

## 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

In an effort to promote the establishment of international communication, the Japan Science and 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. This program supports the organizers of international meetings that are held to provide a broad range of stakeholders, who are playing leading roles in globally advancing science and technology in industry, academia and government, with opportunities to discuss the future direction of science and technology.

#### ② Stakeholder initiatives for co-creation

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

Interested young personnel of the Ministry of Education, Culture, Sports, Science and Technology (MEXT) led policy dialogues with a broad range of people working in the fields of industry, academia, government and private sectors to freely and openly discuss cross-departmental policy issues that are important but not studied sufficiently. The study results were compiled as a report titled: Let Us Create Our Future Together – ST administration that leads with new ideas and a co-creation model. Also, to coincide with the Science & Technology Week (April 13 to 19, 2020) MEXT distributed copies of a poster titled “Antarctic – Window of the Future Earth – One for Every Household –” to elementary, junior high, and high schools as well as science centers and museums in order to promote understanding of science and technology across generations spanning from young children to adults. In addition, the ministry posted “Points for Learning with Pleasure” for elementary, junior high, and high school students on the Science & Technology Week website so that they can further increase their understanding by using the internet and books.

The Ministry of Agriculture, Forestry and Fisheries (MAFF) conducts outreach activities including: dispatching researchers and other experts to give lessons on R&D of state-of-the-art technologies at the requests of producers and consumers; holding study tours of genome editing research facilities for

consumers, etc. and; information dissemination through websites. 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 lectures to schools and seminars.

RIKEN publishes booklets and releases animated videos on its website in order to enable a broader range of people to understand the latest science research. Additionally, RIKEN recommends “100 Science Books” for junior and senior high schools and public libraries to get children interested in science.

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) is actively promoting S&T communication programs including operation of permanent exhibition facilities, participation in virtual and other events, open laboratories and lectures on demand. AIST also creates and publishes videos and web contents to explain the latest research outcomes in an easy-to-understand manner in an effort to communicate research outcomes.

<Reference> Video sites of individual organizations

○RIKEN channel

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

○NIMS Movie Library

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

○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 order to solve various social challenges represented by environment/energy, the aging society with fewer children and disaster prevention/mitigation, the Research Institute of Science and Technology for Society (RISTEX) of the Japan Science and Technology Agency (JST) has been conducting R&D in

partnership with diverse stakeholders by taking advantage of knowledge of the humanities and social sciences in addition to natural sciences. In FY2020 RISTEX launched a new R&D program to address Ethical, Legal and Social Issues (ELSI) of science and technology and to develop its methodology. The institute also promoted projects including clarification of issues in various social phenomena caused by COVID-19 infection and survey/archive research contributing to the improvement of risk literacy.

(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. Miraikan - The National Museum of Emerging Science and Innovation acts to think about the relationship between state-of-the-art S&T and society with visitors to the museum. It promotes interactive communication between researchers and the general public through its exhibitions and 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 as the national center of natural history and S&T history has accumulated intellectual, physical and human resources including research results, specimens and materials. Taking advantage of these resources, the museum 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).

(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 FY2020, it held eleven forums covering a wide range of subjects, including "COVID-19 and Open Science," "Efforts in Academia toward Control of COVID-19 Infection" and "Academia in the Age of Crisis and Its Future."

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, Japan Society for the Promotion of Science subsidizes international conferences held by academic societies and symposiums, and other undertakings to strengthen international information dissemination.

### ③ Scientific advice for policymaking

Cabinet Office is building a system to use the results of quantitative analysis of academic papers, research funds, etc. as well as the results of extraction and analysis in the important S&T fields based on experts' knowledge for formulation of the Integrated Innovation Strategy, review of the existing strategies by field, formulation of new national strategies and for other purposes.

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 for study of the Science, Technology, and Innovation Basic Plan, for example.

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 FY2020, R&D and policy implementation were promoted for five newly adopted projects in addition to the 13 projects that have been adopted by FY2019.

The Center for Research and Development Strategy (CRDS), JST grasps and overviews the trends of STI in Japan and abroad as well as related policies, studies R&D strategies and makes proposals that contribute to STI policies. As the importance of technological innovation is increasing with the advancement and sophistication of technologies, there is an increasing need for strategic investment of limited resources. In this context, the Technology Strategy Center of the New Energy and Industrial Technology Development Organization (NEDO) is collecting and analyzing information on technology

and market trends at home and abroad with the aim of contributing to policy making for access to markets based on the information. TSC is also working for human resource development including expansion of training courses for business people toward promotion of social implementation of R&D results.

#### 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.

Regarding research using human fertilized embryo, the Council for Science, Technology and Innovation (CSTI) compiled the "Second Report on the revision of the 'Basic Principles on the Handling of Human Embryos': on the use of genome modification techniques including genome editing on human embryos" on June 19, 2019. The report recommends that the following activities be permitted: (1) Basic research of genetic and congenital diseases using genome modification techniques including genome editing on surplus embryos from assisted reproductive medicine; (2) Basic research of assisted reproductive medicine on gametes or human fertilized embryos created for research purposes using genome modification techniques including genome editing, and; (3) Research of mitochondrial diseases using nuclear transfer technology on human fertilized embryos. In order to ensure proper implementation while permitting the research above, MEXT and MHLW are conducting studies toward revision of "Ethical Guidelines for Research Using Gene-altering Technologies on Human Fertilized Embryos"(Public Notice No.3 of MEXT and MHLW in 2019), "Ethical Guidelines for Research of Assisted Reproductive Medicine that Creates Human Fertilized Embryos" (Public Notice No.2 of MEXT and MHLW in 2010) and "Guidelines on the Handling of Specified Embryos" (Public Notice No.31 of MEXT in 2019). For research using human ES cells, the government is working to ensure proper implementation based on the "Guidelines on the Derivation of Human Embryonic Stem Cells" (Public Notice of MEXT and MHLW No. 4 of 2019) that was amended in April 2019. Regarding "Ethical Guidelines for Human Genome/Gene Analysis Research" (Public Notice No.1 of MEXT, MHLW and METI of 2013) and "Ethical Guidelines for Medical and Health Research Involving Human Subjects" (Public Notice No. 3 of MEXT and MHLW of 2014), MEXT, MHLW and METI studied the consistency of the guidelines in the light of the progress of research. Based on the studies, the ministries unified the guidelines into "Ethical Guidelines for Medical and Biological Research Involving Human Subjects" (Public Notice No.1 of MEXT, MHLW and METI of 2021) in March 2021 to ensure proper research conduct.

###### 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. For genetic recombinant experiments related to COVID19, in particular, the government is working to establish timeliness and safety in consideration of their importance. In FY2020, based on the use status and scientific knowledge, “about revision to define authorized host vector systems based on the ministerial ordinance providing containment measures to be taken in Type 2 use of living modified organisms for research and development, etc.” was notified and widely disseminated to ensure proper implementation of genetic recombinant experiments by research institutes. In addition, following the issuance of the Ministry of Environment’s policy on the handling of organisms obtained by genome editing technology in February 2019, acceptance and disclosure of information documents pertaining to the organisms began based on the specific procedure provided by the relevant ministries and agencies.

#### 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 Cabinet Office jointly with relevant ministries and agencies discussed basic principles concerning ethics, etc. which should be considered in AI technologies, and medium- to long-term R&D on AI and their utilization, which are common to industry, academia, private and public sectors, at the Meeting to Discuss Principles of Human-centric AI Society held in April 2018 and the succeeding Meeting on Principles of Human-centric AI society. As a result, the “Principles of Human-centric AI society” was decided by the Meeting to Promote Comprehensive Innovation Strategy in March 2019. In addition, MIC has been comprehensively studying various issues in promoting AI networking under the framework of the Conference toward AI Network Society established in October 2016. MIC published the “Draft AI R&D GUIDELINES for International Discussions” in July 2017, and the “AI Utilization Guidelines” in August 2019. Toward “Safe, Secure and Trustworthy Implementation of AI in Society”, MIC published “Report 2020” compiling ambitious initiatives related to AI in July 2020. Based on these results, the government

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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).

promotes international discussion on AI at OECD<sup>1</sup>, Global Partnership on AI (GPAI), UNESCO<sup>2</sup> and other venues. In cooperation with relevant government offices METI also conducted studies for implementation of AI principles and published “AI Governance in Japan Ver. 1.0 (Interim Report by Expert Group on Architecture for AI Principles to be Practiced)” in January 2021.

## 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.

For promotion of fair research activities, MEXT works to ensure system development and other efforts by research institutes 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.) In addition, the ministry has been supporting research ethics education provided by research institutes in cooperation with the Japan Society for the Promotion of the Science, Japan Science and Technology Agency and Japan Agency for Medical Research and Development.

In order to prevent inappropriate use of research funds, MEXT urges appropriate management of public research funds at research institutions based on the Guidelines for Management and Audit of Public Research Funds at Research Institutions (Implementation Standards) (“the Guidelines”: Decision of the MEXT Minister on February 15, 2007), while at the same time providing guidance and advice to support efforts by research institutions. The guidelines were amended in February 2021 to enhance measures to prevent misuse of research funds.

In addition, the Ministry of Economy, Trade and Industry (METI) 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). Other relevant ministries and agencies are also addressing the issue based on their respective guidelines, etc.

Relevant ministries share information on researchers involved in misconduct cases and suspend their access to any competitive research funds provided by the ministries in accordance with the Countermeasures against Misconduct in Research Activities by the Competitive Research Fund (revised in the Liaison Committee of Ministries and Agencies Concerned with Competitive Funding on June 22, 2017) and the Application of Unified Rules to Proposal-based Competitive Research Funds (agreement in the Liaison Committee of Ministries and Agencies Concerned with Competitive Funding on May 8).

<sup>1</sup> Organisation for Economic Cooperation and Development

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