off for the scientist.

Bill Gates – arguable the most famous technocrat in the world – gave an extraordinary speech during the World Economic Forum two weeks ago in Davos, Switzerland (Slide 26). I quote from his speech:

"Thirty years ago, 20 years ago, 10 years ago, my focus was totally on how the magic of software could change the world. .... "But" he said, "breakthroughs change lives primarily where people can afford to buy them…."

"There are billions of people who need the great inventions of the computer age, and many more basic needs as well, but they have no way of expressing their needs in ways that matter to the market, so they go without."

(Slide 27) "If we are going to have a chance of changing their lives, we need another level of innovation. Not just technology innovation, we need system innovation….."

Gates argues that we need to go beyond capitalism – which works on behalf of those who can pay – and philanthropy and government aid – which are the traditional means of helping those who cannot afford to pay. He says:

(Slide 28)"….to provide rapid improvement for the poor we need a system that draws in innovators and businesses in a far better way than we do today."

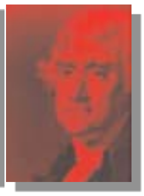
Gates cites examples ranging from the development of software for people who cannot read and write to developing vaccines at a price that Africans can afford to pay, concluding that such projects (Slide 29) "….provide a hint of what we can accomplish if people who are experts on needs in the developing world meet with scientists who understand what the breakthroughs are, whether it's in software or drugs."

What Gates is suggesting, I believe, is that we need to go beyond current concepts of engaging companies with governments and philanthropic organizations – these are called "public-private partnerships" in today's jargon. He is suggesting that we need to develop a new business model that would allow a combination of idealistic motivation to help humanity and the profit motive to drive development. And scientists play a key role in this concept.

Gates, of course, comes from the business world and many scientists and engineers belong to the academic world, which has a different reward structure than the business world. In most research organizations and universities, the major measure of success for scientists is scholarly papers published – and the quality of the journals in which they appear. I think that one of the significant challenges of globalizing the scientist is to integrate his or her global service into the promotion system. While this is already a central part of the activities of many agricultural and public health scientists, it is not so common for scientists in the basic sciences and mathematics.

important activity for the academic scientist in the service of globalization and global equalization of educational opportunity must be to help universities in less developed countries to come up to the standards set by the world's leading universities.

This is a task that many universities recognize to be important, in my experience. But few researchers and professors rush to meet the

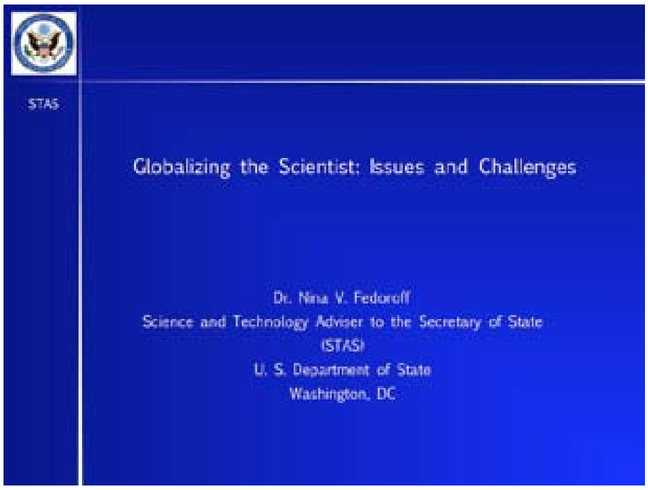


challenge. One of these is Professor Osama Awadelkarim, a materials scientist at the Pennsylvania State University. Dr. Awadelkarim came to the State Department on a Jefferson

Fellowship. Jefferson Fellows are tenured faculty who come to work at the State Department for a year, funded by their own university, as they would be on a sabbatical leave. Dr. Awadelkarim is Sudanese and passionately interested in improving science and technology in Africa. He worked with the State Department's Africa

Bureau and traveled to several African countries to lecture (Slide 30), meet with faculty, as well as with science ministers (Slide 31).

Much, much more needs to be done to make direct connections between the research laboratories and universities of less developed countries everywhere and those of the developed world. Only when we have equalized both educational opportunity and business development among the nations of the world will "brain drain" be truly turned into the "brain circulation" of which people have begun to speak.



Thank you for your attention (Slide 32).

Greetings from the Leader

Takashi Goto
Professor and Leader,
Materials Integration International Center of Education and Research,
Tohoku University

The World's Top-Level Research

Tohoku University has been conducting the world's most advanced researches in materials science. The number of cited papers ranked second highest* in the ISI's list of the world's most cited papers. Furthermore, Nature, the world-famous science magazine, introduced Materials Science of Tohoku University as one of the world-leading educational and research bases in material science.

* Over the period of eleven years 1994 - 2004, published in 2007. Also listed as the best in Japan.

The Global COE (Center of Excellence)

Backed by these accomplishments of the University, the Materials Integration International Center of Education and Research makes efforts to cultivate human resources through deliberate research activities conducted by young researchers at their own initiative in the world-class research environment.

Materials Integration

Infrastructural- and Bio-materials, Electronic materials, Energy and Environment-related materials, and basics of Materials Science –
We at the International Center promote materials integration specifically in these four fields.

Education for Researchers

We promote mutual human exchange, fusion with other science fields, and interdisciplinary studies. Our education fosters materials researchers with a broad view of things and abilities which help them being internationally active. Thus, it will be a source of excellent human resources in research institutions and industries over the world.

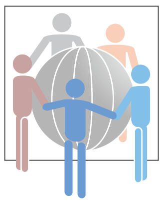
Joint Effort of the Five Faculties and Research Centers related to Materials Science

Future materials researchers will need a multilateral viewpoint combined with high expertise, internationality and interdisciplinary. These features are enhanced through our advanced education and researches. These education and researches are intensively performed through the cooperation of the five materials-science-related divisions of Tohoku University, namely the Institute for Material Research, the Departments of Metallurgy, Materials Science, Materials Processing and Applied Physics (School of Engineering), the Department of Physics (School of Science), the Institute of Multidisciplinary Research for Advanced Material, and the New Industry Creation Hatchery Center.

Developing New Fields of Science

Materials integration is expected to induce synergy effects to develop and produce non-conventional new functions and materials. Through materials integration, the Materials Integration International Center of Education and Research will create new fields of materials science in cooperation with the newly founded Institute for International Advance Research and Education, Tohoku University.

We heartily welcome and thank you in advance for your generous support and cooperation.



The Global COE Program: Materials Integration International Center of Education and Research, Tohoku University

The Materials Integration International Center of Education and Research is a Global COE program. The "Global COE (Centers of Excellence) Program" is sponsored by Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT). The program provides “funding support for establishing education and research centers that perform at the apex of global excellence to elevate the international competitiveness of the Japanese universities,” in order to “strengthen and enhance the education and research functions of graduate schools so as to foster highly creative young researchers who will go on to become world leaders in their respective fields by experiencing and practicing research of the highest standard.” Tohoku University’s Materials Integration International Center of Education and Research has been a part of this program since 2007.
http://www.jsps.go.jp/english/e-globalcoe/index.html

The Purpose of our Global COE
Tohoku University has conducted some of the world's most advanced research in materials science. Our Global COE makes an effort to cultivate human resources through deliberate research activities conducted by young researchers in a world-class environment. This Global COE tries to promote materials integration in four fields and to educate international materials researchers with a more global perspective, while promoting mutual exchange, fusion with other science fields, and interdisciplinary studies so as to provide excellent human resources in research institutions and industries throughout the world.

Developing Human Resources
GCOE’s education: enhancing international and interdisciplinary qualities
In our Global COE Program, Tohoku University’s materials science group of five Departments and Centers provides young researchers with a comprehensive education. Future materials researchers should have a multilateral viewpoint combined with a high level of international and interdisciplinary expertise. The Global COE tries to foster international qualities in our students and researchers by further expanding and developing our strong global network and providing opportunities for direct exchange with scientists from other parts of the world. The Global COE cultivates expertise in four individual research fields and conducts education in their boundary fields, while promoting internationalization and interdisciplinary education through the University’s Institute for International Advance Research and Education.

Search for Knowledge
GCOE’s research: integration for new disciplines
The Global COE focuses on (1) the integration of hetero-materials, (2) the integration of multidisciplinary materials science fields, and (3) the integration of basic science and applications. Researchers with diverse backgrounds and world-class achievements conduct these studies at our GCOE. Their efforts will induce synergy effects to develop and produce non-conventional new functions and materials. Through these endeavors, our GCOE will create new fields of materials science in cooperation with the University’s Institute for International Advance Research and Education.

Administrative Structure
Overall Formation
The COE Advancement Committee, consisting of the Leader and four Sub-leaders, takes care of the planning and management of the Global COE's projects and programs. Internal and external Evaluation Committees are set up, which the Advancement Committee reports to and receives evaluations and advice from. The Advancement Committee has regular discussions over the management and decision-making concerning the following programs: education (including international conferences, symposiums and seminars); and research (in the Center’s four research fields).

Structure for Education
Program members consist of Tohoku University's Institute for Materials Research (IMR), four departments of the School of Engineering (Departments of Metallurgy, Materials Science, Materials Processing, and Applied Physics), the Institute of Multidisciplinary Research for Advanced Materials (IMRAM), the School of Science (Department of Physics), and the New Industry Creation Hatchery Center (NICHE). Working through Tohoku's Inter-Institutional Projects and others, IMR is the core of these collaborations to move the Global COE forward.

Structure for Research Advancements
The Global COE's Program Members are categorized in the following areas according to their research fields: three groups in materials research (infrastructure and bio- materials, electronic materials, and energy and environment- related materials) and the group for basic materials science. The three groups hold annual inter-group liaison meetings and host seminars to report on the progress of their education and research programs. They also hold ad-hoc seminars with the basic materials science group to discuss overall program developments at the Global COE.

Structure for Domestic and International Collaboration for Education and Research
We work actively with the following networks:
•International Collaborations
-Liaison Offices for IMR's International Frontier Center for Advanced Materials at the following universities: University of Cambridge, Swedish Royal Institute of Technology, Institute of Physics of the Chinese Academy of Sciences, Harvard University, and Stanford University
-Asian Core Programs: Yonsei University, HanYang University, Sungkyun Kwan University, Korea University
-Academic Exchange Agreements (MOU): 43 organizations linked with IMR, 73 organizations under inter-university agreements, and others
•Domestic Collaborations
-Metallic Glass - Inorganic Materials Joining Technology Development, IMR and Tohoku University)
-Materials and Structure Laboratory (MSL) Tokyo Institute of Technology
-Joining and Welding Research Institute (JWRI), Osaka

University
•Internal Collaborations
•Tohoku University's Inter-Institutional Projects, IMR, IMRAM, the Research Institute of Electrical Communication, the Institute of Fluid Science, the Institute of Development, the Aging and Cancer, the Center for Interdisciplinary Research, and the Center for Northeast Asian Studies)

COE Support Office

The COE Support Office has the following responsibilities towards the students and you ng researchers at our Global COE:
1) The office for everyday support: it takes care of daily matters including practical steps necessary for placements, procedures for coming into and leaving the country and housing, etc.
2) The checks and evaluations office: it collects and analyzes the data concerning education and research achievements of the students and young researchers.
3) The office for career paths: it works in cooperation with the entire university to support the efforts of the students and young researchers for finding employment, The Head of the COE Support Office keeps close contact with the Leader and the COE Advancement Committee, and oversees the overall management of the practice at the Global COE.

Third-Party Evaluation Committee Members:

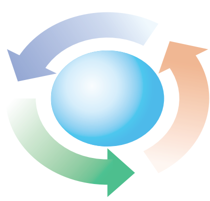
•Internal Evaluation Committee
The Internal Evaluation Committee is formed by one representative from each of the four research fields and one representative from each of the education fields (engineering and the sciences). The committee provides the annual internal evaluation and makes suggestions to the Leader concerning the overall management of the Global COE.
•External Evaluation Committee
Prior to the official interim and final evaluations of the development and achievement of our education and research programs, we seek external evaluations from third parties so as to obtain fair and objective observations. The committee consists of three intellectuals within the country and three intellectuals from overseas, who collaborate to evaluate the programs of the Global COE based on international perspectives and standards. The Leader of this Global COE reviews the programs adjusts the personnel based on the official interim and final evaluations

GCOE’s Goals

Goals for Cultivating Human Resources
We hope to cultivate young researchers equipped with a firm foundation of academic knowledge and a high level of research competence. The following skills are targeted:
- High expertise concerning materials science
Our education programs are designed for young people to complete doctorate courses in a short period of time, so as to obtain a PhD at the age of 25. We implement qualifying examinations for those graduate students who have completed the latter half of the doctorate courses to make sure they have obtained high research abilities in addition to basic knowledge and skills, so as to prepare them to be resourceful and to flourish in international arena.
- The Ability for international communication
We promote master’s and doctoral dissertations written and submitted in English.
Our graduate students in the latter half of the doctorate courses are obliged to make presentations at an international conference. We also provide internship programs for talented graduate students.
- Practical abilities
We support internship programs both domestically and internationally so as to help our students enhance their practical abilities.
- Originality to develop research fields of trans-, inter- and integrated disciplines
Our students are required to complete courses at the International Advanced Research and Education Organization so as to help them further develop highly original and interdisciplinary competence.
- Competence to take part in world class materials science
Our young people obtain the high expertise and sufficient language skills necessary to post more than one research article in world class academic magazines.

Targets for achievement in research activities

The 21st century COE focused on in-depth exploration of many specific materials and processing, and promoted the development of especially structured materials. In contrast, the global COE tries to offer the benefit of frontier science and technology to humanity by pursuing the following new integration concepts:
- Integration of Hetero-materials
The global COE will induce new and non-conventional material properties, developing new functions and designing new materials by sophisticatedly combining specific structures, material properties and functionalities in the following three fields of materials: (A) Infrastructural- and Bio-Materials, (B) Electronic Materials, and (C) Energy and Environment-related Materials.
- Integration of Multidisciplinary Science Fields
The Global COE will integrate three fields of materials and open up new fields of materials science, as well as create new industrial areas on the basis of the integrated multidisciplinary fields.
- Integration of Basic Science and Applications
The Global COE tries to establish new research concepts and follow a new model for research advancements through a mutual feedback system between basic science and applications, in which the application-oriented basic research sectors and basic-based application studies sectors cooperate closely.



Topics

List of Past Seminars and Conferences

2008.5.28 - Young Researchers' Seminar with Prof. Peter Grünberg (Co-hosted)
2008.5.27 - Honorary Degree Ceremony and Nobel Prize Commemorative Lecture of Dr. Peter Grünberg (Co-sponsored)
2008.3.14 - Annual PD/RA Research Presentations (FY2007)
2008.1.29-30 - First International Symposium
2007.12.17 - 18 Students' Exchange Seminar (Co-hosted, Korea)
2007.12.12 - 14 KINKEN-WAKATE2007
2007.10.21 - 25 Materials Science Workshop (Co-hosted, Taiwan)

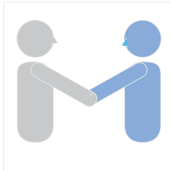
International Seminar on Citizens and Science for a Sustainable Future

Day 1 of the First International Conference [pp. 1-10] was open to the public. Day 2 was the International Seminar for the internal participants, held at the Hall of Institute for Materials Science (IMR), Tohoku University.

Honorary Degree Ceremony and Nobel Prize Commemorative Lecture of Dr. Peter Grünberg

Tohoku University conferred an honorary doctorate degree upon Dr. Peter Grünberg, who won the Nobel Prize in Physics in 2007. After the ceremony, Dr. Grünberg and our GCOE's Professors Maekawa and Takanashi gave a lecture to celebrate the occasion. Co-sponsered by GCOE.

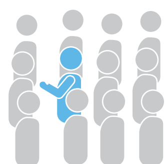
Date: May 27, 2008
Venue: Katahira Sakura Hall
Agenda
Opening Statement and Degree Conferment : President Akihisa Inoue, Tohoku University
Commemorative Lecture : Prof. Dr. P. Grünberg (Forschungszentrum Julich, Germany)
"Spin Waves to Giant Magnetoresistance (GMR) and Beyond"
Lecture : Sadamichi Maekawa (Professor, IMR, Tohoku Univerisity)
"Tunnel Magnetoresistance (TMR) :Past, Present and Future"
Lecture : Koki Takanashi (Professor, IMR, Tohoku Univerisity)
"Nanomagnetism and Spintronics in Ordered-Alloy Systems"



Young Researchers' Seminar with Professor Peter Grünberg

On the following day, our GCOE and Tohoku University co-hosted an informal meeting with Prof. Peter Grünberg for junior researchers. In this meeting, some of our young scientists talked about their research and the difficulties they faced, and received invaluable advice and comments from Prof. Grünberg.

Date: May 28, 2008
Venue: Hall, IMR
Co-sponsor: MEXT Grants-in-Aid for Scientific Research Program "Creation and Control of Spin Flows"
Presenters:
Subrojati Bosu (D2, Takanashi Lab)
Shohei Kawasaki (D2, Sahashi Lab)
Daichi Chiba (PD, Ohno Lab)
Yoshio Miura (Assist Prof, Shirai Lab)
Junichi Ieda (Assist Prof, Maekawa Lab)
Junichiro Ohe (PD, Maekawa Lab)
Shinji Isogami (PD, Takahashi Lab)
Tatsuya Aoki (D2, Ando Lab)
Atsushi Tsukazaki (Assist Prof, Kawasaki Lab)



■ Annual PD/RA Research Presentations (FY2007)

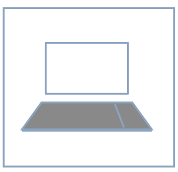
Four scholars and 12 COE fellows reported on the activities of our GCOE, and 78 of our Center's junior researchers took part in the Poster Session to share their research and results.
http://www.gcoe.imr.edu/dl/H19wakate-program.pdf
Date: March 14, 2008
Venue: Hall and Meeting Room, IMR

Program

Opening Statement by Professor Goto (Leader, GCOE)

Presentations: Our GCOE's Activities
(Convener: Professor Goto)
Nobuyoshi Hara, Professor, Dept of Engineering
Hiroshi Matsui, Associate Professor, Dept of Physics
An-Pang Tsai, Professor, IMRAM*
Masashi Kawasaki, Professor, IMR

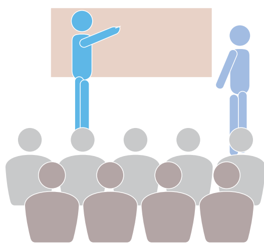
Presentations: GCOE Fellows' Research Reports
(Convener: Professor Kawasaki)
Yuuki Tanaka
"Shape memory effect and superelasticity due to γ/α'thermoelastic martensitic transformation in Fe-Ni-Co-Al based alloys"
Yanhui Liu
"Intrinsic Ductility of Bulk Metallic Glasses: An Energetic Criterion"
Yuqiao Zeng
"Roles of Minor Element Additions on GFA and Mechanical Properties of High Ni-rich BMGs"
Haiying Wang
"Influence of defects on the minority carrier diffusion length in Si multicrystals"
Toyoto Sato
"Synthesis and Characterization of Novel Complex Hydrides"



Presentations: GCOE Fellows' Research Reports
(Convener: Professor Tsai)
Hai Wang
"Preparation and characterization of carbon thin films for spin injection experiments"
Justin Jian Ting Ye
"Fabrication and Characterization of Graphene Based Electronic-Double-Layer-Field-Effect-Transistor (EDLT) Devices"
Can Cui
"Crystal growth of quasicrystal in Ag-In-Yb system by the Bridgman method"
Chakraverty Suvankar
"Memory in a nano magnetic system"
M.A.I. Nahid.
"Large magnetic anisotropy and double switching behavior of Fe3Pt alloy thin films"
Jingyu Gan
"Competing orders in self-doped bilayer cuprates"
Yansheng Gong
"Microstructure of TiN films prepared by Laser CVD"

Poster Session
Award Presentation (Convener: Professor Hara)

*IMRAM: Institute of Multidisciplinary Research for Advanced Materials



Information

■ Our Research Achievements

2008.5 – "Prediction of 'ferromagnetic Josephson resonance'" J. Phys. Soc. Jpn. 77, 053707 (2008) (Maekawa Lab, IMR)
2008.5 – "Prediction of 'ferromagnetic Josephson resonance'" J. Phys. Soc. Jpn. 77, 053707 (2008) (Maekawa Lab, IMR)

2008.3 – "Emission characteristics of Grimm-style glow discharge plasmas with helium matrix plasma gas containing small amounts of nitrogen" Machiko Tsukiji, Kazuaki Wagatsuma Microchemical J., 87 (2007) 175-179 (Wagatsuma Lab, IMR)

2008.1 – "Giant Spin Hall effect in perpendicularly spin-polarized FePt/Au devices" (Takanashi Lab, IMR), (Maekawa Lab, IMR)

2007.11 – "Li superionic conductivity in hydride" (Orimo Lab, IMR, and Takamura Lab, School of Engineering)

2007.9 – "Different drive mechanisms of domain wall motion -Step toward MRAM-"(Maekawa Lab, IMR)
2007.9 – "Formation mechanism of dendrite crystals with parallel twins and its implementation to the crystal growth method to realize high-quality Si multicrystals for solar cell applications" (Nakajima Lab, IMR)

For details, see:
http://www.gcoe.imr.edu/en/index.html

■ International Symposium 2008

Global COE 2008: The First International Symposium on Advanced Synthesis and Processing Technology for Materials (ASPT08)
Date: November 14-17, 2008
Venue: Wuhan University of Technology, Wuhan, China
Keynote speakers:
Takashi Goto, Leader, Materials Integration International Center of Education and Research, Japan
Nancy Selvage, Director, Ceramics Program, Office for the Arts at Harvard, USA
Stephen Merrill, Executive Director, Board on Science, Technology, and Economic Policy, the National Academies, USA
Dongliang Jiang, Vice-Director, Shanghai Institute of Ceramics, China
Yibing Cheng, Professor, Department of Materials Engineering, Monash University, Australia

http://www.gcoe.imr.edu/jp/index.html

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