

Research Highlights

(Vice Dean of Research) Masayoshi Watanabe

The engineering faculty is aiming to conduct cutting-edge international research through global collaboration under competitive conditions. We have also recently been strongly recommended by Ministry of Education, Culture, Sports, Science and Technology (MEXT) for having our own unique features that distinguish us from other universities. Herein, highlights of our research as well as our attempts to make our faculty more high-spirited will be introduced.

Cutting-edge International Research

Cutting-edge international research consists of star research projects selected by the faculty as *"Interdisciplinary Collaborative Research Projects."* We currently have 3rd-term research projects (2012–2016). The three major projects are related to *"Advanced Biomedical Engineering," "Clean Energy Materials,"* and *"Photonics: Materials and Devices,"* which commonly aim at the realization of a sustainable society.

To lay the foundation for cutting-edge international research, our faculty has promoted group research, which combines interdisciplinary yet related researchers onto one team. When a group research project achieves great success, such research will be recognized as an *"Interdisciplinary Collaborative Research Project,"*

For a Sustainable Society



which is our promotion system. Beginning this year, all group research will be conducted by *"Kakenhi groups,"* which aims to facilitate group research as well as get Kakenhi (Grant-in-Aid for Scientific Research by MEXT, the fundamental cornerstone of research funding in Japan) as a financial research resource. Simultaneously, we

designed a backup source of funding for when we fail to acquire a sufficient budget in spite of a relatively high ranking.

"2014 YNU Distinguished Researcher Awards" were presented to the following faculty researcher: Associate Professor Toshimitsu Kanai (Technological Progress Award).

Research Under Competitive Conditions

It is essential for research-focused universities to conduct research under competitive conditions, while at the same time award suitable positions to faculty members who have made honorable achievements. Our faculty created a strict guideline for promotion. We also established a tenure-track system to employ new faculty, especially young members, which was financially supported by MEXT. On November 27th and 28th, 2014, we organized a forum to discuss research activities and career paths for young researchers, where we invited tenure and tenure-track faculty members supported by MEXT not only from our university but also from all over Japan.

Global Collaboration

Global collaboration among our faculty has been conducted based on professional connections. We have signed a worldwide memorandum of understanding between numerous faculty members and universities. In addition, we embarked on systematic global collaboration in 2012, supported by the Japan Society for the Promotion of Science, under the *"Strategic Young Researchers Visit Program for Accelerating Brain Circulation"* program. We selected five overseas universities and national institutes for collaboration, focusing mainly on materials science. Young faculty and students (brain) frequently visit these institutions (circulation) to conduct global collaboration, and we also receive faculty and students to our own institution. The FY 2014 was the final year of this project, and a symposium to present research progress and achievement through these collaborations was held in March 2015.

2014 Ministry of Education, Culture, Sports, Science and Technology Japan Society for the Promotion of Science Grants—Aid for Scientific Research

(More than 10 million yen)

Research Item	Research Theme	Representative	Amount of Money Awarded (Yen)	Study Period
Research on Innovative Areas	Creation of molecularly integrated multi-responsive photochromic materials	Prof. Yasushi Yokoyama	10,500	2014–2018
Research (S)	Super-sensitive bio-marker sensors using ultimate light localization in nano-slot nanolasers	Prof. Toshihiko Baba	28,900	2012–2016
Research (S)	Study on sub- μ W microprocessors using adiabatic single-flux-quantum circuits	Prof. Nobuyuki Yoshikawa	27,500	2014–2018
Research (A)	Development of core technologies for human-friendly assistance systems using spiral motors	Prof. Yasutaka Fujimoto	11,000	2012–2015
Research (A)	Realization of one charge battery driving distance extension based on the high power density energy conversion system	Prof. Atsuo Kawamura	15,100	2014–2016
Research (B)	Sophistication of deformation damage evaluation of metallic materials by an electron and X-ray diffraction hybrid method	Prof. Yoshiaki Akiwa	10,300	2014–2018

Trust Study, Collaborative Investigation, and Furtherance Business with 2014 Ministry of Education, Culture, Sports, Science and Technology—the Government Bank

(More than 10 million yen)

Division	Research Title	Representative	Amount of Money Awarded (Yen)	Study Period
Ministry of Education, Culture, Sports, Science and Technology	Establishment of in-vessel retention using novel passive cooling technology	Assoc. Prof. Shoji Mori	20,046	2014
Japan Science and Technology Agency	Fundamental technologies for the production and usage of chemical hydride/Development of an electrolyzer for electrohydrogenation of toluene and durable electrode for oxygen evolution, and elucidation of hydrogenation mechanism	Prof. Shigenori Mitsushima	78,301	2014–2016
	Optimization of ionic liquid electrolytes and high-capacity cathodes for Lithium-Sulfur batteries	Prof. Masayoshi Watanabe	49,400	2012–2015
	Development of novel ceramics possessing self-healing functions for turbine blades	Assoc. Prof. Wataru Nakao	20,800	2012–2015
	Understanding and boundary structure optimization of coupled phenomena of heat and mass transport and electrochemical reaction by micro-sensors and multi-scale numerical analysis	Assoc. Prof. Takuto Araki	14,430	2013–2015
	Development of novel wrought aluminum alloys concurrently strengthened by ultrafine-grained and precipitation hardening and establishment of guidelines for the innovative alloy designing	Prof. Shoichi Hirosawa	10,069	2014–2017
	CW laser sources for optical frequency combs and their applications	Prof. Feng-Lei Hong	16,900	2014–2017
	Development of oxygen barrier coatings by aerosol deposition method	Assoc. Prof. Makoto Hasegawa	14,000	2014–2016
New Energy and Industrial Technology Development Organization	Microdevices for culturing microbes and their uses for saving energy in wastewater treatment plants	Assoc. Prof. Junji Fukuda	11,385	2011–2015
	Strategic development of PEFC technologies for practical application/non-precious metal-oxide-based catalyst for PEFC	Prof. Ken-ichiro Ota	78,032	2010–2015
	Advancement of hydrogen technologies and utilization project analysis on comprehensive renewable energy systems	Prof. Ken-ichiro Ota	19,997	2014–2016
	Development of super 3D fabrication platform and production of high value-added products	Prof. Shoji Maruo	39,997	2014–2016
National Institute of Information and Communications Technology	Research and development for hybrid quantum repeater - Quantum Entanglement Purification -	Prof. Hideo Kosaka	23,847	2014–2016