

## 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

MEXT, in cooperation with other relevant organizations, including experimental research institutions and local authorities, held the 58th Science and Technology Week from April 17 to 23, 2017. Various events, including opening of research facilities to the general public, experiments in classrooms, lectures, and award ceremony for the winners of science and technology awards given by the Minister of Education, Culture, Sports, Science and Technology, took place at organizations across the country. At the same time, the “Panel Exhibition - Beauty of Science and Technology” introduced to the public beautiful and impressive images produced in the process or as a result of research at the Joho-Hiroba (Lounge of the Exhibition Rooms on the Museum) of MEXT.

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.

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.

The National Institute of Advanced Industrial Science and Technology (AIST) operates permanent exhibition facilities and opens its facilities to the public in ten 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.

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.

## **(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 FY 2016, it held six forums on wide-ranging subjects, including "Academic information on a verge of a crisis and its future," "measurement and prediction of transfer of radioactive materials – safety and security of the past, now and future" and "Think about Japanese universities in the future." It also opened a Science Cafe jointly with MEXT 13 times in FY 2017.

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 2018.

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. In particular, since 2011 and in response to the accident at the Tokyo Electric Power Company (TEPCO) Fukushima Daiichi Nuclear Power Station, active risk communication undertakings have been conducted at meetings for exchanges of opinions with consumers regarding countermeasures against radioactive substances.

### **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, Technology and Innovation Policy Research 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 analyzes the following: 1) social issues, and 2) the status of S&T that has the potential to address such issues from various perspectives, including the feasibility of such S&T. Based on evidence of the severity of issues, RISTEX is supporting the public invitation for R&D on methods to formulate policies through rational processes and on performance indicators for such policies (the 2nd phase started in FY2016.). In FY2017 R&D and policy implementation were promoted for 4 newly adopted projects in addition to 8 projects that have been adopted by FY2016.

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 FY2017, the Expert Committee on Specified Embryo, Bioethics and Biosafety Commission, CST, MEXT, discussed acceptance of research to develop human organs in an animal body and compiled "about handling of research that uses animal-human chimeric embryos" (March 30, 2018). For medical research involving human subjects and research using human embryonic stem (ES) cells, the ministries concerned have taken appropriate measures based on the Ethical Guidelines for Medical and Health Research Involving Human Subjects (Public Notice of MEXT and MHLW, No. 3 of 2014) and the Guidelines on the Derivation of Human Embryonic Stem Cells (Public Notice of MEXT and MHLW, No. 2 of 2014).

#### **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.

#### **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**

The Ministry of Internal Affairs and Communications (MIC) held the Study Group on AI<sup>2</sup> Networking from February to June of 2016. MIC launched the AI Network Society Promotion Council in October of the same year by expansively reorganizing the AI Networking Review Council. The new council is comprehensively examining social, economic, ethical and legal issues toward promotion of AI networking. In July 2017, the “Report 2017” including “AI development guidelines for international discussions (draft)” was compiled for matters to which AI developers are expected to pay attention. Based on the results, international discussions on AI have been promoted at G7 and OECD<sup>3</sup>.

## **Section 2 Ensuring Research Integrity**

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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.

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, survey of implementation status has been conducted based on the guidelines such as “Guidelines for management and audit of public research funds at research institutes (implementation standards)”(revised on February 18, 2014; Decision of the Minister of MEXT) to improve the system. In addition, relevant ministries have requested that the relevant institutions take necessary actions.

Countermeasures include restrictions on new applications for competitive funding for those involved in misconduct in research activities. Because of frequently occurring cases of research misconduct, the relevant ministries are sharing information and ensuring liaison and coordination on operation of the guidelines.

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<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> Artificial Intelligence

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