STI System in Japan and Activities of JST

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Executive Director,
Japan Science and Technology Agency (JST)
Outline

1. Science, Technology and Innovation (STI) System in Japan
2. Overview of JST
3. JST’s activities for accelerating Industry-Academia collaboration
1. STI system in Japan
Japan’s STI Administration

The Role of CSTI

1. Investigation and deliberation on basic policy relating to S&T
2. Investigation and deliberation concerning the policy for allocation of S&T related budget, human resources, etc.
3. Evaluation of nationally important R&D

CSTI is in charge of two multidiscipline cross-ministry research programs - SIP and ImPACT. Innovative research outcomes are highly expected through these programs.
Japan’s STI Administration

Cabinet Office (CSTI)

Policy

Ministry of Education, Culture, Sports, S&T (MEXT)
- Budget
- Universities

Ministry of Economy, Trade, Industry and Tourism (METI)
- Support
- Companies

Other Ministries
- Budget

National R&D Agencies
- Japan Science and Technology Agency (JST)
- National Institute for Material Sciences (NIMS)
- RIKEN etc.

Independent Administrative Institutes
- Japan Society for the Promotion of Science (JSPS)

National R&D Agencies
- New Energy and Industrial Technology Development Organization (NEDO)
- National Institute of Advanced Industrial Science and Technology (AIST) etc.

National R&D Agencies and Independent Administrative Institutes

Source
Ministries and Major Funding Agencies

Thematic funding

Universities
R & D institutions
Private sector

Other Ministries
AMED Medical Research
SIP, ImPACT

AMED= Japan Agency for Medical Research and Development
## Major Funding Agencies in Japan

<table>
<thead>
<tr>
<th>Agency</th>
<th>Funding (USD)</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>JSPS</td>
<td>3.10 Billion</td>
<td>Fostering young researchers and awarding Grants-in-Aid for scientific research</td>
<td><a href="http://www.hitsujigaoka.jp/amusements/clark.html">Source</a></td>
</tr>
<tr>
<td>JST</td>
<td>1.01 Billion</td>
<td>Responsible for implementing S&amp;T policies in Japan</td>
<td><a href="http://www.nikken.co.jp/ja/news/2013/20131128.html">Source</a></td>
</tr>
<tr>
<td>AMED</td>
<td>1.26 Billion</td>
<td>Engaging in R&amp;D in the field of medicine and providing funding</td>
<td><a href="http://www.nedo.go.jp/introducing/edf1.html">Source</a></td>
</tr>
<tr>
<td>NEDO</td>
<td>1.30 Billion</td>
<td>Playing an important part in Japan's economic and industrial policies</td>
<td><a href="http://www.nedo.go.jp/introducing/edf1.html">Source</a></td>
</tr>
</tbody>
</table>

1 USD = 100 Yen
The Science and Technology Basic Plan

The 1st Basic Plan (FY1996～2000)
- Total Budget: 170 Billion USD
- Construction of new R&D system

The 2nd Basic Plan (FY2001～2005)
- Total budget: 240 Billion USD

The 3rd Basic Plan (FY2006～2010)
- Total budget: 250 Billion USD
- Promotion of R&D in prioritized areas

The 4th Science and Technology Basic Plan (FY2011～2015)
- Total budget: 250 Billion USD
- Promotion of R&D to address societal and economical issues

The 5th S&T Basic Plan (FY2016～2020)
- Total budget: 260 Billion USD
- Towards the most innovative global nation

1 USD = 100 Yen
Pillars of the 5th S&T Basic Plan

- Development of future industry and social reform
- Addressing of economic and social challenges
- Reinforcing fundamentals of STI
- Linking of human resources, knowledge and capital for innovation
- Science and technology diplomacy
2. JST’s overview
Overview of JST

JST is one of the major funding agencies responsible for the implementation of science and technology policy in Japan.

Total Operating Expenses in FY2016: **1.19 Billion USD**
(Grants from Government: **1.01 Billion USD**)

Number of Permanent Staff: **1,227** (including about 200 Ph. D.)

Primary Functions:
- Establishing R&D Strategies
- R&D Funding
- Building S&T Infrastructure
- Fostering Next-Generation Scientists
- Promoting Science Communication

1 USD = 100 Yen
JST’s Mission

Mission Promoting Science and Technology Innovation

- Promoting Game-Changing Innovation leading to future society
- Enhancing Japan’s S&T base through nurturing R&D personnel
- Establishing an ecosystem to allow continuous S&T innovation
President’s Initiative for the Reform of JST

HAMAGUCHI Plan:
Challenge for Change!

1. Advanced network-based research institute
2. Visionary R&D strategies for co-creating the future with the society
3. Cultivating human resources who can create the future
4. Promoting the regional revitalization
5. More effective & efficient business implementation

President of JST
Michinari Hamaguchi
JST’s Program and Infrastructure

R&D Program

- Basic Research Programs
- Industry-Academia Collaboration Programs
- International Collaboration Programs

Infrastructure for STI

- Scientific Information Dissemination
- Promoting Science Education
- Science Communication

Promoting S&T Innovation
JST’s Breakthroughs

All of these breakthroughs were based on the research outcomes of JST’s funding programs!

iPS Cells

The Nobel Prize in Physiology or Medicine 2012

Awarded to Prof. Yamanaka

Blue LED

The Nobel prize in physics 2014

Awarded to Prof. Akasaki, Prof. Amano and Prof. Nakamura
3. JST’s activities for accelerating Industry-Academia collaborations
Industry-Academia Collaboration in JST

JST’s Budget and Support

- Strategic Basic Research Programs: 27%
- Fy2016 Budget: 53%
- Industry-Academia Collaboration Programs: 20%

(a) Matching Support
(b) R&D Support
(c) IP Support
The Center of Innovation (COI) Program

Mission
Promoting challenging and high-risk R&D to realize our visions for ideal society in the next 10 years.

Vision 1: Smart Life Care, Ageless Society
Vision 2: Smart Japan
Vision 3: Active Sustainability

COI Site
Back casting

R&D budgets for one site:
1 ~ 10 million USD/year
Period: Up to 9 years

1 USD = 100 Yen
Examples of COI Sites

Center of Open Innovation Network for Smart Lifecare
Kawasaki Institute of Industry Promotion

Innovative Food & Healthcare MASTER
Hokkaido University / Hitachi, Ltd.

The Last 5X Innovation R&D Center for a Smart, Happy, and Resilient Society
Kyoto University / Panasonic Corporation

Global Aqua Innovation Center for Improving Living Standards and Water Sustainability
Shinshu University / Hitachi Infrastructure Systems Company
18 COI Sites in Japan

- 【V1】Hirosaki University
- 【V3】Yamagata University
- 【V3】Shinshu University
- 【V3】Kanazawa Institute of Technology
- 【V1】Hokkaido University
- 【V1】Tohoku University
- 【V1】The University of Tokyo
- 【V3】The University of Tokyo
- 【V2】Tokyo University of the Arts
- 【V2】Tokyo Institute of Technology
- 【V1】Kawasaki Institute of Industry Promotion
- 【V1】Kyoto University
- 【V3】Nagoya University
- 【V3】Keio University
- 【V2】Osaka University
- 【V3】Kyusyu University
- 【V1】Ritsumeikan University

Japan Science and Technology Agency
Management Style of COI

The **visionary team** is responsible for managing each COI site. Three experts from industry including one visionary leader are assigned for each vision.

**Activities of visionary team**
- Setting each year’s milestone and carrying out thorough management for each site
- Visiting all COI sites (more than 100 visits in a year)
- Focusing only on innovative technology, not on existing technologies
- Facilitating collaboration among COI sites

**Visionary Team**

**Vision1**
- Visionary Leader
- Visionary Team Member
- Visionary Team Member

**Vision2**
- Visionary Leader
- Visionary Team Member
- Visionary Team Member

**Vision3**
- Visionary Leader
- Visionary Team Member
- Visionary Team Member

5 Research Advisors from industries and academia
Outcomes of COI Program

Cloned Reproduction of the Cultural Property

Displayed in this year’s G7 summit held in Iseshima, Japan

The wall paintings of the Golden Hall of Horyuji Temple (Nara)

The Bamiyan Wall Painting
Outcomes of COI Program

Developing precision maps and positioning technology accurate to 10 centimeters

The world’s thinnest printed electronic circuit on a one-micron plastic film
Super Cluster Program

**Mission**

Forming a globally competitive Super Cluster through wide-range collaboration in order to create innovation with high-impact in our country

- Construction of Highly-Efficient Energy to Achieve a Clean and Low Environmental Impact Society (Kyoto Area)
- Energy Innovation Cluster With Advanced Nano-Tools (Aichi Area)

**Subjects**

Source: [www.astf.or.jp](http://www.astf.or.jp)

Source: [www.astem.or.jp/about/profile](http://www.astem.or.jp/about/profile)

Japan Science and Technology Agency
Outcomes and Future Application

Outcomes

An environmentally-friendly, user-friendly, integrated PV + V2X + Lithium-ion battery solution

Future Potential Application

Ultra Small and High Efficient Energy Management System (HEMS/BEMS/FEMS)

The World’s First Drive System using a Magnet-Less Motor Driven by Silicon Carbide Based Inverter

Rare Earth Free and Magnet-Less Ultra Small Motor Driven System for Electric Vehicle
Program for Revitalization Promotion

Mission

Commercialize research seeds of universities with companies located in disaster-hit areas (mainly Tohoku) to revitalize the region

Academy-Industry Coordinators (hereinafter referred to as **Matching planners (MPs)**) who have lots of experience and knowledge in technology transfer are assigned to Tohoku region.
Program for Revitalization Promotion

**Whole picture of the program**

MP grasps local company’s technological challenges.

MP matches company’s needs and research seeds of universities.

Submit research proposal.

Funding for joint research:
- Max 200,000 USD/year
- 1~3 years

Commercialization Employment Creation in Tohoku

1 USD = 100 Yen
Outcomes of Program

Tamamushi (jewel beetle) lacquerware (Tohoku Kogei Co., Ltd.)

- Aimed at creating a lacquerware coating with clay-based film ‘CLAIST’ that fulfils the strength and long-term durability requisites for daily use.
- Selected as one of the gifts presented from Sendai Mayor to officers participating in G7 Finance Ministers and Central Bank Governors’ Meeting.

Japanese SOBA noodle (Kawaki Corporation)

- Fresh noodle with a 10-day expiration date (Usually 3 days)
- Additive-free (No alcohol/No Preservative)
- Natural flavor and Rich taste
- Awarded the highest prize in food contests in Ministry of Agriculture, Forestry and Fisheries. Won three other prizes.
Outcomes of Program

R&D for keeping seafood fresh with Slurry Ice (Kamaishi Hikari Foods Corporation)

- Slurry Ice is a liquid-like ice composed of ice particles and salt water → Salinity Control 1% → Hard freeze
- Rapid Cooling/ Gentle to Fish Body / Improve workability
Kyosou (共創) Program

Mission
Bolster Japanese industrial competitiveness by tackling common technical issues in industry

Program Officer
(proposer of the theme)

Industry

Academia

Utilize research results

Forum for collaboration and innovation
※Sharing achievements of the research

Strengthen industrial competitiveness

Activation of basic research

Construction of basic technologies for solving technical issues common in industry

Applicants
Researchers in academia

R&D Budget
300,000 USD / project / year

1 USD = 100 Yen

R&D Period
2~5 years per project

Number of projects
Program Officer adopts up to 10 projects per each theme.
Kyosou (共創) Program

- R&D themes are selected based on requests from industry and each theme continues for up to 10 years.

- 5 themes have been established from 2010 to 2012 and new themes are currently being established.

- Research projects are continuously replaced in the same theme.
Technology Themes

Themes in 2010:

**Heterogeneous Structure Control**
Towards Innovative Development of Metallic Structural Materials

**Terahertz-wave**
Towards Innovative Development of Terahertz-wave technologies and Application

Themes in 2011:

**In vivo Molecular Imaging**
Towards Bio Photonics Innovations in Medicine

**High Performance Magnets**
Towards Innovative Development of Next Generation Magnets
Technology Themes

Theme in 2012:

**Marine Product Processing Supply Chain**

Theme in 2015:

**Compact Neutron Source**
Towards Development of Key Technologies for Industrial Application

Theme in 2016:

**High Performance of Ceramics and Manufacturing Process**
Examples of Outcomes

Heterogeneous Structure Control

Establishing the method for joining Cast Iron and Stainless Steel using Friction Stir Welding

Research Accomplishment

- Making higher strength junction
- Realizing the price reduction of rolling tool based on the industrial demand

Expectation and Impact

Application to Automotive Lightening

Terahertz-wave

Realizing Super Small and High Efficient Room Temperature Terahertz Oscillator

Research Accomplishment

Accomplishing 1.92 THz oscillation which is the world highest performance as a single room temperature electronic device.

Expectation and Impact

Application to High-Capacity Wireless Communication
Joint Research Situation with Industry in Finished Projects

27 out of 29 finished projects (93%) led to joint research with companies.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Number of finished projects</th>
<th>Number of projects leading to joint research</th>
<th>Collaborating companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heterogeneous Structure Control</td>
<td>11</td>
<td>11</td>
<td>Iron and Steel Companies, Automobile Companies</td>
</tr>
<tr>
<td>Terahertz-wave</td>
<td>12</td>
<td>11</td>
<td>Automobile Component Companies</td>
</tr>
<tr>
<td>High Performance Magnets</td>
<td>4</td>
<td>3</td>
<td>Electronics, Material Companies</td>
</tr>
<tr>
<td>Molecular Imaging</td>
<td>2</td>
<td>2</td>
<td>Medicine, Chemical, Cosmetic Companies</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>27</td>
<td></td>
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As of March 31, 2016
Thank you very much for your kind attention!