

Think globally, Act locally

The Role of the Graduate School of Environmental Studies, Tohoku University
 – From Regional to Global –

It is obvious that the most crucial task that we are facing now and also in the future is to solve environmental problems. We all dreamed of a 21st century full of hope, but the century has been confronted with growing problems of population, resources, energy, climate change, water, food, and infectious diseases that threaten the sustainability of the earth. In order to build a sustainable society, it is necessary to devote all our efforts to solving environmental problems and harmonizing development with the global environment. Not only should each research field work on each individual problem, but it is also necessary for researchers from various academic disciplines such as arts, science, engineering and medicine to unite and work together for the betterment of humanity.

The Graduate School of Environmental Studies, Tohoku University was established in the spring of 2003. Faculty members from engineering, science, social science, and cultural sciences gathered to work on a common research and education target “Development of Environmental Studies”. This demands extra efforts to work across the boundaries which exist for each discipline. We are sure that we have created a new fusion between science and humanities, but we must consolidate this further and embark on a new mission to strengthen this multidisciplinary foundation.

One of the most important missions of the University is to supply to our society men and women with superior talents. The students whom we try to nurture should have expertise in basic science, possess wide knowledge and a global environmental perspective. We also offer stage-of-the-art education to members of society through carefully devised practical education programs.

Environmental problems have spread from local and nearby locations to distant parts of the world. It is our task to show the way to solving both regional environmental problems and providing solutions to global environmental problems. We presume that our motto should be “Think Globally, Act Locally”, and we should discharge our mission of research and education while promoting regional alliances and international cooperation more than ever before.

Dean, Graduate School of Environmental Studies, Tohoku University
 Professor

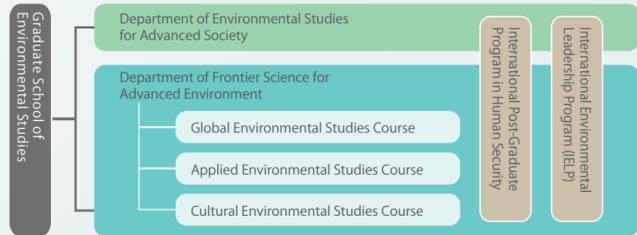


Philosophy

- ▶ To construct an environmental science including environmental management that integrates the humanities and science;
- ▶ To train people to acquire high and comprehensive competence and become able to serve active roles in international society;
- ▶ To implement education and research to pursue sustainability of human life space;
- ▶ To implement education and research to analyze environmental issues from diverse perspectives, taking regional and ethnic factors into consideration;
- ▶ To implement education and research for the construction of an energy system that is in harmony with the environment;
- ▶ To implement education and research for the creation of an efficient recovery and utilization system of materials and biotechnology that can coexist with nature;
- ▶ To implement education and research for the creation of new recyclable resources and reproductive technologies that support a recycle-based society; and
- ▶ To implement education and research for the planning of an environmental creation scheme in order to build symbiotic social structures.

About GSES

The Graduate School of Environmental Studies offers 2 schools: the Department of Environmental Studies for Advanced Society and the Department of Frontier Sciences for Advanced Environment, the Department of Frontier Sciences for Advanced Environment consists of three educational courses.



The Graduate School of Environmental Studies is intended to create a social system that can become bases of a cultural and recycle-based society which supports sustainable development by integrating the “knowledge” of Tohoku University as a comprehensive university. The purpose of our education is to train people to acquire high-level knowledge and skills and to become individuals who can tackle myriad challenges on a global scale.

Department of Environmental Studies for Advanced Society

This department aims at an education to nurture human resources with an ability to create solutions to the environmental problems that threatens human society. The department welcomes students who have a strong interest in the environmental aspects of civilization and thinking, who have a good understanding of the realities of social sciences and policy, who would like to obtain a solid basic knowledge on various technologies, and who can meet the challenge of integrating these towards creating innovative solutions. Moreover, we are looking for students who would like to cultivate an ability to provide a direction for society from a global perspective.

Department of Frontier Science for Advanced Environment

This department aims at an education to nurture human resources with an ability to manage advanced environmental technologies from an international bird’s-eye perspective of the environmental problems that threaten human society. The department welcomes students who would like to study and acquire environmental expertise in fields such as geo-system and energy science, environmental chemistry and ecoengineering, and eco-material design and process engineering. Students should have a strong motivation to explore outside of their own field from the broad perspective of environmental sciences, and study together with international students from other Asian countries. We expect students to wish to lead in their advanced research on the environment by integrating their deep specialisms with an international perspective and broad background knowledge.

>>Global Environmental Studies Course

This course teaches and researches the fields of resources, materials and energy which are critical to sustainable human society. Specifically, treatment of raw materials used for safeguarding the global environment, material processing, recycle technology, low-energy and developing new materials capable of reducing the environmental burden. Together with acquiring the detailed knowledge of the special characteristics of these technologies, you can deepen your basic knowledge of humanities and social science.

>>Applied Environmental Studies Course

This course aims at reducing the environmental load in industries that are supplied materials and resources taken from the environment, and also energy-intensive industries such as those manufacturing chemical products and other materials. Students acquire an advanced knowledge to pioneer new environmental-friendly processes. In addition, you can deepen your basic knowledge of environment assessment and economic valuation.

>>Cultural Environmental Studies Course

In addition to the technical objectives mentioned in the above two courses, it is also necessary for a sustainable human society to solve cultural challenges related to the social system. Together with acquiring knowledge of sciences, you can study research fields that directly connect society, such as social history, social anthropology, environmental law, environmental policy, environmental economics, and technology management.

Education

Voice

Devaraj, Abhilasha Sumangal

Graduated in September 2015
 / Toyota Motor Corporation



I chose the Graduate School of Environmental Studies at Tohoku University because of the interdisciplinary courses that were offering regarding the environmental issues in Japan and the rest of the world. I was drawn into the curriculum designed for foreign students because for same lecture in Japanese are also taught in English. As an environmentalist, it is extremely important to learn about the issues from different perspectives and backgrounds. I belonged to Kawada Laboratory, where the focus of this laboratory is on Solid Oxide Fuel Cells. Being part of Kawada Laboratory, I learned a lot in the past two years that I was a Master Student. My professors guided me throughout my research experiences while I was able to freely express my own creative ideas. I also got many opportunities by able to attend conferences and share my research with other students and professor in Japan and in other countries. GSES helped me grow academically, culturally, and even with my Japanese skills. I have always wanted to pursue in working with environmental awareness and I felt that this department has helped me expand my knowledge on environmental problems and what I can personally do for the future. I learned greatly about the environmental issues through the eyes of the students from different academic and cultural backgrounds. Finally, meeting new students within this department and getting together such as “sports day” made it homely and easy for foreign students.

Fonseca Ashton, Juan Diego

Graduated in September 2015
 / Assistant Professor,
 San Francisco de Quito University (Ecuador)



Back in my home country of Ecuador I used to work as a Petroleum Engineer. However, after witnessing the high environmental impact that the industry caused I decided to quit my job and instead focus my efforts in activities that protect the environment. I decided to move to Japan because of the country’s increasingly positive attitude towards environmental conservation and technology, and I chose to join the Graduate School of Environmental Studies at Tohoku University because the programs offered where up to my expectations. At Tohoku University, my research focused on pretreatment methods for recycling PVC plastic waste such as medical tubes and bags, and the removal of halogens from plastics such as chlorine from PVC or bromine from flame retardants contained in high-impact polystyrene. Throughout my studies and life in Japan, I learned that environmental problems originate not only from various industrial and technological factors, but also from social and even spiritual limitations. Therefore, I think that education and personal cultivation are both crucial for finding real solutions to environmental problems. I would like to become a person who can lead and educate about environmentally sustainable development seen from various points of view. I believe that I am on my way to becoming such a person now that I have started working as a full time university teacher and researcher back in Ecuador. I will strive to transmit my academic, working, and personal experience to my students in order to promote their growth as professionals and as human beings.

International Environmental Leadership Program (IELP)

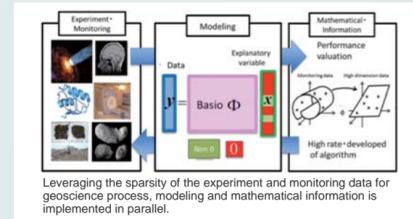
The International Environmental Leadership Program (henceforth referred to as “IELP”) at Tohoku University Graduate School of Environmental Studies provides a trans-disciplinary education, combining the humanities and sciences with instructors from the Regional Environment and Socio-Cultural Studies, Geosystems and Energy Sciences, Environmental Chemistry and Ecoengineering, Ecomaterial Design and Process Engineering and International Program for Environmental Sustainability Science courses. It is through this context that the program educates both Japanese and foreign exchange students side by side, making use of maximized synergy among participants from multiple countries and placing high emphasis on specialized research in environmental fields. IELP fosters a comprehensive way of thinking that is crucial for international environmental leaders, the program seeks to equip students with a sense of internationalism, practical know-how, management capability, and the individual leadership and group-minded orientations inherent in strategic planning. URL: <http://www.kankyo.tohoku.ac.jp/ielp/index.html>

Research Highlight 1 >> Komai Laboratory

Development of Earth Sciences Process based on Data-driven Analysis using Sparse Modeling

Sparse modeling is a new methodology using a concept of data driven technology in innovative information sciences. This is highly focused on the extraction of basic principles from big data of space and earth with sparseness, and is called as magical mathematics. By applying sparse modeling to earth sciences, the general framework of methodology can be developed to extract basic process and structure lying in high dimensional and huge data. We have investigated the application of sparse modeling to the problems of tsunami deposits and geo-chemical processes of solid earth sciences. Sparse modeling brings us a revolution of data analysis in terms of hazard prevention of tsunami, risk assessment of soil contamination and exploration of mineral deposits.

Grant-in-Aid for Scientific Research on Innovative Areas, H25-H29



Leveraging the sparsity of the experiment and monitoring data for geoscience process, modeling and mathematical information is implemented in parallel.

Fig.1 Framework of statistical analysis using sparse modeling.

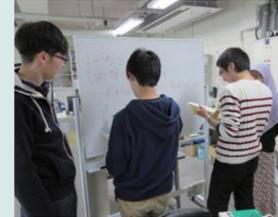


Photo Discussion with members in Komai's lab.

Research Highlight 2 >> Furukawa Laboratory

he lifestyle design project ‘Creating a Fountain of Future Lifestyle Ideas’ supported by RISTEX,JST has started in 2015. This project proceed research of lifestyle design method using backcasting under future severe environmental restriction and 90 year-old hearing in order to find the value that community should take over to the future society. Toyooka city, Kitakami city, Okinoerabu-jima and Mie prefecture support this project as a model area and we run the lifestyle design projects there and evaluate how they change their lifestyles. Our lab will open branch offices for this advanced lifestyle innovation research at this local government for collaborative research for the society.

‘Creating a Fountain of Future Lifestyle Ideas’ project supported by RISTEX,JST(2015-2018)



Photo1: Workshop on the future lifestyles about local food (Toyooka city)
 Discussion with Nagatani Seito (Igayaki) about lifestyle innova



International Post-Graduate Program in Human Security

Tohoku University started “the International Joint Educational Program in Human Security” from April 2005, by linking the Cultural Studies and the Graduate School of Agricultural Science, the Graduate School of Medicine, the Graduate School of International Cultural Studies and the Graduate School of Environmental Studies. Our institute, the Graduate School of Environmental Studies, takes part in this program in the environmental perspectives. The human race has been affecting the nature and has promoted the social and economic, and cultural system the problems would be hardly solved. “Human Security and Environment” program educates and researches especially on shortage and contamination of water resource, air pollution, climate change, ecological destruction of forest, desertification, soil deterioration, energy resources and so on with incorporating global and historical perspectives. URL: <http://www2.kankyo.tohoku.ac.jp/human-security/>

Location

North- East of Japan

Size of the City (as of 1st April 2014)
 Area: 785.85 km²
 Population: 1,066,609
 Population Density: 1,361 inhab./km²

Railways Shinkansen



Domestic Airlines



Research



Graduate School of Environmental Studies, Tohoku University

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

Aoba, 468-1, Aramaki, Aoba-ku,
 Sendai, 980-0845, JAPAN
[General Affairs Section]
 Tel +81-22-752-2233
 E-mail somu@mail.kankyo.tohoku.ac.jp
[Academic Affairs Section]
 Tel +81-22-752-2235
 E-mail kankyo.kyomu@grp.tohoku.ac.jp



Division	Laboratory	Research Theme [Faculty Members]	Educational Courses	Entrance Examination Groups
Core Divisions	Urban Environment and Environmental Geography	Physical Environmental Geography	Geographical analyses on Human-Environmental Relations [Prof. Kiyotaka Sakaida / Assist. Prof. Ryohei Sekine]	CES Env/Geo ※
		Human Environmental Geography		CES Env/Geo ※
	Solar and Terrestrial Systems and Energy Sciences	Process Engineering for Advanced Resources Utilization	Aiming at Advanced Metal Production Process with Maximum Energy Efficiency & Minimum Environmental Load [Prof. Eiki Kasai / Assoc. Prof. Taichi Murakami / Assist. Prof. Daisuke Maruoka]	GEMS Materials
		Earth System Monitoring and Instrumentation	Investigation of global atmospheric environment with spectroscopic observations [Assoc. Prof. Isao Murata]	CES Env/Geo
	Sustainable Recycle Process	Urban and Regional Environmental Systems	Resolving Water-related Issues in the world through Observation and Prediction [Prof. So Kazama (School of Engineering) / Prof. Yu-You Li (School of Engineering) / Assoc. Prof. Daisuke Komori]	CES Env/Geo
		Environmental Green Process Study	Let's develop green processes with supercritical carbon dioxide and water! [Prof. R. L. Smith Jr. / Assoc. Prof. Masaru Watanabe (School of Engineering) / Assist. Prof. Taku Aida]	AEC Chem/Bio
	Environmentally Benign Systems	Material Process for Circulatory Society	Design of Materials Processes toward Sustainable Society [Prof. Komarov Sergey / Assoc. Prof. Noboru Yoshikawa]	GEMS Materials
		Recycling Chemistry	We have examined the chemical recycle of wastes for the realization of resources recycling society. [Prof. Toshiaki Yoshioka / Assoc. Prof. Tomohito Kameda (School of Engineering) / Assist. Prof. Shogo Kumagai / Assist. Prof. Yuko Saito]	AEC Chem/Bio
		Environmental Bioengineering	Creating biomolecular sensing devices for the next-generation biomolecular industry [Prof. Tomokazu Matsue (AIMR) / Prof. Hitoshi Shiku (School of Engineering) / Lecturer Kumi Inoue / Assist. Prof. Kosuke Ino]	AEC Chem/Bio
	Ecomaterial Design and Process Engineering	Environmental Analytical Chemistry	Analytical chemistry toward better understanding of the environment [Assist. Prof. Atsuko Suzuki]	AEC Chem/Bio
Environmentally-Benign Molecular Design and Synthesis		Design of environmentally benign molecular systems with high functionality [Prof. Nobuhiko Iki / Assist. Prof. ryunosuke karashimada]	AEC Chem/Bio	
Life Cycle Assessment		Integrated analysis of material flows and economic activities contributing sustainable resource management [Prof. Tetsuya Nagasaka (School of Engineering)]	GEMS Materials	
Cooperative Divisions	Earth and Environmental Systems Design	Environmental Materials Surface Science	Atomic/molecular level surface design for developing eco-friendly energy system [Prof. Toshimasa Wadaya / Prof. Kyosuke Yoshimi (School of Engineering) / Assist. Prof. Naoto Todoroki]	GEMS Materials
		Energy Conversion Chemistry	Research on innovative materials for advanced batteries with high performance and low environmental impact [Prof. Itaru Honma / Assist. Prof. Takaaki Tomai / Assist. Prof. Naoka Nagamura (IMRAM)]	AEC Chem/Bio
	Society of Northeast Asia	Social Anthropology/ Cultural Ecology Conservation	We provide students with knowledge and skills required for specialists in Social Anthropology and Northeast Asian Studies. [Prof. Masahisa Segawa / Assoc. Prof. Toshihiro Ueno (CNEAS)]	CES Human/Social
		Laboratory of Cultural Ecology and Conservation	We explore the sustainable future of human-nature relations through the anthropological fieldwork reflecting the cultural diversities in human history. [Prof. Hiroki Takakura / Assist. Prof. Yuichiro Fujioka (CNEAS)]	CES Human/Social
		History on East Asia	Studies of the history of Edo period from analyzing original historical documents that remaining in the local communities of Japan [Assoc. Prof. Daisuke Sato (IRIDeS)]	CES Human/Social
	Culture of Northeast Asia	Environmental Sciences and Policies	Deriving policy implications from environment-energy policy, international politics, and science and technology studies [Prof. Jusen Asuka / Assoc. Prof. Atsushi Ishii (CNEAS)]	CES Human/Social
		Regional Study on Inner Asia	Variety of Languages and Cultures of Northeast Asia [Prof. Hitoshi Kuribayashi (CNEAS)] We are studying the historical changes of the social environment of pastoral and agrarian societies of Inner Asia [Prof. Hiroki Oka (CNEAS)]	CES Human/Social
	Physical Chemistry for Environmental Materials	Ethnic Culture and Environment	What will become of the Russian language spoken by Russians outside of Russia? [Assoc. Prof. Kenji Yanagida (CNEAS)]	CES Human/Social
		Chemistry for Environmental Inorganic Materials	Development of advanced optical functional and environmentally sensitive materials by soft chemistry process [Prof. Shu Yin (IMRAM)]	AEC Chem/Bio
		Analytical Sciences for Environmental Evaluation	Seeking for seeds development of analysis methods of materials and elements [Prof. Kazuaki Wagatsuma / Assoc. Prof. Susumu Imasyuku / Assist. Prof. Hideyuki Matsuta / Assist. Prof. Shunsuke Kashiwakura (IMR)]	GEMS Materials
Hydride Research for Innovative Energy Applications		Hydride Research for Innovative Energy Applications [Prof. Shin-ichi Orimo (AIMR) / Assoc. Prof. Shigeyuki Takagi / Assist. Prof. Shigeyuki Takagi / Assist. Prof. Toyoto Sato (IMR)]	GEMS Materials	
Collaborative Divisions	Process Engineering for Environmentally Adapted Materials	Development of new steelmaking technology contributing to the energy and resources sustainable society [Prof. Yuichi Sato / Prof. Kazuhiko Kusunoki / Prof. Jun Okazaki (Nippon Steel & Sumitomo Metal Corporation)]	GEMS Materials	
	Global Environment	Detection of changes in global atmospheric environment. [Prof. Toshinobu Machida / Prof. Nobuko Saigusa (National Institute for Environmental Studies)]	CES Env/Geo	
	Environmental Risk Assessment	Safe and secure utilization of geosphere [Prof. Hiroshi Asanuma / Prof. Zhang Ming / Assoc. Prof. Nobukazu Soma / Assoc. Prof. Yasuhide Sakamoto (National Institute of Advanced Industrial Science and Technology)]	GEMS Energy	
	Biotechnical Eco-management	Utilizing biotechnology and bio-system as global warming mitigation / adaptation measures and environmental measurement. [Prof. Yoshitomo Watanabe / Assoc. Prof. Norio Matsumoto (Central Research Institute of Electric Power Industry)]	AEC ※	

Those who wish to apply for the laboratories with the sign ※, please contact the Academic Affairs Section in advance.

[Educational Courses] CES : Cultural Environmental Studies GEMS : Global Environment Materials Science AEC : Applied Eco-chemistry
 [Entrance Examination Groups] Human/Social : Human and Social Science Group Env/Geo : Environment and Geography Group Chem/Bio : Chemistry and Bioengineering Group Materials : Materials Group Energy : Environmental & Energy Group
 [Institution] FRRI : Fracture and Reliability Research Institute CNEAS : Center for Northeast Asian Studies IRIDeS : International Research Institute of Disaster Science IMRAM : Institute of Multidisciplinary Research for Advanced Materials IMR : Institute for Materials Research IFS : Institute of Fluid Science AIMR : Advanced Institute for Materials Research

Division	Laboratory	Research Theme [Faculty Members]	Educational Courses	Entrance Examination Groups
Core Divisions	Resources Strategies	Geo-environmental Measurement and Analysis	Accurate Measurement, Analysis and Record of the Earth Environments status. And development/improvement of the best [Assist. Prof. Nobuo Hirano]	- -
		Nanocomposite Science and Interfacial Materials Design	Development of functional composites to create next generation life styles [Assoc. Prof. Yoshinori Sato]	- Energy
	Energy Resources	Design of environment-friendly materials	Design of materials harmonizing with life and environment [Prof. Hideaki Matsubara / Assoc. Prof. Masanobu Kamitakahara]	- Energy
		Geoenvironmental Remediation	Development of Environmental Load Reduced Remediation Technology [Prof. Chihiro Inoue / Assist. Prof. Mei-Fang Chien / Assist. Prof. Kosuke Nakamura]	- Energy
		Geomaterial and Energy	Inspire the energy and resources of the Earth. Standing on between pure science and advanced engineering. Only one and highly active Lab. [Prof. Noriyoshi Tsuchiya / Assoc. Prof. Atsushi Okamoto / Assist. Prof. Masaaki Uno]	- Energy
		Surface and Subsurface Instrumentation	Development of subsurface measurement technologies for energy utilization on environmental issue [Assoc. Prof. Hirokazu Moriya (School of Engineering)]	- Energy ※
		Earth Exploitation Environmental Studies	We are developing the high performance next generation and eco-friendly machine construction system to create a recycling society. [Prof. Hiroshi Takahashi / Assoc. Prof. Kiyotoshi Sakaguchi / Assist. Prof. Tomoaki Satomi]	- Energy
		Distributed Energy System	Efficient energy conversion system to realize low carbon society [Prof. Tatsuya Kawada / Assoc. Prof. Keiji Yashiro / Assoc. Prof. Shinichi Hashimoto / Assist. Prof. Mayu Muramatsu / Prof. Toshiyuki Hashida / Assoc. Prof. Go Yamamoto / Assoc. Prof. Kazunaga Sato (School of Engineering)]	- Energy ※
	Environmental Policies	Resources and Energy Security	Security and risk management for resources and energy development as well as data-driven earth and environmental science [Prof. Takeshi Komai / Assoc. Prof. Noriaki Watanabe / Assist. Prof. Kengo Nakamura]	- Energy
		Designing of Nano-Ecomaterials	Development of the materials and energy benign to the environment [Prof. Kazuyuki Tohji / Assoc. Prof. Hideyuki Takahashi / Assist. Prof. Shun Yokoyama]	- Energy
International Energy Resources		Carbon dioxide reduction through more efficient resource utilization [Assoc. Prof. Guido Grause / Assoc. Prof. Herto Dwi Ariesyady / Assist. Prof. Kyle Bahr]	- ※	
Environmental technology and Innovation		Backcast way of thinking for affluent lifestyles and innovation [Assoc. Prof. Ryuzo Furukawa / Assist. Masae Mitsuhashi]	- Human/Social	
Cooperative Divisions	Advanced Policies for Environment	Socio-Economic Dynamism of East Asian Countries	We are exploring the path to a sustainable future through the resolution of north-south conflicts over the global environment. [Prof. Shigeaki Fujisaki]	- Human/Social
		Environmental and Energy Economics	Integrated analysis of material flows and economic activities contributing sustainable resource management [Prof. Kazuyo Matsubae]	- Human/Social
	Control of Environmental Materials (DOWA Holdings Co., Ltd.)	Crustal Complex Systems Design		- Energy ※
		Information Sciences for Environment	Environmental Study and Disaster Mitigation by Applied Electromagnetic Wave Technology [Prof. Motoyuki Sato (CNEAS)]	- Energy
		Powder Processing for Functional Materials	Earth-friendly Environmental Powder Technology [Prof. Junya Kano / Assist. Prof. Shingo Ishihara (IMRAM)]	- Energy
		Extraction of Crustal Energy	Application of extreme environments in the earth's crust and unconventional energy resources for sustainable human life [Prof. Takatoshi Ito / Assist. Prof. Hiroyuki Shimizu (IFS)]	- Energy
		Physical Recycling Processes	For Achievement of Sustainable Society [Prof. Etsuro Shibata / Assist. Prof. Atsushi Iizuka (IMRAM)]	- Energy
		Materials Separation Processing	Development of new energy materials and environmentally-conscious materials for opening up our future [Prof. Takahisa Omata / Assist. Prof. Satoshi Tukuda (IMRAM)]	- Energy
		High-temperature physical chemistry of materials	Bring innovation to materials processing [Prof. Hiroyuki Fukuyama / Assoc. Prof. Makoto Ohtsuka / Assist. Prof. Masayoshi Adachi (IMRAM)]	- Energy
		Control of Environmental Materials	Creation and production of environmentally friendly electronic devices with highly efficient energy storage and practical applications. [Assoc. Prof. Norihiro Shimo]	- Energy
Geosphere Environment	Waste management and protection and remediation of environmental pollution for resource recycling [Prof. Toshikazu Shiratori (DOWA Holdings Co., Ltd.)]	- Energy		
Study of Functional Materials	We are developing the efficient optical device of an ultraviolet range, and the application to the environmental clean-up. [Prof. Ryuichi Toba (DOWA Holdings Co., Ltd) / Assist. Prof. Takahiro ohashi / Assist. yoshiko.shiraiwa]	- Energy		
Research Project	Next-generation Energies for Tohoku Recovery (NET)	Research and development on ocean and algae biofuel-based next-generation energy and mobility adaptable control systems for Tohoku's recovery. [Assoc. Prof. Atsushi Kishita / Assist. Prof. Senshin Umeki]		

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