Aiming to Create Innovation in Science and Technology
What are Strategic Basic Research Programs?

Strategic Basic Research Programs are intended to advance basic research aimed at achieving solutions for key issues Japan is facing, and to produce the seeds of creative, innovative technologies from new scientific knowledge that gives rise to innovation in science and technology leading to social and economic change. As such, Strategic Basic Research Programs seek to build research institutes (time limited research organizations spanning organizational boundaries) consisting of networks of researchers at universities, companies, and public research institutions. Researchers pursue their work, while building networks of other researchers, industrial concerns that will benefit from the fruits of research work, and interested parties in society at large, under the leadership of a Program Officer (Research Supervisor, etc.) performing the role of the institute director.

Strategic Objectives established by the national government to achieve solutions for key issues Japan is facing

Construction and operation of research institutes

Creating the Seeds for New Technology
(CREST, PRESTO, ACT-I, ERATO, ACCEL)

Network-based (team-based) research giving rise to outstanding results that lead to innovation in science and technology.

- Research Directors, under the management of a Research Supervisor, lead research teams and, while forming and drawing on the strengths of networks spanning industry, academia, and government, seek to produce research results that are of an internationally high level and contribute significantly to innovation in science and technology.

- Research period: 5 years and 6 months or less
- Research budget: Total of 150-500 million yen / team

Outstanding research leaders strive to generate the seeds of breakthrough new technologies

ERATO

ERATO will contribute to the creation of scientific and technological innovation that changes the economy and society.

- The Research Directors conduct the research projects which consist of pioneering and original ideas and creating new currents of advancement in science and technology.

- Research period: Approximately 5 years
- Research budget: Total of 1.2 billion yen / project

A low carbon society can be created by implementing ALCA game-changing technologies

ALCA

ALCA is aiming at creating a low carbon society by the development of game-changing technologies limiting the CO2 generation through energy creation, storage and carbon neutral initiatives and reducing the CO2 emissions through energy efficient technologies.

- Research period: Up to 10 years
- Research budget: 100-1000 million yen / year and project

Network-based (individual) research giving rise to wellsprings of innovation in science and technology

PRESTO

The objective of this program is to produce results that will become wellspring of innovation in science and technology and turn out future research leaders by having individual researchers, working under the management of a Research Supervisor, interact with and inspire one another as they pursue original, challenging research.

- Research period: 3 years and 6 months or less
- Research budget: Total of 30-40 million yen / project

Network-based individual research of ICT young researchers for Individuality Establishment

ACT-I

Under the management of a Research Supervisor, find out and foster ICT young researchers who will come up with origami ideas to resolve present or future issues which people are facing and will face, and support to establish individuality of researchers.

- Research period: 1 year and 6 months or less
- Research budget: 3 million yen as standard (Max. 5 million yen)

RISTEX aims to produce practical wisdom and methods which will lead to solutions to the social problems through conducting R&D projects carried out by researchers from various fields, practitioners, and other stakeholders. In addition to the R&D projects, RISTEX runs programs to support implementation and outspread of the R&D results into society.

- Research period: 3 years
- Research budget: Total of 15-90 million yen / project

Accelerated Innovation Research Initiative Turning Top Science and Ideas into High-Impact Values

ACCEL

ACCEL aims to set a path to the next phase, such as company R&D, venture start-up and other public funding, based on the outputs of the Strategic Basic Research Programs (CREST, PRESTO, ERATO, etc.) that have the potential to be world-leading but cannot be continued by companies and other organizations due to their perceived risks. The Program Manager (PM) leads research and development with the innovation requirements and goals, demonstrating Proof of Concept (PoC) and promoting the appropriate rights arrangements.

- R&D period: Up to 5 years
- R&D budget: 10-300 million yen / year and project

* The projects selected in FY2017 are implemented as ACCEL in the JST-Mirai R&D Program.

Toward the Creation of Innovation in Science and Technology
Network-based (team-based) research giving rise to outstanding results that lead to scientific and technological innovation

Concept
To achieve Strategic Objectives established by the Japanese government, the CREST program promotes unique and world-leading directed basic research. The CREST program seeks to produce outstanding results that contribute significantly to scientific and technological innovation.

Outline

1. Management of Research Areas by Research Supervisors
   Research Supervisors oversee the activities of Research Directors affiliated with industrial, academic and governmental institutions, and manage Research Areas as research institutes. To maximize the research results in each Research Area, Research Supervisors manage the Research Areas by setting directions of Research Areas, selecting Research Themes, coordinating and approving research plans, sharing views with and advising Research Directors, evaluating Research Themes, etc.

2. Strong Leadership of Research Directors
   In pursuit of the research concept he or she has proposed, a Research Director will assemble a single optimal research team consisting of multiple researchers. The Research Director bears responsibility for the entire research team and advances research in a way that contributes to achievement of the Research Area’s overall objectives.

3. Formation of Networks for Scientific and Technological Innovation
   Each Research Director, with the support of the Research Supervisor and Research Area Advisors, will form a network of researchers inside and outside the Research Area and actors from industry and others. Research Directors utilize this network for the effective production of results and development of innovation by sharing information and collaborating with these people.

Research Framework

Japanese Government (MEXT)
<table>
<thead>
<tr>
<th>Research Area</th>
<th>Research Supervisor</th>
<th>Deputy Research Supervisor</th>
<th>fiscal year</th>
<th>Themes</th>
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</thead>
<tbody>
<tr>
<td>Innovation in Chemical Reactions through Active Control of Electrons and Ions for Production</td>
<td>Jun-ichi YOSHIDA  President, National Institute of Technology, Tokai University</td>
<td>Professor Emeritus, Kyoto University</td>
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<tr>
<td>Scientific Innovation for Energy Harvesting Technology</td>
<td>Kenji TAMGUCHI  Professor Emeritus, Daisaku University, Principal Research Manager</td>
<td>Professor Emeritus, National Institute of</td>
<td>13</td>
<td></td>
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<tr>
<td></td>
<td>Yutaka KOBAYASHI  Principal Research Manager, National Institute of</td>
<td>Advanced Industrial Science and Technology (AIST)</td>
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<tr>
<td>Creation of Innovative Core Technology for Manufacture and Use of Energy Carriers from Renewable Energy</td>
<td>Koichi EGUCHI  Professor, Graduate School of Engineering, Tokyo University</td>
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<td>12</td>
<td></td>
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<tr>
<td>Phase Interface Science for Highly Efficient Energy Utilization</td>
<td>Katsumori HANAMURA  Professor, School of Engineering, Tokyo University, Institute of</td>
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<td></td>
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<tr>
<td>Creation of Essential Technologies to Utilize Carbon Dioxide as a Resource through the Enhancement of Plant Productivity and the Exploitation of Plant Products</td>
<td>Akira ISOGAI  Professor Emeritus, Nara Institute of Science and Technology</td>
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<tr>
<td>Establishment of Core Technology for the Preservation and Regeneration of Marine Biodiversity and Ecosystems</td>
<td>Isao KOKE  Professor Emeritus, The University of Tokyo</td>
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<td></td>
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<tr>
<td>Large-Scale Genome Synthesis and Cell Programming</td>
<td>Harunihiko SIOMI  Professor, Keio University School of Medicine</td>
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<tr>
<td>Elucidation of Biological Mechanism of Extracellular Fine Particles and the Control System</td>
<td>Yoshinobu OHTSU  Professor, School of Engineering, Nagoya University</td>
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<tr>
<td>Development and Application of Optical Technology for Spatiotemporal Control of Biological Functions</td>
<td>Ryochiro KAGEYAMA  Professor, Institute for Frontier Life and Medical Science, Kyoto University</td>
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<tr>
<td>Creation of Fundamental Technologies Contribute to the Elucidation and Application for the Robustness in Plants against Environmental Changes</td>
<td>Satoshi TABATA  Director and Vice Chairman of the Board of Trustees, Kazusa DNA Research Institute</td>
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<tr>
<td>Innovative Technology Platforms for Integrated Single Cell Analysis</td>
<td>Sumio SUZUKI  Lecturer (part-time), Medical Research Institute, Tokyo Medical and Dental University</td>
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<tr>
<td>Structural Life Science and Advanced Core Technologies for Innovative Life Science Research</td>
<td>Koji TANAKA  Director, Tokyo Metropolitan Institute of Medical Science</td>
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<tr>
<td>Creation of Fundamental Technologies for Understanding and Control of Biosystem Dynamics</td>
<td>Tadashi YAMAMOTO  Professor, Okayama Institute of Science and Technology (OIST)</td>
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<tr>
<td>Creation of Core Technology Based on the Topological Materials Science for Innovative Devices</td>
<td>Masahito UEDA  Professor, School of Science, The University of Tokyo</td>
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<tr>
<td>Creation of Innovative Core Technologies for Nano-Enabled Thermal Management</td>
<td>Shigeo MARUYAMA  Professor, School of Engineering, The University of Tokyo</td>
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<tr>
<td>Revolutionary Material Development by Fusion of Strong Experiments with Theory / Data Science</td>
<td>Hideo HOSONO  Professor, Institute of Innovative Research, Tokyo Institute of Technology</td>
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<tr>
<td>Development and Application of Intelligent Measurement-Analysis Methods through Coalition between Measurement Technologies and Informatics</td>
<td>Yoshiyuki AMEMYAMA  Project Professor, Graduate School of Frontier Sciences, The University of Tokyo, Project Professor</td>
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<tr>
<td>Creation of an Innovative Quantum Technology Platform Based on the Advanced Control of Quantum States</td>
<td>Yashiro ARAKAWA  Specially Appointed Professor, Institute for Nano Quantum Information Electronic Research, The University of Tokyo</td>
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<tr>
<td>Advanced Core Technology for Creation and Practical Utilization of Innovative Properties and Functions Based upon Optics and Photonics</td>
<td>Ken-ichi KITAYAMA  Professor, The Graduate School for the Creation of New Photonics Industries</td>
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<tr>
<td>Innovative Catalysts and Creation Technologies for the Utilization of Diverse Natural Carbon Resources</td>
<td>Wataru UEDA  Professor, Faculty of Engineering, Kanagawa University</td>
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<tr>
<td>Development of Atomic or Molecular Two-Dimensional Functional Films and Creation of Fundamental Technologies for Their Applications</td>
<td>Atsushi KURIBA  Chief Fellow, Corporate Research &amp; Development Center, Toshiba Corporation</td>
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<tr>
<td>Innovative Nano-Electronics through Interdisciplinary Collaboration among Material, Device and System Layers</td>
<td>Takayasu SAKURAI  Professor, Institute of Industrial Science, The University of Tokyo</td>
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<td>Creation of Innovative Functional Materials with Advanced Properties by Hyper-Nano-Space Design</td>
<td>Tohru SETHYAMA  Executive Officer, Mitsubishi Chemical Corporation / General Manager, Yokohama R&amp;D Center Saitama Laboratory</td>
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<tr>
<td>Establishment of Molecular Technology towards the Creation of New Functions</td>
<td>Hisashi YAMAMOTO  Professor, Chiba University, Emeritus professor, University of Chicago</td>
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<tr>
<td>Technology for Computing Revolution for Society 5.0</td>
<td>Shuichi SAKAI  Professor, Graduate School of Information Science and Technology, The University of Tokyo</td>
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<tr>
<td>Creation and Development of Core Technologies Interfacing Human and Information Environments</td>
<td>Kenji MASE  Professor, Graduate School of Informatics, Nagoya University</td>
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<tr>
<td>Development and Integration of Artificial Intelligence Technologies for Innovation Acceleration</td>
<td>Minoru ETOH  Professor, Open and Transdisciplinary Research Initiative, Osaka University</td>
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<tr>
<td>Modeling Methods allied with Modern Mathematics</td>
<td>Takashi TSUBOI  Professor, Graduate School of Mathematical Sciences, The University of Tokyo</td>
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<tr>
<td>Intelligent Information Processing Systems Creating Co-Experience Knowledge with Human-Machine Harmonious Collaboration</td>
<td>Norio HAGITA  Board Director, Director, Intelligent Robotics and Communication Laboratories, Advanced Telecommunications Research Institute International</td>
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<tr>
<td>Advanced Application Technologies to Boost Big Data Utilization for Multiple-Field Scientific Discovery and Social Problem Solving</td>
<td>Yuzuru TANAKA  Professor Emeritus, Hokkaido University</td>
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<tr>
<td>Advanced Core Technologies for Big Data Integration</td>
<td>Masato HATAJIMA  Director General, National Institute of Informatics / Professor, Institute of Industrial Science, The University of Tokyo</td>
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<tr>
<td>Creation of Fundamental Theory and Technology to Establish a Cooperative Distributed Energy Management System and Integration of Technologies Across Broad Disciplines Toward Social Application</td>
<td>Misayuki FUJITA  Professor, Tokyo Institute of Technology</td>
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</tbody>
</table>
Network-based (individual) research giving rise to wellsprings of scientific and technological innovation

**Concept**

To achieve Strategic Objectives established by the Japanese government, the PRESTO program promotes pioneering directed basic research that is original and challenging, and expected to lead to the development of high international standards. The PRESTO program aims to lead the world in the production of results that serve as a wellspring of innovation.

**Outline**

1. **Strong Support Structure for Advancing Research**
   A PRESTO researcher takes responsibility for advancing a Research Project he or she has proposed within a Research Area led by a Research Supervisor. In advancing the Research Project, the researcher can gain various types of advice and guidance from the Research Supervisor and Research Area Advisors. JST will assist researchers with patent applications, public relations activities, and other needs, as well.

2. **Research Area Meetings as an Opportunity for Interacting and Networking with People in Other Fields**
   At research report retreats (Research Area meetings) held twice yearly, researchers can interact with their Research Supervisor, advisors, and researchers working in other fields of the same Research Area, and form networks that will continue beyond the end of their participation in the PRESTO program.

3. **Generous Accommodation of Life Events**
   Research activities can be temporarily suspended for child care, nursing care, or other life events. Research periods can be extended by up to one year.

4. **Research Institution Affiliation Not Required for Application to the PRESTO Program**
   When it is acknowledged that an individual would be able to properly pursue PRESTO research even without a research institution affiliation at the time of his or her selection to the program, arrangements can be made to allow that individual to pursue research as an Exclusive Appointment Researcher employed by JST.

**Research Framework**

**Japanese Government (MEXT)**

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Objectives of scientific and technological innovation

Network-based (individual) research giving rise to wellsprings

Program aims to lead the world in the production of results that serve as a wellspring of expectations and expected to lead to the development of high international standards. The PRESTO initiative is a Department of Innovation Research program of the Japan Science and Technology Agency (JST).

www.jst.go.jp/kisoken/presto/en/  presto@jst.go.jp

Research Framework

Outline

Rationale for PRESTO

- To provide advanced, pioneering and fundamental research opportunities for top scientists and engineers
- To foster the development of cutting-edge technologies and innovations
- To enhance the global competitiveness of Japan in science and technology

Support System for Advancing Research

- Exclusive Appointment Researcher Program
- Research Supervisors
- Research Themes

Research Areas

- On-going Research Areas
- Research Themes
- Research Area fiscal year
- Research Themes

Research Area

- Controlled Reaction by Electrons or Ions
  - Yasushi SEKINE
  - Professor, Faculty of Science and Engineering, Waseda University

- Scientific Innovation for Energy Harvesting Technology
  - Kenji TANGUCHI
  - Professor Emeritus, Osaka University
  - Hiroaki AKINAGA
  - Principal Research Manager, National Institute of Advanced Industrial Science and Technology (AIST)

- Creation of Innovative Core Technology for Manufacture and Use of Energy Carriers from Renewable Energy
  - Koichi EGUCHI
  - Professor, Graduate School of Engineering, Kyoto University

- Large-Scale Genome Synthesis and Cell Programming
  - Hanahiko SEKI
  - Professor, Keio University School of Medicine

- Creation of Life Science Basis by Using Quantum Technology
  - Mitsutoshi SETOU
  - Director of the center, International Mass Imaging Center

- Function and Control of Fine Particles in a Living Body
  - Akihiko NAKANO
  - Deputy Director, RIKEN Center for Advanced Photonics

- Optical Control of Biological Functions for the Elucidation of Biological Systems
  - Yoshinori SHICHIDA
  - Visiting Professor, Research Organization of Science and Technology, Ritsumeikan University / Professor Emeritus, Kyoto University

- Creation of Next-Generation Fundamental Technologies for the Control of Biological Phenomena in Field-Grown Plants
  - Kiyotaka OKADA
  - Professor, Faculty of Agriculture, Ryukoku University

- Innovative Technology Platforms for Integrated Single Cell Analysis
  - Iruu HAMACHI
  - Professor, Graduate School of Engineering, Kyoto University

- Creation of Innovative Technology for Medical Applications Based on the Global Analyses and Regulation of Disease-Related Metabolites
  - Yoshiya ODA
  - Group officer / Senior director, Tauku Research Laboratories, ELAS Co., Ltd.

- Topological Materials Science for Creation of Innovative Functions
  - Shuichi MURAKAMI
  - Professor, School of Science, Tokyo Institute of Technology

- Thermal Science and Control of Spectral Energy Transport
  - Katsunori HANAMURA
  - Professor, School of Engineering, Tokyo Institute of Technology

- Development and Application of Intelligent Measurement-Analysis Methods through Coalition between Measurement Technologies and Informatics
  - Yoshiyuki AMEMIYA
  - Project Professor, Graduate School of Frontier Sciences, The University of Tokyo
  - Genshiro KITAGAWA
  - Project Director, Mathematics and Informatics Center, The University of Tokyo

- Quantum State Control and Functionalization
  - Kohji ITOH
  - Dean Professor, Keio University

- Fully-Controlled Photons and Their Proactive Usage for New Era Creation (FRONTIER)
  - Ken-ichi LEDA
  - Professor Emeritus, The University of Electro-Communications

- Science and Creation of Innovative Catalysts
  - Hiroshi KITAGAWA
  - Professor, Department of Chemistry, Graduate School of Science, Kyoto University

- Innovative Nano-Electronics through Interdisciplinary Collaboration among Material, Device and System Layers
  - Takayasu SAKURAI
  - Professor, Institute of Industrial Science, The University of Tokyo
  - Naoki YOKOYAMA
  - Honorary Fellow, FUJITSU LABORATORIES LTD.

- Hyper-Nano-Space Design toward Innovative Functionality
  - Kazuyuki KURODA
  - Professor, Faculty of Science and Engineering, Waseda University

- Pioneering Research on Computing Frontiers
  - Koji INOU
  - Professor, Faculty of Information Science and Electrical Engineering, Kyoto University

- The Future of Humans and Interactions
  - Jun REKIMOTO
  - Professor, Faculty of Information Science and Electrical Engineering, Kyoto University

- Fundamental Information Technologies toward Innovative Social System Design
  - Sadao KUROHASHI
  - Professor, Graduate School of Informatics, Kyoto University

- Advanced Materials Informatics through Comprehensive Integration among Theoretical, Experimental, Computational and Data-Centric Sciences
  - Shintaro TSUNEYUKI
  - Professor, School of Science, The University of Tokyo

- Innovational Technical Basis for Cultivation in Cooperation with Information Science
  - Seiichi NINOMIYA
  - Professor, Graduate School of Agricultural and Life Sciences, The University of Tokyo

- Collaborative Mathematics for Real World Issues
  - Hiroshi KOKUBU
  - Professor, Graduate School of Science, Kyoto University

- Design of Information Infrastructure Technologies Harmonized with Societies
  - Hiroto YASUURA
  - Executive Vice President / Professor, Graduate School of Science, Kyoto University

- Advanced Core Technologies for Big Data Integration
  - Masaru KITSUSEGAWA
  - Director General, National Institute of Informatics / Professor, Institute of Industrial Science, The University of Tokyo
  - Etsuya SHIBAYAMA
  - Professor, Information Technology Center, The University of Tokyo

Themes

- Green Innovation
- Life Innovation
- Nanotechnology & Materials
- Information and Communication Technology

As of July 2018
Network-based individual research of ICT young researchers for Individuality Establishment

**Concept**
ACT-I aims to promote ICT area research toward the strategic objectives that is likely to generate new values necessary for scientific and technological innovations.

**Outline**

1. **ICT Young Researches Targeted**
   ACT-I tries to find out and foster creative young researchers who are willing to provide solutions, through innovative imagination, for various challenges that people are facing today or will face tomorrow, and to establish individuality of researchers. This solicitation is limited to people who are under the age of 35 on April 1 in the year of application. We are also looking forward to exciting proposals from graduate students and younger researchers affiliated to companies.

2. **Strong Support Structure for Advancing Research**
   An ACT-I researcher takes responsibility for advancing a research project he or she has proposed within a Research Area led by a Research Supervisor. In advancing the research project, the researcher can gain various types of advice and guidance from the Research Supervisor and Research Area Advisors in Research Area Meeting (Meeting for reading research papers), and in addition, researchers will be strongly supported with Advisor Assignment System.

3. **Research Area Meeting as an Opportunity for Interacting and Networking with People in Other Field**
   Research Area meetings are held twice yearly, researchers can interact with their Research Supervisor, Advisors, and researchers working in other fields of the same Research Area, and form networks that will continue beyond the end of their participation in the ACT-I program.

4. **Support Research Subjects Expected to Achieve Greater as Acceleration Phase**
   After a regular research period, research subjects that can be expected to achieve even greater results will be eligible for a research extension up to 10 million yen per year for up to two years as the acceleration phase.

**Research Framework**

![Diagram showing the research framework](image)

**On-going Research Areas**

<table>
<thead>
<tr>
<th>Research Area</th>
<th>Research Supervisor</th>
<th>First Year</th>
<th>Research Term</th>
<th>Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information and Future</td>
<td>Masataka GOTO (National Institute of Advanced Industrial Science and Technology)</td>
<td>FY2016</td>
<td>2016-2021/2020-2021 Acceleration Phase only</td>
<td>60</td>
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</tbody>
</table>

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July 2018
Virtual Laboratory Integrating Researches in AIP Project
Laboratory Director: Katsumi EMURA (Executive Vice President, CTO and Member of the Board, NEC Corporation)

Concept

As a research organization executing the AIP Project* supported by MEXT, JST promotes unique research activities leading to new innovations utilizing the framework of our Strategic Basic Research Programs. We combine multiple research areas to build a virtual laboratory (i.e. a network laboratory) and unlock the potential of the AIP Project by closely collaborating with RIKEN.

* The AIP (Advanced Integrated Intelligence Platform) Project is an initiative leveraging innovative AI technologies to conduct integrated research and development activities on big data, IoT, and cyber security. The project is executed by JST and RIKEN.

Outline

1 Integration of Research Areas
   AIP Network Lab is to fund prominent researchers to support innovative research projects and to maximize the outcome in the strategic basic research program. It also promotes joint researches across research areas in a wide range of research phases, including topic selection and research promotion.

2 Integrated Operation with RIKEN
   AIP Network Lab actively shares research results and researchers with RIKEN AIP Center to enable consistent research and development activities from basic research to real-world applications.

3 Direction of Laboratory
   1. Find and support innovative frontier researches in AI related areas and demonstrate their presences.
   2. Actively disseminate research results internationally and contribute to the progress of AI related research areas.
   3. Support collaborative research within the AIP Network Lab. and create new value.
   4. Work on the entire lab to develop and educate young researchers.

Research Areas incorporated in the AIP Network Laboratory (FY2018)

<table>
<thead>
<tr>
<th>Program</th>
<th>Research Area</th>
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<tbody>
<tr>
<td>CREST</td>
<td>Advanced Core Technologies for Big Data Integration</td>
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<tr>
<td>CREST</td>
<td>Advanced Application Technologies to Boost Big Data Utilization for Multiple-Field Scientific Discovery and Social Problem Solving</td>
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<tr>
<td>CREST</td>
<td>Intelligent Information Processing Systems Creating Co-Experience Knowledge and Wisdom with Human-Machine Harmonious Collaboration</td>
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<tr>
<td>CREST</td>
<td>Development and Integration of Artificial Intelligence Technologies for Innovation Acceleration</td>
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<tr>
<td>CREST</td>
<td>Symbiotic Interaction: Creation and Development of Core Technologies Interfacing Human and Information Environments</td>
</tr>
<tr>
<td>PRESTO</td>
<td>Advanced Core Technologies for Big Data Integration</td>
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<tr>
<td>PRESTO</td>
<td>Design of Information Infrastructure Technologies Harmonized with Societies</td>
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<td>PRESTO</td>
<td>Fundamental Information Technologies toward Innovative Social System Design</td>
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<tr>
<td>PRESTO</td>
<td>The Future of Humans and Interactions</td>
</tr>
<tr>
<td>ACT-I</td>
<td>Information and Future</td>
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</tbody>
</table>
Outstanding research leaders strive to generate the seeds of breakthrough new technologies

**Concept**

To form a headstream of science and technology, and ultimately contribute to innovation in science and technology that will change society and the economy in the future.

**Outline**

1. **Flexible and Functional Organization**
   In the ERATO program, in order to promote a creative and challenging research project, “a Virtual Research Institute” is organized under the leadership of a Research Director, and cooperatively managed by JST and a research institute. This “JST-Institute Collaboration Framework,” a different scheme from typical contract based research, will be newly established for the ERATO program.

2. **Research Group without Boundaries**
   In order to drive the research project efficiently, researchers and research administrators work at a research base together with the Research Director. The project team consists of several research groups and the Project Headquarters office for the research administration work.

3. **Research Bases Independent from the Existing Facilities**
   ERATO builds new research bases for research projects, meaning that each Research Director establishes and operates a new research facility independent from the existing one.

4. **Making the Best Possible Use of the Research Period**
   In order to best utilize the unique features of the ERATO program and maximize the breakthrough discoveries and innovations from each project, the program is allowing the first fiscal year for a project setup before the official start of the project. Also, special extension periods can be provided (generally one year) for exceptional projects after their research term.

**Research Framework**

- Establish new research bases
- A virtual office established cooperatively by a research institute and JST
- Flexible support by the Collaboration Framework
- Application for intellectual property rights
- Planning and holding of symposiums, etc.
- Design of research plans
- Support technology transfer of research results
- Outreach activities, etc.

**Encounters with researchers from various fields**

- Brought together in an ERATO project for a limited time
- Research Institutes
- JST

**Department of Research Project**

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## On-going Research Projects

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Research Director</th>
<th>Research Term</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MIZUSHIMA Intracellular Degradation</strong></td>
<td>Noboru MIZUSHIMA, Professor, Graduate School of Medicine, The University of Tokyo</td>
<td>2016-2021</td>
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<tr>
<td><strong>NUMATA Organellar Reaction Cluster</strong></td>
<td>Keiji NUMATA, Team Leader, RIKEN Center for Sustainable Resource Science</td>
<td>2016-2021</td>
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<tr>
<td><strong>NOMURA Microbial Community Control</strong></td>
<td>Nobuhiko NOMURA, Professor, Faculty of Life and Environmental Sciences, University of Tsukuba</td>
<td>2016-2021</td>
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<tr>
<td><strong>SATO Live Bio-Forecasting</strong></td>
<td>Thomas N. SATO, Director, The Thomas N. Sato BioMEC-X Laboratories, Advanced Telecommunications Research Institute International (ATR)</td>
<td>2016-2021</td>
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<tr>
<td><strong>TOUHARA Chemosensory Signal</strong></td>
<td>Kazushige TOUHARA, Professor, Graduate School of Agricultural and Life Sciences, The University of Tokyo</td>
<td>2016-2021</td>
</tr>
<tr>
<td><strong>NAKAMURA Macroscopic Quantum Machines</strong></td>
<td>Yasunobu NAKAMURA, Professor, Research Center for Advanced Science and Technology, The University of Tokyo</td>
<td>2016-2021</td>
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<tr>
<td><strong>YAMAMOTO Atom Hybrid</strong></td>
<td>Kimihisa YAMAMOTO, Professor, Institute of Innovative Research, Tokyo Institute of Technology</td>
<td>2016-2021</td>
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<tr>
<td><strong>SAITO Spin Quantum Rectification</strong></td>
<td>Elji SAITO, Professor, Graduate School of Engineering, The University of Tokyo</td>
<td>2016-2021</td>
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<tr>
<td><strong>MOMOSE Quantum Beam Phase Imaging</strong></td>
<td>Atsushi MOMOSE, Professor, Institute of Multidisciplinary Research for Advanced Materials, Tohoku University</td>
<td>2016-2021</td>
</tr>
<tr>
<td><strong>ADACHI Molecular Exciton Engineering</strong></td>
<td>Chihaya ADACHI, Professor / Director, Center for Organic Photonics and Electronics Research, Kyushu University</td>
<td>2016-2021</td>
</tr>
<tr>
<td><strong>ISOBE Degenerate n-Integration</strong></td>
<td>Hiroki ISOBE, Professor, Department of Chemistry, The University of Tokyo</td>
<td>2016-2021</td>
</tr>
<tr>
<td><strong>ITAMI Molecular Nanocarbon</strong></td>
<td>Kenichiro ITAMI, Professor, Graduate School of Science, Nagoya University / Director, WPI-ITbM, Nagoya University</td>
<td>2016-2021</td>
</tr>
<tr>
<td><strong>MINOSHIMA Intelligent Optical Synthesizer</strong></td>
<td>Kooru MINOSHIMA, Professor, Graduate School of Informatics and Engineering, The University of Electro-Communications</td>
<td>2016-2021</td>
</tr>
<tr>
<td><strong>INAMI JIZAI Body</strong></td>
<td>Masahiko INAMI, Professor, Research Center for Advanced Science and Technology, The University of Tokyo</td>
<td>2016-2021</td>
</tr>
<tr>
<td><strong>HASUO Metamathematics for Systems Design</strong></td>
<td>Ichiro HASUO, Associate Professor, Information Systems Architecture Science Research Division, National Institute of Informatics</td>
<td>2016-2021</td>
</tr>
<tr>
<td><strong>KAWAHARA Universal Information Network</strong></td>
<td>Yoshihiro KAWAHARA, Associate Professor, Graduate School of Information Science and Technology, The University of Tokyo</td>
<td>2016-2021</td>
</tr>
<tr>
<td><strong>ISHIGURO Symbiotic Human-Robot Interaction</strong></td>
<td>Hiroshi ISHIGURO, Professor, Graduate School of Engineering Science, Osaka University / Director (sitting), Hiroshi Ishiguro Laboratory, ATR</td>
<td>2016-2021</td>
</tr>
<tr>
<td><strong>KAWARABAYASHI Large Graph</strong></td>
<td>Ken-ichi KAWARABAYASHI, Professor, Principles of Informatics Research Division, National Institute of Informatics</td>
<td>2016-2021</td>
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</tbody>
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Life Innovation, Nanotechnology & Materials, Information and Communication Technology, Math & Mathematical Science & Computer Science

*As of April 2018*
A low carbon society can be created by implementing ALCA game-changing technologies.

**Concept**

ALCA is aiming at creating a low carbon society by the development of game-changing technologies limiting the CO₂ generation through energy creation, storage and carbon neutral initiatives and reducing the CO₂ emissions through energy efficient technologies.

**Outline**

- Identifying and promoting the game-changing R&D subjects
- Diversifying with the small-starts funds and prioritizing with the stage-gate evaluation
- Shifting to the enabling technology phase toward the efficient collaboration among the industry, university, and government
- Having the common R&D goal and integrating the technologies toward the creation of the low carbon technology

**Layered Structure of ALCA Technology Areas**

- Energy Storage
  - Next Gen. Battery
  - Electric Storage Devices
- White Biotech.
- Effective Biomass Materials with Bioresource Tech.
- Biomass-Based Chemicals and Polymers
- Development of Highly Efficient Carbon-Circulation Chemical System
- Next-Generation Smart Community
- Energy Generation
  - Photom management and optical engineering
- Chemical Processes
- Biotech.
- Low Carbon Society

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www.jst.go.jp/alca/en/ alca@jst.go.jp
ALCA is aiming at creating a low carbon society by the development of game-changing technologies. A low carbon society can be created by implementing ALCA carbon technology university, and government neutral initiatives and reducing the CO2 emissions through energy efficient technologies.

**Layered Strucure of ALCA Technology Areas**

- **Concept**
  - Shifting to the enabling technology phase toward the efficient collaboration among the industry,
  - Diversifying with the small-starts funds and prioritizing with the stage-gate evaluation
  - Identifying and promoting the game-changing R&D subjects

- **Next Gen. Devices**
  - Batteries
  - White Biotech.
  - Limiting CO2 Generation
  - Effective Biomass Materials
  - with Bioresource Tech.
  - Biotech.
  - Carbon Neutral
  - Biomass-Based
  - Chemicals and Polymers
  - Chemicals
  - Processes
  - High-Quality and Large-Diameter GaN Wafers
  - Next Generation Batteries
  - Ultra Heat-Resistant Materials and Polymers
  - Innovative Light-Weight Materials for the Forward Energy-Saving Society
  - Next-Generation Smart Community
  - Highly Efficient Production Process for Biomass-Based Chemicals and Polymers
  - Production of Effective Biomass Materials with Bioresource Technology
  - Development of Advanced Industrial Electricity Equipment for High-Efficiency Energy Equipment Systems
  - Waste-heat Recovery Technology
  - Photon Management and Optical Engineering
  - Development of Highly Efficient Carbon-Circulation Chemical System

**Top Down Proposal Technology Area**

- T1 Next Generation Batteries
- T2 White Biotechnology

**Game-Changing Technology Area**

- G1 Solar Cell and Solar Energy Systems
- G2 Superconducting Systems
- G3 Electric Storage Devices
- G4 Ultra Heat-Resistant Materials and Polymers
- G5 Biotechnology
- G6 Innovative Energy-Saving and Energy-Producing Chemical Processes
- G7 Innovative Energy-Saving and Energy-Producing Systems and Devices

**Enabling Technology Project**

- E1 High-Quality and Large-Diameter GaN Wafer
- E2 Superconducting Electric Power Equipment using Liquid Hydrogen Cooling
- E3 New Heat Resistant Materials for Low CO2 Emission Type Next-Generation Thermal Electric Power Generation
- E4 Innovative Light-Weight Materials for the Forward Energy-Saving Society
- E5 Next-Generation Smart Community
- E6 Highly Efficient Production Process for Biomass-Based Chemicals and Polymers
- E7 Production of Effective Biomass Materials with Bioresource Technology
- E8 Development of Advanced Industrial Electricity Equipment for High-Efficiency Energy Equipment Systems
- E9 Waste-heat Recovery Technology
- E10 Photon Management and Optical Engineering
- E11 Development of Highly Efficient Carbon-Circulation Chemical System

**Advance Work on R&D Projects and Provide Overall Project Management**

**Stage Gate Evaluation in ALCA**

- Selection
- Stage Gate Evaluation
- Stage Gate Evaluation
- Stage Gate Evaluation

**Reducing CO2 Emissions**

- Waste-Heat Recovery Technology
- High-Quality and Large-Diameter GaN Wafers
- Heat Resistant Materials for Next-Gen. Thermal Power Plants
- Light-Weight Materials
- SC Electric Power Equipment using Liq.H Cooling
- Development of Advanced Industrial Electricity Equipment for High-Efficiency Energy Equipment Systems

**Integration**

- Start with small funds in the earlier stage
- Prioritizing on the basis of the stage gate evaluation

*SC: Superconducting*
Promoting R&D Focus Areas and programs for the innovative solutions to the issues which human society confronts.

### Concept

RISTEX aims to produce practical wisdom and methods which will lead to solutions to the social problems through Trans-disciplinary researches, which is carried out by researchers from various fields, practitioners, and other stakeholders. In addition to the R&D projects, RISTEX runs programs to support implementation and outspread of the R&D results into society.

### Outline

1. **Identifying Social Problems to Address and Establishing R&D Focus Areas**
   
   Social problems are researched and analyzed, and R&D Focus Areas for which R&D activities can be expected to produce concrete results thought to have social and public significance are established.

2. **Promoting R&D**
   
   To achieve the objectives for each R&D Focus Area, each Program Supervisor cooperates with the Program Advisors to solicit and select R&D project proposals and promote R&D with strong leadership and management.

3. **Supporting the Implementation of “Science and Technology for Society” R&D Results**
   
   To give value back to society, RISTEX supports initiatives aiming to implement R&D results that will contribute to the resolution of social problems.

4. **Establishing the Foundation for Cooperation and Coordination for Solving Social Problems**
   
   RISTEX connects various people working to solve social problems and builds human networks to construct a collaborative foundation for identifying and solving problems.

### Research Framework

Research team

- University researchers
- Government
- Various public organizations
- Industry
- NPO etc.

Joint effort by researchers and stakeholders including those working on solutions to the problems.

Solicitation and selection of R&D project proposals

Program Supervisor
Person Responsible for Area management

Program Advisors
Specialist advising the Program Supervisor

R&D Project

Society
On-going Research Areas (as of July 2018)
Accelerated Innovation Research Initiative Turning Top Science and Ideas into High-Impact Values

**Concept**
ACCEL aims to set a path to the next phase, such as company R&D, venture start-up and other public funding, based on the outputs of the Strategic Basic Research Programs (CREST, PRESTO, ERATO, etc.) that have the potential to be world-leading but cannot be continued by companies and other organizations due to their perceived risks. The Program Manager (PM) leads research and development with the innovation requirements and goals, demonstrating Proof of Concept (POC) and promoting the appropriate rights arrangements.

**Outline**
- Management structure led by the PM
- Development and provision of Proof of Concept (POC)
- Appropriate rights arrangement

**R&D Framework**

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### Research and Development Projects

<table>
<thead>
<tr>
<th>Status</th>
<th>R&amp;D Project Name</th>
<th>Research Director</th>
<th>Program Manager</th>
<th>Projects Selected</th>
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</thead>
<tbody>
<tr>
<td>Conformal Bioimager</td>
<td>Takao SOMEYA, Professor, School of Engineering, The University of Tokyo</td>
<td>Yorihide MATSUMI, AOEEL Program Manager, JST</td>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>Terahertz optical science and technology in semiconductors</td>
<td>Kokihiro TANAKA, Professor, Faculty of Science, Kyoto University</td>
<td>Ryoichi FUKASAWA, AOEEL Program Manager, JST</td>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>Application field development of Dynamic intelligent systems by using high speed vision</td>
<td>Masatoshi SHIKAWA, Professor, Graduate School of Information Science and Technology, The University of Tokyo</td>
<td>Norimasa KISHI, AOEEL Program Manager, JST</td>
<td>2016</td>
<td></td>
</tr>
<tr>
<td>Building Foundations and Developing Applications for Next-Generation Media Content Ecosystem Technologies</td>
<td>Masataka GOTO, Prima Senior Researcher, National Institute of Advanced Industrial Science and Technology (AIST)</td>
<td>Hiroyuki ITOH, AOEEL Program Manager, JST</td>
<td>2016</td>
<td></td>
</tr>
<tr>
<td>Development of high-resolution LIDAR system based on slow-light structures</td>
<td>Toshihiko BABA, Professor, School of Engineering, Yokohama National University</td>
<td>Kohroh KOBAYASHI, AOEEL Program Manager, JST</td>
<td>2016</td>
<td></td>
</tr>
<tr>
<td>Creation of the Functional Materials on the Basis of the Inter-Element-Fusion Strategy and Their Innovative Applications</td>
<td>Hiroshi KITAGAWA, Professor, Graduate School of Sciences, Kyushu University</td>
<td>Akihito OKABE, AOEEL Program Manager, JST</td>
<td>2015</td>
<td></td>
</tr>
<tr>
<td>Realization and development of innovative processing system and application using near-field coupling integration technology</td>
<td>Tadahiro KURODA, Professor, Faculty of Science and Technology, Keio University</td>
<td>Seiichiro KAWAMURA, AOEEL Program Manager, JST</td>
<td>2015</td>
<td></td>
</tr>
<tr>
<td>Reinforcement of Resiliency of Concentrated Polymer Brushes and Its Tribological Applications — Development of Novel “Soft and Resilient Tribology (SRT)” System</td>
<td>Yoshinobu TSUJI, Director / Professor, Institute for Chemical Research, Kyoto University</td>
<td>Kimihito MATSUKAWA, AOEEL Program Manager, JST</td>
<td>2015</td>
<td></td>
</tr>
<tr>
<td>Development of Key Chemical Processes of Extremely High Efficiency with Super-Performance Heterogeneous Catalysts</td>
<td>Yasuhiro KUZUMI, Professor, Institute for Moleculer Science, National Institutes of Natural Sciences</td>
<td>Toshikazu MASE, AOEEL Program Manager, JST</td>
<td>2014</td>
<td></td>
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<tr>
<td>Fundamentals and Applications of Diamond Electrodes</td>
<td>Yasuaki ENAGA, Professor, Faculty of Science and Technology, Keio University</td>
<td>Nobuhiro TSUKAHARA, AOEEL Program Manager, JST</td>
<td>2014</td>
<td></td>
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<tr>
<td>Molecular Basis of Symbiotic Networks and its Application</td>
<td>Masayoshi KAWAGUCHI, Professor, National Institute for Basic Biology, National Institutes of Natural Sciences</td>
<td>Masanori SAITO, AOEEL Program Manager, JST</td>
<td>2014</td>
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<tr>
<td>Embodied Media Technology based on Haptic Primary Colors</td>
<td>Susumu TACHI, Professor Emeritus, The University of Tokyo</td>
<td>Junji NOMURA, AOEEL Program Manager, JST</td>
<td>2014</td>
<td></td>
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<tr>
<td>Development of Flexible Nitride Semiconductor Devices with PSD</td>
<td>Hiroshi FUJIIKA, Professor, Institute of Industrial Science, The University of Tokyo</td>
<td>Akira USUI, AOEEL Program Manager, JST</td>
<td>2014</td>
<td></td>
</tr>
<tr>
<td>Three-Dimensional Integrated Circuits Technology Based on Vertical BC-MOSFETS and Its Advanced Application Exploration</td>
<td>Tetsuo ENDOH, Director of Center for Innovative Integrated Electronic Systems, Professor, Graduate School of Engineering, Tohoku University</td>
<td>Toru MASAOKA, AOEEL Program Manager, JST</td>
<td>2013</td>
<td></td>
</tr>
<tr>
<td>Innovative Molecular Structure Analysis based on Self-Assembly Technology</td>
<td>Makoto FUJITA, Professor, School of Engineering, The University of Tokyo Distinguished Professor, Institute for Molecular Science (IMS), National Institutes of Natural Sciences</td>
<td>Atsu EZAKI, AOEEL Program Manager, JST</td>
<td>2013</td>
<td></td>
</tr>
<tr>
<td>The Nanospace Science of PCP for Molecular Control</td>
<td>Susumu KITAGAWA, Director / Distinguished Professor, Institute for Integrated Cell-Material Sciences (ICMS), Kyoto University</td>
<td>Takahito YAMAMOTO, AOEEL Program Manager, JST</td>
<td>2013</td>
<td></td>
</tr>
<tr>
<td>“Photonic Crystal Surface-Emitting Semiconductor Laser” - Towards Realization of High Power and High Brightness Operation</td>
<td>Susumu NODA, Professor, Graduate School of Engineering, Kyoto University</td>
<td>Shipponori YAGI, AOEEL Program Manager, JST</td>
<td>2013</td>
<td></td>
</tr>
<tr>
<td>Materials Science and Application of Electrides</td>
<td>Hideo HOSONO, Professor, Laboratory for Materials and Structures, Institute of Innovative Research, Director, Materials Research Center for Element Strategy, Toyo Institute of Technology</td>
<td>Toshinari YOKOYAMA, AOEEL Program Manager, JST</td>
<td>2013</td>
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</tbody>
</table>

The projects selected in FY2017 are implemented as ACCEL in the JST-MIRAI R&D Program. As of July 2018.

Each affiliation in the completed R&D projects is as of March 2018.
Feature of Strategic Basic Research Programs

In Strategic Basic Research Programs, the Research Area is designated together with a Research Supervisor. To maximize the output of Strategic Basic Research Programs, in accordance with the characteristics of each Research Area, extensive management is implemented and organized, including outreach activities, Progress support, fusion of multidisciplinary fields, international collaboration, social implementation or practical development, and human resource development.

In accordance with the characteristics of each Research Area / issue, extensive management is implemented and organized

- Symposia
- Open seminar for young researchers
- Joint events with academic conference
- Press releases
- Newsletter publications
- Publication of feature articles in academic journal
- Joint meeting across multiple Research Areas
- Networking meetings / seminars
- Supplementary support for integrated researches
- Appointing Industry backgrounded Advisers
- Evaluation based on technical readiness level (TRL)
- Patenting support
- New Technology Presentation Meeting
- Strengthening cooperation with companies
- Bridging to various technology transfer funding programs
- Research Area meetings
- Site visits
- Monthly / Quarterly / half-yearly progress report
- Support for life-events
- Appointing international Advisers
- Cooperation with overseas FA
- Cooperation with JST international collaboration funding program (SICORP)
- Joint symposium with various overseas organizations
- Invitation and dispatch of researchers
- Award system
- Researcher networking events
- Overseas dispatch training
- Young researcher camp
- SciPoS program
International Evaluation of Strategic Basic Research Program

The 3rd International Evaluation of Strategic Basic Research Program

Overview of International Evaluation

The Strategic Basic Research Programs have undergone two international evaluations of the program operation and research outcomes during the mid-term plan period, once per 5 years, in order to reflect the evaluation results in the management of the operation from an international perspective by the evaluation committee comprised of experts from Japan and abroad. So far, the first evaluation was held in 2006 and the second in 2011, and the third international evaluation held in January 2016, focused mainly on the five year period (FY2011-2015) of CREST, PRESTO, ERATO, ACCEL, and ACT-C programs, evaluated the overall Strategic Basic Research Programs based on the initiatives for promoting target-oriented basic research, their results and ripple effects and sought advice and proposals for initiatives that serve the creation of science, technology and innovation and thus JST must take on going forward.

Strategic Basic Research Programs Characteristics

Strategic Basic Research Programs Characteristics were evaluated mainly as described below.

Strategic Basic Research Program contributes to the creation of innovation in science and technology by effectively advancing basic research through the construction of virtual-network based research institutes in order to achieve the strategic objectives established by the national government.

By the promotion of strategic basic research, the program has led to world-leading achievements, has produced numerous nascent technologies and some of them reached practical application.

The program has also produced many globally competent research leaders.

Summary of Evaluation Results

Overall, Strategic Basic Research Programs were evaluated as earning high marks for its significant contribution to the creation of innovation in science and technology. Going forward, Strategic Basic Research Programs are strongly expected to continue and expand to develop science and technology in Japan.

List of Members

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Toshiyuki NAKATA Professor, The University of Tokyo
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Matthias KLEINER President, the Leibniz Association (JST Operation Committee member, Former President of DFG)
Edison T. LIU President and CEO, The Jackson Laboratory (Former President of Human Genome Organization (HUGO))

All affiliations are as of January 2016.
Strategic Basic Research Programs
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