

## Activity Report for FY2015

Amidst science technologies which create new leading industries becoming increasingly important, one of the considerable subjects is promoting the development of fundamental technology in the field of biomedical engineering measurement. The Nakatani Foundation for Advancement of Measuring Technologies in Biomedical Engineering, since its establishment in 1984, has carried out grant programs to encourage the development of leading technologies and technology exchanges in the field of measuring technologies. Since FY2014, we have added an education promotion program to foster and support researchers. We have also carried out the programs described below in FY2015 while preparing to revise the grant programs in order to implement more fulfilling activities, e.g. organizing the international student exchange program, which is planned to start in FY2016.

### **I. Grant Program for the Development of Technology**

Biomedical engineering measuring technologies are basic technologies; therefore, it is quite important to promote the development of its leading technologies. The grant program for the development of technology in the field of biomedical engineering measuring technologies is our core project and we focused on this activity this year as well. In FY2014, we initiated a Grant Program for Special Research to grant subsidies of up to 30 million yen over two years for the research to be expected outstanding results and lead to practical uses.

#### 1. Invitation for Applications

Biomedical engineering measuring technologies cover a broad range of fields. They overlap the boundaries of science/engineering and medicine/biology as the field of technology development to be expected to play an important role in building a healthy and hopeful world. We invited applications from universities and equivalent research institutes for the research subjects for the grant, "Biomedical Engineering Measuring Technologies Related to the Living Body," for which the social need has been growing as an academic research. The invitation was given in the same way as in the preceding year: by sending out letters and posting on our website to reach as many people as possible.

[Invitation] Started from July 2015 ⇒ Mailed invitation letters and posted on our website

[Due date for applications]

Grant for Special Research: Closed on September 15, 2015

Grant for Development and Encouragement of Research: Closed on September 30, 2015

#### 2. Screening

Members of the selection committee (consisting of Mr. Kajiya, Chairperson, and 12 other members), which is set up in the Nakatani Foundation for Advancement of Measuring Technologies in Biomedical Engineering, carefully screened the applications from universities, etc. and chose 30 cases (13 for development of research, 10 for encouragement of research, and 7 for special research) that were expected to contribute to the development of leading technologies in the field of biomedical engineering measuring technologies.

[Screening procedures]

- Primary screening (paper)
  - Grant for Special Research
  - Grant for Development and Encouragement of Research

- Secondary screening (paper)
  - Grant for Special Research
  - Grant for Development and Encouragement of Research
- Third screening (interview)
  - Grant for Special Research
- Final screening: At the selection committee meeting on December 2015

### 3. Ceremony to Present the Grant for Development of Technology

A ceremony was held on February 26, 2016, at the Hamamatsucho TOKYO KAIKAN to present the FY2015 Nakatani Award and the grants to the recipients of the FY2015 Nakatani Research Grants and to hear their research presentations. The grant for the development of technology, amounting to 199.81 million yen in total (FY2015), was presented to the following 30 researchers and 6 researchers who had won the grant program for special research in FY2014:

#### Recipients of FY2015 Nakatani Research Grants

##### **【 Technology Development Research Grants 】**

##### **Development Research Grants**

Unit: 1,000 Japanese yen

Recipient	Position and Affiliation	Research Theme	Amount
Yasufumi Takahashi	Associate Professor Division of Electrical Engineering and Computer Science Kanazawa University	Development of Nano Electrochemical Microscopy for Single Cell Evaluation	3,000
Taketoshi Kajimoto	Assistant Professor Department of Molecular and Cellular Biology, Graduate School of Medicine Kobe University	Research and development of high-performance method for detecting exosomal marker for very early diagnosis of distant metastatic risk	2,800
Hitoshi Tatsumi	Professor Department of Applied Bioscience, College of Bioscience and Chemistry, Kanazawa Institute of Technology (KIT)	Improvement and application of super-resolution light microscopy on the imaging of cofilin dependent severing of actin filaments	2,610
Masamichi Yamanaka	Assistant Professor College of Science, Academic Institute, Shizuoka University	Development of separation method for large DNAs by electrophoresis using supramolecular hydrogel	3,000
Shinya Goto	Professor Department of Medicine (Cardiology), Tokai University School	The innovative development of new method to measure binding force of platelet cell adhesion at the site of vascular injury under arterial blood flow conditions.	3,000
Kazuto Takashima	Associate Professor Graduate School of Life Science and Systems Engineering, Kyushu Institute of Technology	Miniaturization of high sensitive catheter tactile sensor composed of organic ferroelectrics and establishment of palpation in vivo	3,000

Recipient	Position and Affiliation	Research Theme	Amount
Shuji Shimizu	Senior Research Fellow Department of Cardiovascular Dynamics, National Cerebral and Cardiovascular Center	Development of measurement technique of myocardial interstitial microRNA levels using cardiac microdialysis	3,000
Hiroyuki Abe	Professor Biochemical Engineering, Graduate School of Science and Engineering, Yamagata University	Development of imaging system for analysis of follicular development in ovarian tissue using optical coherence tomography	3,000
Kinichi Nakashima	Professor Department of Stem Cell Biology and Medicine, Graduate School of Medical Science, Kyushu University	Direct reprogramming of mouse microglia into functional neuron and its application for treatment of spinal cord injury	3,000
Teruyuki Kondo	Professor Advanced Biomedical Engineering Research Unit, Center for the Promotion of Interdisciplinary Education and Research, Kyoto University	Novel Paramagnetic Metal Oxide Nanoparticles for Use in Dual Photoacoustic and Magnetic Resonance Imaging	3,000
Yasuto Naoi	Assistant Professor Department of breast and endocrine surgery, graduate school of medicine Osaka University	Development of a recurrence prediction method of breast cancer based on the multi-gene expression analysis that can be applied to formalin fixed tissue.	3,000
Masami Kageshima	Professor Department of Physics, Kansai Medical University	Mechanical Analysis of Cell Sheet for Regenerative Medicine Using Novel Magnetic Indenter	2,550
Takao Iwawaki	Associate Professor Education and Research Support Center, Graduate School of Medicine, Gunma University	Development of probe to visualize oxidative stress for clinical application	3,000

**Grants for Encouragement of Research**

Unit: 1,000 Japanese yen

Recipient	Position and Affiliation	Research Theme	Amount
Yusuke Sato	Assistant Professor Department of Chemistry, School of Science, Tohoku University	Design of fluorescent probes for the visualization of intracellular RNA duplexes	1,500
Masaaki Koike	Assistant Professor Nara Institute of Science and Technology, Graduate School of Biological Science	Development of novel fluorescent probes for imaging of endoplasmic reticulum stress	1,500
Tomomi Aida	Associate Professor Medical Research Institute, Tokyo Medical and Dental University	Development of highly efficient knock-in technology for in vivo genetic biosensing	1,500
Masashi Watanabe	Assistant professor Department of Biochemistry, Hokkaido University Graduate School of Medicine	Development of a comprehensive and quantitative method for measuring physiological substrates catalyzed by ubiquitin E3 ligases	1,500
Toshihide Takeuchi	Assistant professor ICR, Kyoto University	Comprehensive analysis of exosomal chaperone toward development of diagnostic biomarkers for neurodegenerative diseases	1,500
Yoshihide Hattori	Lecturer Osaka Prefecture University Research Center of BNCT	Development of Analytical Method for Boron-Pharmaceuticals Using Fluorescent Boron-Sensor	1,500
Kazunori Shimizu	Associate Professor Graduate School of Engineering, Nagoya University	Development of Innervated Skeletal Muscle Microtissue on a Chip	1,500
Shinya Yoshida	Research Associate Professor Department of Bioengineering and Robotics, Tohoku University	Development of Ingestible Thermometer Operated by Utilizing Gastric Acid for Daily Measurement of Core Temperature during Sleep.	1,500
Mitsuru Yasuda	Post Doctoral Fellow Kwansei Gakuin University	Simultaneous-Multiple and Enhanced-Fluorescence Immunoassays Using an Optical Interference Mirror Slide with a Nano-Multilayered Structure	1,500
Hirohito Nishimura	Postdoctoral fellow National Cerebral and Cardiovascular Center Research Institute Department of Biochemistry	Development of molecular and cellular imaging techniques in living animals.	1,500

**Special Research Grants: multi-year grants (two years)**

Unit: 1,000 Japanese yen

Recipient	Position and Affiliation	Research Theme	Amount
Katsumasa Fujita	Associate Professor Department of Applied Physics, Osaka University	Development of high-speed Raman microscopy for label-free tissue diagnosis	30,000
Hirohide Saito	Professor Kyoto University, CiRA	Synthetic RNA switch to detect and control target live cells for medical applications	30,000
Michiyuki Matsuda	Professor Kyoto University Graduate School of Medicine, Department of Pathology and Biology of Diseases	Development of CMOS sensors for the real-time monitoring of protein activities.	30,000
Masataka Kinjo	Professor Faculty of Advanced Life Science Hokkaido University	Development of multi-cellular fluorescence correlation spectroscopy for study of pharmacokinetics based on protein-protein interaction in living cell	30,000
Hiroshi Ueda	Professor Chemical Resources Laboratory, Tokyo Institute of Technology	Selection of quench-based immunosensors with high performance	29,900
Moritoshi Sato	Associate Professor Department of Multi-Disciplinary Sciences, Graduate School of Arts and Sciences, The University of Tokyo	Fluorescent probes for live-cell, super-resolution imaging	28,200
Yutaka Yatomi	Professor Department of Clinical Laboratory Medicine, Graduate School of Medicine, The University of Tokyo	Development of a new and practical assay of reduced/oxidized albumin for the clinical introduction	28,000

## II. Commendation Program (Nakatani Award)

The Nakatani Award, in expectation of dramatic advances in the development of technology in the field of biomedical engineering measuring technologies related to the living body, was instituted to recognize researchers who had achieved the outstanding works. We selected the candidates for the prize after careful screening among the applications with recommendations received via our open invitation and presented the Nakatani Award grand prize and encouraging prizes to the winners at a ceremony.

### Recipients of FY2015 Nakatani Awards

#### Grand Prize

Unit: 1,000 Japanese yen

Recipient	Position and Affiliation	Prize Theme	Amount
Eiichi Tamiya	Professor Osaka University, Graduate School of Engineering, Department of Applied Physics	Pioneering research on the practical application of biosensors using nano-micro devices	5,000

#### Encouraging Prizes

Unit: 1,000 Japanese yen

Recipient	Position and Affiliation	Prize Theme	Amount
Tai Kiuchi	Department of Pharmacology, Kyoto University Faculty of Medicine	Development of super-resolution fluorescence microscopy using probes that repeatedly associate with and dissociate from the targets	2,500
Junichi Ushiba	Associate Professor Faculty of Science and Technology, Keio University	Development of Brain-Machine Interface towards assisting recovery of brain's motor function	2,500

[Invitation] Started from July 2015 ⇒ Mailed invitation letters and posted on our website

[Due date for applications] Closed on October 14, 2015 ⇒ Application with recommendation

[Screening procedures]

- Primary screening (paper)
- Final screening: At the selection committee meeting on December 2015

### III. Grant Program for Technology Exchanges

Along with the development of nanotechnology and biotechnology in recent years, academic areas related to development and research of technology have become increasingly complicated and diverse. Thus it becomes more important to promote technology exchanges among the researchers in Japan and overseas. In FY2015, therefore, we conducted the grant programs for Dispatch to Overseas, Invitation to Japan, Overseas Training, Overseas Study, and Study in Japan for technology exchanges and subsidized them as follows:

[Invitation] Posted on our website

[Acceptance of Application] Anytime in every quarter of a year (Once a year for Overseas Study and Study in Japan)

[Screening procedures] by exchange screening committee members

[Screening results]

Number of cases: 20 cases for Dispatch to Overseas

11 cases for Invitation to Japan

5 cases for Overseas Training

3 cases for Overseas Study

Total amount of grants: 16.12 million yen (including the amount for the recipients in FY2014)

3.58 million yen for Dispatch to Overseas

2.77 million yen for Invitation to Japan

3.96 million yen for Overseas Training

4.00 million yen for Overseas Study

1.80 million yen for Study in Japan

#### The recipients of the grant program for dispatch to overseas

Name	Post, Facility	Conference Name	Location	Date
Toshifumi Moriyama	Associate Professor Nagasaki University Graduate school of Engineering	Progress in Electromagnetics Research Symposium	Czech Republic Prague	July 2015
Satoshi Makita	Lecturer Dept. of Control Engineering, National Institute of Technology, Sasebo College	The 25th Congress of the Int. Society of Biomechanics (ISB 2015)	UK Glasgow	July 2015
Toshio Koyama	Graduate School of Natural Science and Technology Kanazawa University	The 2015 IEEE/ASME International Conference on Advanced Intelligent Mechatronics	South Korea Busan	July 2015
Yukimi Tanaka	Department of Human and Engineered Environmental Studies, Graduate School of Frontier Sciences The University of Tokyo	IEEE Engineering in Medicine and Biology Society (EMBS)	Italy Milan	August 2015

Name	Post, Facility	Conference Name	Location	Date
Tomoyo Shiramatsu	Project Researcher Research Center for Advanced Science and Technology, The University of Tokyo	Error Signals from the Brain - 7th Conference on Mismatch Negativity (MMN)	Germany Leipzig	September 2015
Masanobu Manabe	Doctoral Course Division of Sustainable Energy and Environmental Engineering, Graduate School of Engineering, Osaka University	8th Young Researchers BNCT Meeting	Italy Pavia	September 2015
Yasuo Yoshimi	Professor College of Engineering, Applied Chemistry, Shibaura Institute of Technology	14 <sup>th</sup> International Congress of Therapeutic Drug Monitoring and Clinical Toxicology	Holland Rotterdam	October 2015
Takuya Arafune	Electronics and Informatics, Mathematics and Physics, Graduate School of Science and Technology, Gunma University	The IEEE 11 <sup>th</sup> International Conference on ASIC	China Chengdu	November 2015
Takeshi Kajimoto	Assistant professor Department of Biochemistry and Molecular Biology, Kobe University Graduate School of Medicine	2015 Cell Biology ASCB Annual Meeting	US San Diego	December 2015
Jun Ando	Post-doctoral research fellow Department of Applied Physics, Osaka University	Pacificchem 2015	US Honolulu	December 2015
Satoru Yoshida	Graduate School of Science and Technology, Keio University	IEEE MEMS 2016 (The 29th IEEE International Conference on Micro Electro Mechanical Systems)	China Shanghai	January 2016
Noriyuki Suzuki	Graduate School of Science and Technology, School of Integrated Design Engineering, Keio University	IEEE MEMS 2016 (The 29th IEEE International Conference on Micro Electro Mechanical Systems)	China Shanghai	January 2016



Name	Post, Facility	Conference Name	Location	Date
Taiyu Okatani	Department of Mechano-Informatics, Graduate School of Information Science and Technology, the University of Tokyo	IEEE MEMS 2016 (The 29th IEEE International Conference on Micro Electro Mechanical Systems)	China Shanghai	January 2016
Wataru Onishi	Same as above	Same as above	China Shanghai	January 2016
Hui-Jun Park	Same as above	Same as above	China Shanghai	January 2016
Yuma Shiraishi	Department of Mechanical Systems Engineering, Tokyo University of Agriculture and Technology	The Biophysical Society Annual Meeting	US Los Angeles	February 2016
Yuki Kanazawa	Assistant Professor Tokushima University, Graduate School of Biomedical Sciences Department of Medical Image Informatics	European Congress of Radiology (ECR)	Austria Vienna	March 2016
Kento Terasaki	Doctoral Course Quantum Radiation Sciences, Department of Health Sciences, Graduate School of Medical Sciences, Kyushu University	14 <sup>th</sup> International Congress of the International Radiation Protection Association (IRPA14)	South Africa Cape Town	May 2016
Takuya Hamaguchi	Instructor Center for Kampo Medicine, Keio University School of Medicine	International Congress on Integrative Medicine and Health 2016(ICIMH 2016)	US Las Vegas	May 2016
Yasunari Iguchi	Doctoral Course Division of Sustainable Energy and Environmental Engineering, Graduate School of Engineering, Osaka University	64 <sup>th</sup> ASMS Conference on Mass Spectrometry and Allied Topics	US San Antonio	June 2016

**The recipients of the grant program for invitation to Japan**

Name	Post, Facility	Conference Name	Location	Invitee	Date
Tohru Kiryu	Professor Graduate School of Science and Technology Niigata University	①Japan Society of Electrophysiology and Kinesiology 2015 ② Standardization of body dimension measurement	①Nagoya ②Tokyo	Roberto Merletti Professor Laboratory for Engineering of the Neuromuscular System, Politecnico di Torino, Italy	July 2015
Norio Takata	Assistant Professor Department of Neuropsychiatry, School of Medicine Keio University	The 38 <sup>th</sup> Annual Meeting of the Japan Neuroscience Society	Kobe, Japan	Lee, Jin Hyung Assistant Professor Stanford University School of Medicine	July 2015
Seiichi Mochizuki	Professor Kawasaki University of Medical Welfare Faculty of Health Science and Technology	10th World Congress for Microcirculation	Kyoto	Ms. Maria Siebes Associate Professor, Academic Medical Center, University Amsterdam,	September 2015
Gen Uehara	Director Professor Applied Electronics Laboratory, Kanazawa Institute of Technology	Academia Sinica in Taiwan/National Central University in Taiwan/ Joint workshop for the application of magnetoencephalography (MEG)	Kanazawa Institute of Technology	①Prof. Ovid Tzeng, Academia Sinica and National Yang Ming University	October 2015
Same as above	Same as above	Same as above	Same as above	②Dr. Denise Hsien Wu, National Central University, Taiwan	October 2015
Kazuko Kimura	Professor Institute of Medical, Pharmaceutical and Health Sciences, Kanazawa University	The 30th Japan Association for International Health Congress 2015	Kanazawa University	①Mom Bun Heng, Minister, Ministry of Health, Royal Government of Cambodia	November 2015

Name	Post, Facility	Conference Name	Location	Invitee	Date
Same as above	Same as above	Same as above	Same as above	②Patrick Lukulay, Vice President, Global Health Impact Programs (GHIP)	November 2015
Masami Ando	Professor Research Institute for Science and Technology Tokyo University of Science	The 10th Asia Synchrotron Radiation in Biology and Medicine Imaging Seminar	Yamagata	①LI Gang Assistant Professor Beijing Synchrotron Facility (BSRF), Institute of High Energy Physics, Chinese Academy of Sciences	February 2016
Same as above	Same as above	Same as above	Same as above	②KIM Jong-Ki Professor College of Medicine, Faculty of Medicine, Catholic University of Daegu	February 2016
Same as above	Same as above	Same as above	Same as above	③JHEON Sanghoon Professor College of Medicine, Seoul National University	February 2016
Jumpei Murakami	Assistant Professor Division of Special Care Dentistry, Osaka University Dental Hospital	The 1st Association of Promoting New Treatment for Tourette Syndrome Annual meeting	Osaka University Dental Hospital	Dr. Anthony B. Sims Maryland Center for Craniofacial TMJ and Dental Sleep Disorders	May 2016

**The recipients of the grant program for overseas training**

Name	Facility, Post	Research Theme	Facility of Training	Date
Takahiro Teramoto	Assistant Professor Department of Electrical and Electronic Engineering, Ritsumeikan University	Development of the two-dimensional electronic-vibrational spectroscopy	US University of California, Berkeley	July 2015
Hideki Miwa	Assistant Professor Gunma University Graduate School of Medicine	Relationship between GABAergic neuron and the generation of sleep oscillatory wave	US Harvard Medical School VA Boston Healthcare System	April 2016
Tatsuya Daikoku	Visiting Fellow Department of Clinical Laboratory Medicine, Graduate School of Medicine, The University of Tokyo	Imaging sensorimotor interactions using brain transcranial magnetic stimulation in combination with neuroimaging	UK Department of Experimental Psychology, University of Oxford	April 2016
Jinhee Lee	Doctoral Course Ikebukuro Laboratory Department of Biotechnology and Life Science, Graduate School of Engineering, Tokyo University of Agriculture and Technology	Simultaneous detection of multiple target double-stranded DNAs using the DNA microarray technology and enzyme-fused zinc finger protein	France Universite Lyon 1 -Claude Bernard	April 2016
Takuya Isomura	Doctoral Course Department of Human and Engineered Environmental Studies, Graduate School of Frontier Sciences, The University of Tokyo	Construction of the machine learning model that reproduces human's unconscious inference and its application for psychiatry	UK Wellcome Trust Centre for Neuroimaging, University College London	April 2016

**The recipients of the grant program for overseas study**

Name	Facility, Post	Research Theme	Overseas Facility	Date
Moeto Nagai	Assistant Professor Department of Mechanical Engineering, Toyohashi University of Technology	Optofluidic system for High- Throughput Analysis of Single Cells	US University of California, Los Angeles	September 2015
Daisuke Morisawa	Assistant Professor Division of Coronary Heart Disease Department of Internal Medicine, Hyogo College of Medicine	A hydrodynamic analysis of blood vortex formation in the right ventricle by particle imaging velocity measurement using ultrasonic wave and a simulator	US School of Engineering University of California, Irvine	September 2015
Daichi Nakagawa	The University of Tokyo, Graduate School of Medicine Neurosurgery	<ul style="list-style-type: none"> <li>• Establishment of a technique that can accurately measure the coil after embolizing aneurysms in the human body</li> <li>• Making a high-definition three-dimensional coil model, etc. using computer graphics</li> </ul>	US Department of Neurosurgery University of Iowa	August 2016

#### IV. Grant Program for Research Study

Since there are various challenges in the field of biomedical engineering measuring technologies related to the living body, grant programs that the result of research is utilized broadly in a society have an important implication. We did the screening in the same way as the program for the development of technology and determined to subsidize the following research.

##### Investigative Research Grants

Unit: 1,000 Japanese yen

Recipient	Position and Affiliation	Research Theme	Amount
Wenxi Chen	Professor Biomedical Information Technology Lab. The University of Aizu	A Comprehensive Survey of Unobtrusive Measurement of Vital Signs	2,800
Hideo Wada	Associated Professor Department of Molecular and Laboratory Medicine. Mie University Graduate School of medicine	Evaluation of Hypercoagulable (Pre-thrombotic) state by hemostatic markers	3,000
Kenichi Aizawa	Associate Professor Division of Clinical Pharmacology, Department of Pharmacology, Jichi Medical University	Research about development and the clinical application of the low-invasive diagnostic method of the coronary stenosis	3,000

[Invitation] Started from July 2015 ⇒ Mailed invitation letters and posted on our website

[Due date for applications] Closed on September 30, 2015

[Screening procedures]

Primary screening, Final screening (at the selection committee meeting on December 2015)

#### V. Gathering and Providing Information on Biomedical Engineering Measuring Technologies

In order to promote the broad use of information regarding biomedical engineering measuring technologies related to the living body, we compiled data of the foundation's activities, such as the results of our grant programs for the research and technology exchanges, and issued our Annual Report No. 29. It was distributed widely to related facilities and has been opened as a database of biomedical engineering measuring technologies on our website. Researchers can obtain useful information using its retrieval function.

[Publication] Annual Report No. 29

- Issued on June 20, 2015
- Printed copies: 800
- Distribution to: Persons concerned, universities, related corporations, etc.
- Annual report is provided free of charge

## VI. Grant for the Promotion of Science Education

We think that raising children to have logical thinking skills and creativity will help not only the progress of science technology but also the development of Japan. Hence, we have sponsored a grant program for the promotion of science education in middle schools and high schools since FY2014.

[Individual] Planning and practice of science classes, club activities, etc. that may help increase students' interest in science at educational facilities, such as middle school and high schools. (up to 300,000 yen/case)

[Program] Programs jointly planned and run by educational facilities such as schools, museums, science education centers, research facilities such as colleges and universities, school boards and so on. (up to 1 million yen/case, 2-year limitation)

### The 2nd (FY2015) grant for science education

Grant Program	No. of Cases/Amount of Grant
Individual	58/16.06 million yen
Program (1st year)	14/12.89 million yen
(2nd year)	14/11.68 million yen

[Grant Program for Global Research Internship (Nakatani RIES Fellowship)]

The Nakatani Foundation for Advancement of Measuring Technologies in Biomedical Engineering expects to start Grant Program for Global Research Internship (Nakatani Research & International Experiences for Students Fellowship) in FY2016 to contribute to fostering researchers who have both technical and international communication skills for international research collaborations. Under this new program, undergraduate students will have opportunities to spend summer in different countries to conduct research internship at university host laboratories, study language and culture of the country and interact with other students. With the support of parties concerned, the design and application of this program have been completed within this fiscal year end so that we can start with the U.S. to interchange students this summer as the first step.