

## Chapter 6 Deepening the Relationship between STI and Society

In order to respond to social changes and economic/social challenges in the future, we need dialogue and collaboration with diverse stakeholders. To this end, the government, universities, public research institutions, science museums will play central roles in developing co-creation platforms and promoting efforts to ensure the public nature of research.

### Section 1 Promoting Co-creative STI

#### 1 Dialogue and collaboration with stakeholders

The Japan Science & Technology Agency (JST) implements the Program for the Promotion of International Policy Dialogs Contributing to the Development of Science and Technology Diplomacy, under the JST initiative for Infrastructure Development for Promoting International Science and Technology Cooperation.

#### 2 Stakeholder initiatives for co-creation

##### (1) Efforts by public organizations

The Ministry of Education, Culture, Sports, Science and Technology (MEXT) had policy dialogues with experts from various fields to discuss a framework for the designing of a vision for future society, future research, research human resources, and the foundation of innovation. On August 3, 2018, the Task Force for Science and Technology System Reform published the Report: Science and Technology System Reform for the Co-Creation of a Future Society. Also, in cooperation with other relevant organizations, including experimental research institutions and local authorities, MEXT held the 59th Science and Technology Week from April 16 to 22, 2018. During this week, these organizations held various events across Japan, such as facility tours, experiment workshops, lectures, and awarding ceremonies for the MEXT Minister Prize for Science and Technology and other awards. Also, MEXT distributed copies of a poster titled “Encyclopedia of Quantum Beams – One for Every Household –” to elementary, junior high, and high schools as well as science centers and museums in order to arouse people’s curiosity and promote their understanding of science and technology across generations spanning from young children to adults.

The Ministry of Agriculture, Forestry and Fisheries (MAFF) provides producers, consumers and mass media with information and opportunities to exchange opinions on the R&D of advanced technology in agriculture, forestry and fisheries. MAFF also sends researchers to give lectures. The National Research and Development Agencies under MAFF open their facilities to the public and provide lectures throughout the year, helping to raise awareness by facilitating interactive communication with the public about their research activities and by exhibiting research results.

The Japan Aerospace Exploration Agency (JAXA) provides various educational activities in space science, such as the Cosmic College, and lecturers to schools and seminars.

RIKEN offers various programs to citizens and conducts outreach activities. For example, RIKEN prepares booklets that introduce the latest research results and puts animated films on the website in an

effort to reach a broader range of people in order to explain the latest research results and scientific phenomena. In an effort to introduce the fun, depth and width of science through books, RIKEN sends “100 Science Books” and “100 Science Books for Juniors” to elementary, junior-high and high schools, public libraries and book stores across the country.

<Reference> RIKEN channel

<https://www.youtube.com/user/rikenchannel>

The National Institute for Materials Science (NIMS) is active in introducing its research to the public, particularly to young students who might become scientists in the future. For this purpose, NIMS has a video site titled *Material's Eye* that showcases the mysteries of various materials. NIMS is devoting great effort to help people develop an understanding of, and an interest in, science.

<Reference> NIMS Movie Library

<https://www.nims.go.jp/publicity/digital/movie/index.html>

The National Institute of Advanced Industrial Science and Technology (AIST) operates permanent exhibition facilities and opens its facilities to the public in nine locations nationwide. In addition, AIST actively promotes S&T communication programs through events such as experimental classrooms and the AIST Open Laboratory. AIST also creates and publishes videos to explain the latest research outcomes in an easy-to-understand manner in an effort to communicate research outcomes.

<Reference> AIST Video Library

[https://www.aist.go.jp/aist\\_j/aistinfo/video/video\\_main.html](https://www.aist.go.jp/aist_j/aistinfo/video/video_main.html)

Universities and public research institutions make efforts to widely disseminate information on research results to the general public.

The Council for Science, Technology and Innovation (CSTI) encourages researchers who receive annual public research funds of 30 million yen or more for individual research projects to actively communicate with the public regarding the contents and the results of their research activities. In addition, the results of the Public Opinion Poll on S&T and Society (Cabinet Office) also showed that people think the public should be more involved in the discussion of science and technology policies.

## (2) Enhancement of activities conducted by science museums

JST has been promoting co-creation, where various stakeholders discuss relationships between science technology innovation and social challenges and collaborate to connect the discussions to policy formation, knowledge creation and social implementation. As part of the activities JST holds Science Agora that is one of the greatest open forums in Japan, and supports dialogue and collaboration activities by local authorities, etc. in order to promote co-creation activities in regional communities. The National Museum of Emerging Science and Innovation promotes interactive communication between researchers and the general public through the creation and lecture of exhibitions to introduce advanced S&T in an easy-to-understand manner, and also through planning and conducting events. It also encourages collaboration of science museums and schools across the country as the hub of Japan's S&T communication activities.

The National Museum of Nature and Science holds exhibitions that provide opportunities to expand people's interest in nature and science across generations, encouraging them to think together, and provides age-appropriate learning support (learning support depending on different backgrounds). Other activities of the museum include: dissemination of model projects to improve the science literacy focused on

communication using the exhibitions, spread of learning support activities for effective cooperation between schools and the museum, and a training course for curators of natural science museums.

### (3) Efforts of the Science Council of Japan and academic societies

The Science Council of Japan (SCJ) holds academic forums as part of its activities to feed outcomes of research back to society. In FY2018, it held six forums covering a wide range of subjects, including “Future of Science and Technology That Gender-Based Perspectives Change: Gender Summit 10 Follow-up Symposium,” “Current Situation and Challenges in Research on Military Security: Based on the Results of an SCJ Survey,” and “Complex Natural Disasters That Consecutively Occurred in Summer 2018 and Reports from Academic Societies.”

The academic societies are voluntary associations organized mainly by researchers at universities and other research institutions. They play important roles in research evaluation, information exchanges and communication beyond those of individual research organizations, and they contribute to the development of academic research through academic research meetings, seminars and symposiums that disseminate the latest results from quality research and academic journals.

Through programs such as the Grants-in-Aid for Publication of Scientific Research Results, MEXT subsidizes international conferences held by academic societies and symposiums, and other undertakings to strengthen international information dissemination.

### (4) Promotion of risk communication

From FY2014, MEXT is implementing the Promotion Strategy for Risk Communication based on the Program for Developing Risk Communication Models (March 27, 2014, the Committee for Science and Technology for Safety and Security and Social Linkage, the Subdivision on Research Planning and Evaluation, SCT). MEXT adopted initiatives of three organizations in FY2016 and is supporting five organizations as of March 2019.

The Consumer Affairs Agency (CAA), the Food Safety Commission, the Ministry of Health, Labour and Welfare (MHLW) and MAFF collaboratively conduct risk communication activities for food safety. The 2003 Basic Food Safety Act (Act No. 48 of 2003) made the government responsible for informing the nation about food safety. Meetings are held for exchanges of opinions on various topics, including the safety of imported food products, pesticide residues, safety of food additives, prevention of food poisoning, efforts for food safety and the safety of functional foods. These ministries and agencies have promoted especially proactive risk communication efforts in response to the TEPCO Fukushima Daiichi Nuclear Disaster since FY2011, such as holding opinion exchanges with consumers and participating in exhibitions at events for parents and children.

## 3 Scientific advice for policymaking

With the aim of formulating policies for science, technology and innovation by following a rational, evidence-based process, MEXT has been promoting the Science of science, technology and innovation policy program. In this program, by supporting researchers who pursue science, MEXT promotes STI policies, supports centers (universities) that foster human resources, implements STI policies in society and networks these centers to establish a system that systematically fosters human resources nationwide. In

doing so, MEXT uses the Science for Redesigning Science, Technology and Innovation Policy Center (SciREX Center), which was established at the National Graduate Institute for Policy Studies (GRIPS), as the hub. MEXT organizes and networks core centers at the University of Tokyo, Hitotsubashi University, Osaka University, Kyoto University and Kyushu University in collaboration with these universities. Indicators and evidence-based policies were developed, including those related to the economic and social ripple effects of government investment in R&D.

The National Institute of Science and Technology Policy (NISTEP) has established an information base for the collection and accumulation of data that are necessary for the formulation of STI policies and for research, analysis and study on STI. Results of research using the information base are provided to and used by various policy councils of the Cabinet Office and MEXT.

The Research Institute of Science and Technology for Society (RISTEX) of the JST is supporting the R&D projects through open call (the 2nd phase started in FY2016). The aims of these projects are as follows: (1) analyzing from various perspectives the social issues, the status and the feasibility of S&T that has the potential to address such issues, and (2) based on the evidence, developing the methods and indicators to formulate policies through rational processes. In FY2018, R&D and policy implementation were promoted for four newly adopted projects in addition to seven projects that have been adopted by FY2017.

Center for Research and Development Strategy (CRDS), the JST grasps and overviews the trends of STI in Japan and abroad as well as related policies, and proposes STI policies and R&D strategies.

#### 4 Ethical, legal, and social initiatives

##### (1) Efforts for development of systems for life science research

###### A. Approaches to bioethical issues

Today's rapidly advancing life science is beneficial to people, but raises ethical questions which may threaten human dignity and rights. The relevant ministries and agencies have formulated the necessary regulations.

For research using human cloning techniques, the ministries concerned have taken appropriate measures based on the Act on Regulation of Human Cloning Techniques (Act No. 146 of 2000), etc. In FY2018, the Guidelines on the Handling of Specified Embryos (MEXT Public Notice No. 31 of 2019) were revised to allow researchers to create human organs in animal bodies in basic research. In addition, in response to the recent rapid global advancement of genome editing technologies toward making it easier to achieve intended genetic modification, the government formulated the Guidelines for Research Using Gene-Altering Technologies on Human Fertilized Embryos (MEXT/MHLW Public Notice No. 3 of 2019) in April 2019 as a framework for implementing basic research contributing to assisted reproductive technology. In relation to research involving human embryonic stem (ES) cells, the government has formulated the Guidelines on Derivation of Human Embryonic Stem Cells (MEXT/MHLW Public Notice No. 3 of 2019), the Guidelines on the Utilization of Human Embryonic Stem Cells (MEXT Public Notice No. 68 of 2019), and the Guidelines on the Distributing Organizations of Human Embryonic Stem Cells (MEXT Public Notice No. 69 of 2019) in April 2019, in order to make it possible to distribute ES cells to overseas institutions for clinical purposes and streamline the procedures concerning the handling of ES cells.

## B. Securing safety in life science

Recombinant DNA technology can result in new combinations of genes that do not exist in nature. Therefore, concerning living organisms obtained through use of the technology, the Act on the Conservation and Sustainable Use of Biological Diversity through Regulations on the Use of Living Modified Organisms (Act No. 97 of 2003) provides regulations necessary for ensuring biodiversity. In addition, following issuance of the Ministry of Environment's policy on the handling of organisms obtained by genome editing technology in February 2019, relevant ministries and agencies are developing and disseminating a list of matters to pay attention to regarding the handling of such organisms.

## C. Efforts for the proper implementation of animal trials

The Act on Welfare and Management of Animals (Act No. 105 of 1973) stipulates that animal trials be conducted in accordance with the 3Rs (Replacement, Reduction and Refinement). Based on this act, the Standards Relating to the Care and Management of Laboratory Animals and Relief of Pain (Standards for Care and Keeping) (Public Notice of the Ministry of the Environment (MOE), No. 88 of 2006) was enacted for animal experiments. Based on these guidelines, MEXT, MHLW and MAFF have implemented similar basic guidelines<sup>1</sup> for research institutes that fall under their jurisdictions, in order to ensure proper care for animal trials.

## (2) Efforts for development of systems for artificial intelligence research

Under the framework of the Conference toward AI Network Society established in October 2016, MIC comprehensively studies social, economic, ethical, and legal challenges in promoting AI networking. MIC published the Draft AI R&D Guidelines for International Discussions (2017 Report) in July 2017, which covered matters that AI developers should pay attention to. In July 2018, it published the Draft AI Utilization Principles (2018 Report), which described the matters that AI users need to be aware of when they use the technology. The Council for Social Principles of Human-Centric AI established jointly by the Cabinet Office and other relevant ministries in April 2018 has discussed common basic principles for industry, academia, and the government concerning the mid- to long-term R&D and utilization of AI and related technologies. At the same time, the Integrated Innovation Strategy Promotion Council issued the Social Principles of Human-centric AI in March 2019. Based on these guidelines, the government intends to promote international discussion on AI at UNESCO<sup>2</sup>, G7, and OECD<sup>3</sup>.

## Section 2 Ensuring Research Integrity

Securing of the integrity of research is essential for researchers to build trusting relationships with various stakeholders of society. Researchers and research institutions including universities need to bear it firmly in mind that tirelessly addressing research misconduct is the way to respond to society's trust in STI and increase STI's driving force.

<sup>1</sup> Basic Guideline for Animal Trials at Research Institutes (Public Notice of MEXT, No. 71 of 2006); Basic Guideline for Animal Trials at Research Institutes Under Jurisdiction of MHLW (Public Notice by the Director of Welfare and Science, MHLW, 2006); and Basic Guideline for Animal Trials at Research Institutes Under Jurisdiction of MAFF (Public Notice of by the Secretary-General of Secretariat of Agriculture, Forestry and Fisheries Research Council, MAFF, 2006).

<sup>2</sup> United Nations Educational, Scientific and Cultural Organization

<sup>3</sup> Organisation for Economic Cooperation and Development

In light of frequently occurring cases of research misconduct, MEXT conducts surveys of implementation status based on the Guidelines for Responding to Misconduct in Research (decision by the Minister of Education, Culture, Sports, Science and Technology on August 26, 2014) and works to ensure compliance by research institutes by providing guidance based on the survey results. The ministry has been working to promote research integrity activities by supporting research ethic education provided by research institutes in cooperation with the Japan Society for the Promotion of Science, Japan Science and Technology Agency and Japan Agency for Medical Research and Development.

In order to prevent inappropriate use of research funds, MEXT conducts surveys of implementation status based on the Guidelines for Management and Audit of Public Research Funds at Research Institutions (Implementation Standards) (revised on February 18, 2014; Decision of the MEXT Minister) to establish a system for the appropriate use and management of public research funds at research institutions.

In addition, the Ministry of Economy, Trade and Industry is addressing this issue based on the Guidelines for Responding to Misconduct in Research (revised on January 15, 2015), and the Guidelines for Responding to Misuse of Public Research Funds (revised on January 15, 2015).

Relevant ministries share information on researchers involved in misconduct cases and suspend their access to any competitive funds provided by ministries in accordance with the Countermeasures against Misconduct in Research Activities by the Competitive Research Fund (revised on June 22, 2017) (agreement in the Liaison Committee of Ministries and Agencies Concerned with Competitive Funding).