



RISTEX

Past,
Present,
and Future



Introduction

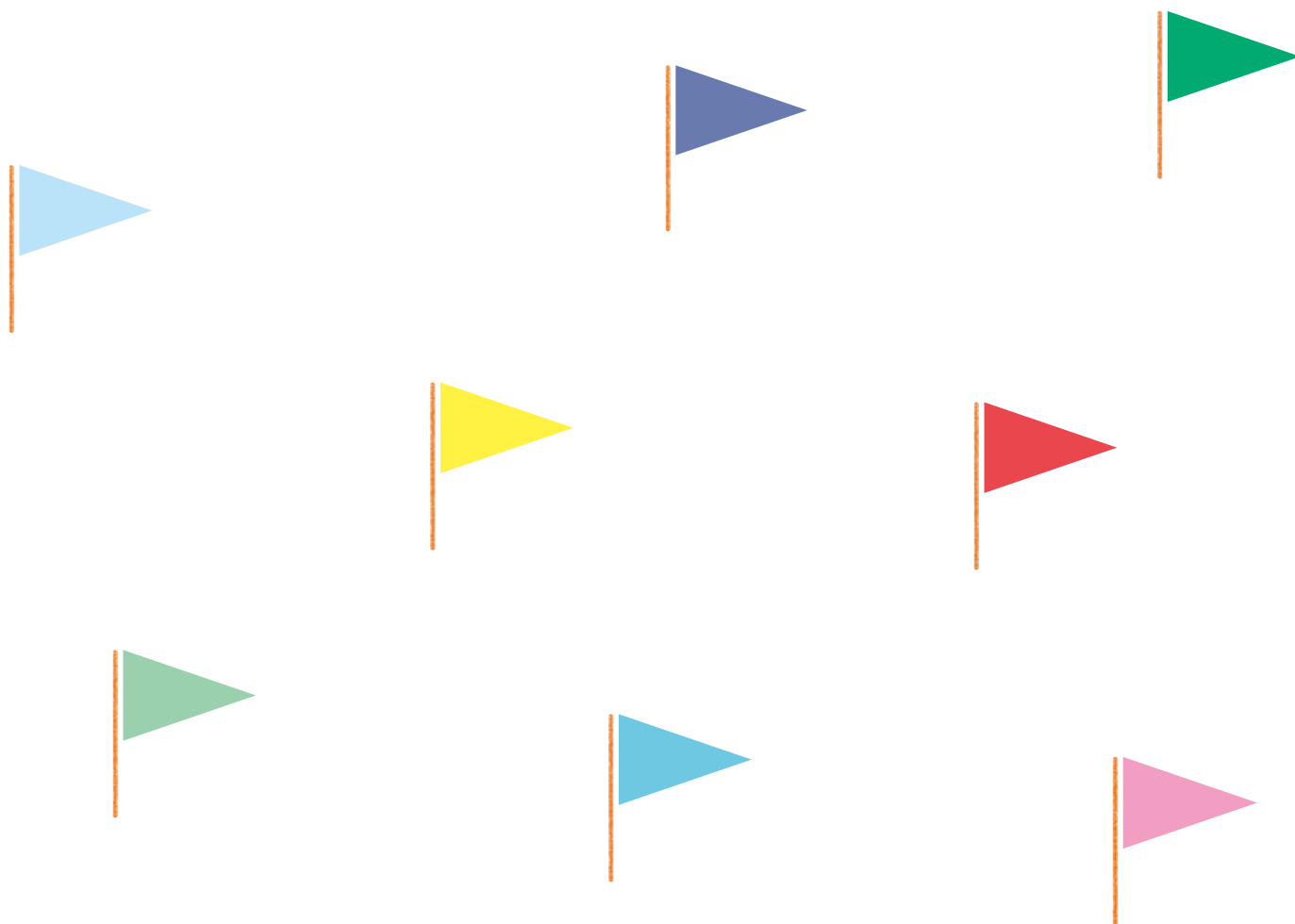
Looking Back on 20 Years, Now, to Envision the Future of RISTEX

In 2000, the necessity of promoting 社会技術 *Shakai-Gijutsu* (Science and Technology for Society: STfS), to create new social systems by combining and integrating knowledges from natural sciences and social sciences and humanities (SSH) was proposed, and as a result, RISTEX (Research Institute of Science and Technology for Society, of which Japanese name is the System for Research in Science and Technology for Society) was founded in July, 2001.

After a major organizational restructure in 2005, the current RISTEX (stands also for Research Institute of Science and Technology for Society, but the Japanese name is the Center for Research in Science and Technology for Society) was established.

Over the last 20 years, despite many changes RISTEX has been through, one thing has remained the same. That is, we have been promoting R&D that are aimed to solve social issues by combining knowledges of natural sciences, SSH, and experiences of various stakeholders who face the social issues.

To mark our 20th anniversary, we have created this booklet to look back on what have been attempted and achieved in the past, to consider what to do now, and in the future. We hope that readers, especially those who engage in social issues in one way or another, find this booklet meaningful.



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RISTEX - Past, Present, and Future

Research Institute of Science and Technology for Society (RISTEX) that promotes R&D in S&T for Society (STfS) has engaged in various social issues for 20 years by approaches based on the combination of multiple knowledges. To assist such R&D, we have made various attempts and have accumulated a know-how in our characteristic 'hands-on' management.

This booklet shows some elements of the 20-year accumulation of experiences and knowledges in RISTEX. After a brief description of its management style and key terms, our Director General, KOBAYASHI Tadashi, guides us through the historical, conceptual, and practical backgrounds of RISTEX and illustrates what RISTEX's current and future challenges are. This is followed by his dialogues with four prominent figures who have made tremendous contributions to the development of STfS.

RISTEX's R&D Management for the Promotion of STfS

RISTEX aims to create novel social, public, and economical values through R&D for solutions to social issues. To achieve this, some of its R&D funding frameworks explicitly include the mechanism to flesh out the solutions to social issues by combining various knowledges. For example, **in SOLVE for SDGs, the call for proposals requires the joint submission by researchers and local stakeholders. In STI Policy, we have built a framework which requires the collaborative effort between researchers and policymakers on specific policy needs.** Since its establishment, RISTEX has encouraged research not bound to study rooms and laboratories, but that has **a vision of its application and utilization in society.**

To achieve such uneasy challenges, we have ensured to engage those who seek solutions to social issues and attend to their voices, so we can devise ways to promote necessary R&D. In other words, we have been promoting various forms of transdisciplinary research.



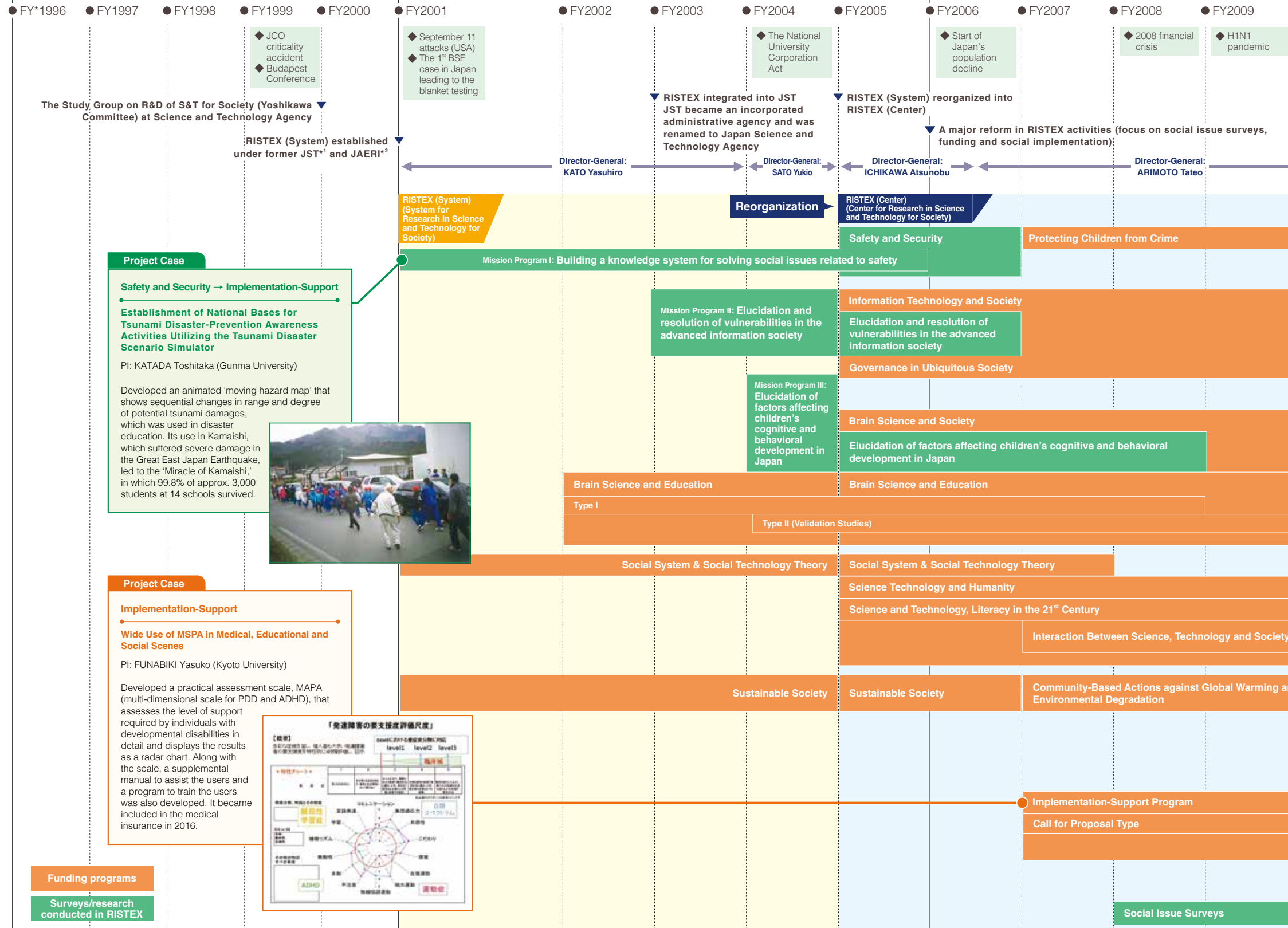
The Timeline of RISTEX History

RISTEX (Research Institute of Science and Technology for Society) was established in 2001 with the Japanese name of 'the System for Research in Science and Technology for Society' (RISTEX (System) for short). After the reorganization in 2005, the Japanese name was changed to the Center for Research in Science and Technology for Society (RISTEX (Center) for short). Despite many changes within and outside of the organization, RISTEX has continued to fund and promote R&D in STfS.

the 1st Science and Technology Basic Plan

the 2nd S&T Basic Plan

the 3rd S&T Basic Plan



* The Japanese fiscal year starts in April and ends in March of the following year.
 *1 Japan Science and Technology Corporation
 *2 Japan Atomic Energy Research Institute

the 4th S&T Basic Plan

the 5th S&T Basic Plan

the 6th Science, Technology and Innovation Basic Plan

● FY2010 ● FY2011 ● FY2012 ● FY2013 ● FY2014 ● FY2015 ● FY2016 ● FY2017 ● FY2018 ● FY2019 ● FY2020 ● FY2021 ● FY2022 ● FY2023 ● FY2024 ● FY2025

◆ Great East Japan Earthquake
◆ Fukushima nuclear disaster

◆ Kumamoto earthquakes

◆ COVID-19 pandemic

Director-General: ARIMOTO Tateo

Director-General: IZUMI Shin-ichiro

Director-General: IWASE Kimikazu

Director-General: MORITA Akira

Director-General: KOBAYASHI Tadashi

▼ The evaluation committee set up in RISTEX for evaluation of funding programs
JST renamed to Japan Science and Technology Agency

▼ RISTEX set up ELSI initiatives

Creating Community-Based Robust and Resilient Society

Creating a Safe and Secure Living Environment in the Changing Public and Private Spheres (Public/Private Spheres)

Promotion of Future Earth Initiatives

Promotion of Future Earth Initiatives

Science of Science, Technology and Innovation Policy (STI Policy)

Human-Information Technology Ecosystem (HITE)

Service Science, Solutions and Foundation

Responsible Innovation with Conscience and Agility (RInCA)

Research Activities: ELSI Initiatives

Research Activities: Research Integrity Surveys

Solution-Driven Co-Creative R&D Program for SDGs (SOLVE for SDGs)

Scenario Creation, Solution Creation

Preventing Social Isolation & Loneliness and Creating Diversified Social Networks

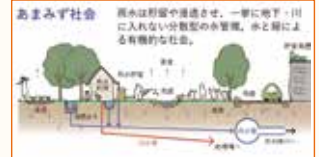
Project Case

Intergenerational Co-Creation

Distributed Rainwater Management for a Sustainable Well-Being Society

PI: SHIMATANI Yukihiro (Kyushu University)

To solve the issues of the centralized water management system, an urban vision "Rainfall Society" was proposed and a method was developed for a decentralized water management system based on an intergenerational co-creation which stores and infiltrates water around the basin while increasing high-quality greenery. It is effective for disaster prevention as well as community revitalization. Collaborated with a JICA project and the World Bank.



Project Case

Public/Private Spheres

Training for and Implementing Collaborative Investigative Interviews for Child Protection and Welfare

PI: NAKA Makiko (RIKEN; Ritsumeikan University; and Hokkaido University)

Organized a training program to support forensic interviews conducted in a collaborative manner by child guidance centers, law enforcement, and prosecutors, with which more than 10,000 professionals have been trained. Also, a training program for trainers of this program was developed which has so far resulted in more than 100 trainers.



Project Case

STI Policy

Realizing of Policymaking Process of Infectious Disease Control Using Mathematical Modeling Techniques

PI: NISHIURA Hiroshi (Hokkaido University)

Developed a model that describes in mathematical terms how infectious diseases spread, and how long it takes for diseases to manifest and become severe, for effective infectious disease control based on objective evidence. It was used in revising national vaccination programs.



Redesigning Communities for Aged Society

Designing a Sustainable Society through Intergenerational Co-creation (Intergenerational Co-Creation)

Social Implementation of Solutions Related to the Great East Japan Earthquake

R&D Results Integrated Type

RISTEX Key Terms

社会技術 *Shakai-Gijutsu* (Science and Technology for Society: STfS)

STfS is a special term for RISTEX, which means S&T for creating new social systems by integrating knowledges from natural sciences and social sciences and humanities (SSH). As of 2022, it is defined as S&T that "regards society itself as the object of R&D and seeks to resolve problems that either currently exist in society or that are anticipated to occur in the future." This expression appears in "Regarding the Pursuit of R&D in S&T for Society" (December 22, 2000) by the Study Group on R&D of S&T for Society chaired by YOSHIKAWA Hiroyuki who generously participated in a dialogue session of which article is included in this booklet.

→ To find out more, go to Dialogue #1 YOSHIKAWA Hiroyuki x KOBAYASHI Tadashi

Social Sciences and Humanities (SSH) Integration

SSH integration (or more accurately, the integration of SSH and Science, Technology, Engineering and Mathematics (STEM)) is a regular theme in high education policy and S&T policy, and RISTEX has been taking a leading role in promoting such a research style for addressing social issues. Recently, in dealing with social issues as typified by the SDGs, it is becoming more widely recognized that S&T alone does not suffice and thus the anticipation towards the integration of SSH has been rising. In the realm of social sciences, there is a new trend that stems from such an interest, which materialized in new disciplines such as experimental political philosophy, computational social science, and experimental social science. Furthermore, as exemplified by behavioral economics, there is a new development in knowledge creation that transcends boundaries of existing disciplines, not limited to SSH/natural sciences boundary, to deal with problems in modern society.

→ To find out more, go to Dialogue #2 MURAKAMI Yoichiro x KOBAYASHI Tadashi

Transdisciplinary Research (TDR)

TDR is the research that consists of the interdisciplinary collaboration between natural sciences and SSH, and the co-creation with various non-academic stakeholders.*1 R&D promoted by RISTEX can be widely categorized as TDR, as STfS assumes interdisciplinarity and also we emphasize the importance of co-creation with stakeholders of target social issues.

→ To find out more, go to Dialogue #3 KOBAYASHI Shinichi x KOBAYASHI Tadashi

総合知 *Sogo-Chi* (Convergence of Knowledge)

This is an expression used in the 6th STI Basic Plan,*2 and appears in phrases such as "in the future, it becomes increasingly more important to accumulate rich knowledge in SSH, as well as the creation and the use of 総合知 that results from convergence of such knowledge and knowledge of natural sciences, which would lead to a comprehensive understanding of people and society as well as to solutions of social issues." However, the term (literally, comprehensive knowledge) itself is not novel, as it has been used in descriptions of various research topics. Here, we regard this term as a form of knowledge that represents the process of co-creation/collaboration of various disciplines, rather than the production of knowledge by establishing a new discipline.

→ To find out more, go to Dialogue #4 ARIMOTO Tateo x KOBAYASHI Tadashi

*1 OECD "Addressing Societal Challenges Using Transdisciplinary Research," *OECD Science, Technology and Industry Policy Papers* No. 88, 2020.

*2 Under the S&T Basic Law enacted in 1995 the government formulates the S&T Basic Plan for implementing systematic and consistent S&T policies from a long-term perspective. This is the 6th Plan.



Looking Back on 20 Years of STfS / RISTEX

R&D of Solutions to Social Issues by Combining Various Knowledges



Director-General, RISTEX

KOBAYASHI Tadashi

PROFILE

KOBAYASHI Tadashi served as a professor and the Executive Vice President of Osaka University, and is currently a specially appointed professor at Center for the Study of Co*Design in Osaka University. At RISTEX, he served as a senior fellow before becoming appointed as the Director-General. He was also the first president of the Japanese Society for Science and Technology Studies. He is currently a member and a Secretary of the First Section of the Science Council of Japan. His publications include *Who Are to Consider Science and Technology?: An Experiment of Consensus Conference*, 2004, and *The Age of Trans-Science*, 2007 (both in Japanese).

Background of the Concept 'S&T for Society (STfS)' and Convergence of Knowledge (総合知)

STfS that RISTEX advocates has several historical contexts. One is post-Cold War academic discussions around the world

regarding how science in the 21st century should be. With the collapse of the Cold War, in which the uplifting of national prestige could be considered the *raison d'être* of science, **the question of what science is for** arose anew at the end of the 20th century. Against this background, **the 'use' of science** emerged as an enticing notion. The 1999 World Conference on Science adopted the Declaration on Science

and the Use of Scientific Knowledge (Budapest Declaration), and the attempt to express the concept of 'use' in Japanese has led to the framing of problems and approach to solutions derived from engineering.

At that time, there was much discussion on future S&T policy after the merger of the Ministry of Education and the Science and Technology Agency planned as part of the reorganization of ministries in 2001. The topics discussed apparently stretched from research on safety and security, from which a Mission Program in RISTEX (System) probably stemmed, new mode of basic research, to social issue-driven research. I also hear that there was a suggestion to call such research 'public technology.' This term was not adopted in the end as it was likely to be associated with civil engineering, of which Japanese name literally means engineering of soil and wood. This Japanese translation was, in the first place, a desperate attempt to translate civil engineering, which implies how difficult it was to express 'civil' in Japanese. This in turn may indicate that the original meaning of civil engineering was in fact what current 社会技術 (STfS) is aiming to achieve. In any case, the term suggests that engineers who led those discussions then were **firmly determined to transform what was conventional, be the cause of changes, and to solve problems.**

Today we call ourselves 社会技術研究開発センター (the Center for Research in Science and Technology for Society) in Japanese, but the problem of terminology could not be resolved easily then, and it was even more difficult to decide its English name. After much consideration, 社会技術 was coined, and rather than a literal translation (social technology), "Science and Technology for Society" from the Budapest Declaration was adopted for its

English name.

The R&D for solutions to social issues, which RISTEX has been promoting, does not have a fixed formula that specifies which knowledges to be combined. Rather, it is characteristic for its flexible style of promoting R&D, that is, **identifying the goals to be achieved, or the purposes of R&D (missions that correspond to prominent social issues at that time, such as well-being, creation of social and public values and so on), working out the methodology and disciplines for achieving them, and assisting R&D accordingly.** In this sense, the notion of 'using' S&T, which is increasingly more manifest in the 21st century, gave birth to the term 社会技術, and perhaps we could say 総合知 (convergence of knowledge), too, stems from the same idea.

A Turning Point in Academia and the Term 総合知 (Convergence of Knowledge)

Examining the Article 3 "Policy for the Promotion of the Creation of Science, Technology and Innovation" of the Science, Technology and Innovation Basic Law makes us realize why the term 'convergence of knowledge' is necessitated now. For instance, Item 5 of the Article states that "[the] creation of science, technology and innovation must be promoted with the aim of realizing a society in which all citizens can enjoy the full benefits of the creation of science, technology and innovation," and this clearly appears to have in mind the SDGs' principle of "leaving no one behind." Also, we notice the following statement in Item 6 which seems to serve as the basis for the concept of convergence of knowledge:

In promoting the creation of science, technology and innovation, attention must be paid so that appropriate measures are taken to address the following challenges and other social issues by converging knowledges on science and technology from all academic disciplines:

- (i) challenges facing our country, including the declining birthrate and aging society, declining population, and responses to the development of cross-border socio-economic activities,
- (ii) challenges facing humankind, including food problems, constraints in energy use, and global warming, and
- (iii) new challenges in employment and other areas due to changes in socio-economic structures induced by application of S&T.

At present, there are words into which new meanings are infused such as 総合知 (convergence of knowledge), intermingled with various existing words such as STfS, transdisciplinary research, and SSH integration. Such a situation appears to me as **implying a change occurring in the relationship between academia and social issues, and thus academia facing a turning point**. The notion of 'using' science was not explicit, and expressions such as 'science for knowledge' in the Budapest Declaration sufficed to convince the Mertonian view of science*¹ probably until the 1970s, which then began to deteriorate, and this trend became more evident in the 1990s. We should also note that at the same time information science, of which nature is very different from conventional science, showed a rapid development.

Entering the 21st century, there was an increasing demand for science to contribute

to solving social issues, and accordingly, the structure of funding began to change. We may say that **science can no longer expect to receive support from society and politics merely by maintaining that freedom of research is important, in the classical sense**.

Meanwhile, academic disciplines became increasingly specialized, to an extent it is almost impossible to grasp the overall picture of scientific research, and on top of that, social issues so complex and grave have become harder to be addressed appropriately by such research. Considerations and attempts to supplement what is lacking resulted in the coinage of various terms but the 'something' they try to articulate has not yet crystallized enough, and thus, it seems, its manifold expressions are being tested and still coexist at present. We may consider STfS and the convergence of knowledge as examples of such 'something.'

Tracing the roots of this 'something' takes us back to terms that originate from medicine, such as 'transdisciplinarity' and 'evidence-based medicine,' which emerged around 1970 when the search for new wording to express novel concepts began. These terms signify the awareness that it was impossible to advance medicine without collaborative efforts among medical researchers who produce evidence-based knowledge; medical professionals who have enough clinical experience and use such knowledge; and also voices of patients, their families, and patient advocacy groups who receive the application of such knowledge. Medicine encompasses scientific aspects typified by physics as well as other aspects that transcend science. The 'use' of knowledge for the purpose of treatment is a fundamental nature of medicine, which cannot be reduced to a 'human biology.' Here again, the challenge

*1 An understanding of science that assumes science as progressing without being influenced by various interests in society, and a pursuit of the truth by scientists who possess autonomy.



lies in the use of knowledge. The idea of technology assessment, which comprehensively forecasts and analyzes the positive and negative effects of technologies also materialized around that time. This implies that there began to appear doubts to technocratic optimism that emphasizes the benefit of using science. As the 21st century drew closer, issues such as environmental problems that are beyond the scope of conventional discipline-based approaches became increasingly more recognized, and as a result initiatives such as Future Earth started to appear. Or we may say that **medicine, which has a much longer history than science, provided a model, and we arrived at the analogy of diagnosing and treating the earth itself**. Thence, environmental issues have prompted a drastic review of roles of academia.

Jane Lubchenco, an environmental scientist and marine ecologist, in a 1998 *Science* article entitled "Entering the Century of the Environment: A New Social Contract for

Science" argued that "impacts of human activities on ecological systems are becoming too significant to ignore, and science needs to respond quickly to social changes caused as a result and other emerging challenges." She called for "all scientists to devote their energies and talents to the most pressing problems of the day," and she claimed that "new fundamental research, faster and more effective transmission of new and existing knowledge to decision-makers, and better communication of this knowledge to the public will all be required to meet this challenge." Her argument which is based on the global environmental issues indicates fundamental perspectives in the consideration of how science and academia should be in the 21st century, as did the Budapest Declaration. In 2006, Jerome Ravetz asserted in his book *The No-Nonsense Guide to Science* that impacts on society of research that were rapidly progressing in developed countries such as those in the fields of genomics, the brain, artificial intelligence, nanotechnology,

and neuroscience would become too significant to ignore, and that the need for discussions about ethical, legal and social issues (ELSI) and similar considerations would become increasingly more important. He called such a pursuit “SHEE science,” the science of safety, health and the environment, plus ethics, and warned that S&T could run out of control unless these sciences are cultivated simultaneously. His suggestion of the acronym “SHEE” seems to contain certain gender-sensitive irony as SHEE stands for ‘soft’ sciences, as opposed to emerging hard sciences which are often associated with power.

So far, I have been writing from the perspective of the turning point in academia, but what about the social issues that academia is required to address? It seems there is a general awareness of the change in the nature of social issues we face, and attempts are being made to express these in various ways: ‘trans-scientific’ problems which “can be asked of science and yet which cannot be answered by science” alone; circumstances described as VUCA*² which are unpredictable and intricate; ‘wicked problems’ that are vague and elusive, and thus have no clear solution; and ‘systemic risk,’ a financial term that refers to the impact of a malfunction in an individual system on another system or the whole. And to describe the research required to tackle these problems, expressions such as transdisciplinary research and SSH integration were proposed, and the academic community worldwide is discussing enthusiastically about its promotion.

Here again, global environmental issues are significantly important. And these are, in fact, much larger in scale than how they are generally understood in Japan as scientific knowledge of global warming is now a prerequisite for discussions in SSH. For

example, research on community development and regional studies can no longer be conducted without considering global and environmental constraints. It is obvious that SSH is affected by questions such as what existing values we should change, and how we should rearrange social systems in order to respond to global environmental challenges. The SDGs is exactly a term that sums up this situation. Indeed, a tectonic shift is occurring slowly in academia, just as Lubchenco said that a new social contract was needed.

How do we express this situation, and how are we going to obtain solutions? Perhaps various terms are being coined from different disciplines and sectors because such questions are commonly shared, and all are aiming to reach the same goal. It is as if various people are trying to climb the same mountain from different trailheads. Some are climbing along an old trail of ‘SSH integration,’ others along a somewhat peculiar trail of ‘transdisciplinarity’ which is gaining more awareness recently. Yet others choose to climb along an old trail of ‘convergence of knowledge’ which has been recently renovated. Among them, RISTEX has been advocating STfS for 20 years, by establishing a trailhead as well as the trail route. While there are multiple entrances, we should understand that all of these share the same aspiration and goal, consider how to reach the summit, and put it into practice - this, I think, is the most important thing that we should keep in mind.

My Message at Present

S&T policy has shifted from S&T promotion to innovation policy, and has become more of a public policy now. There is a heightened

*2 An acronym for Volatility, Uncertainty, Complexity and Ambiguity. It refers to circumstances where the future is uncertain and difficult to predict. It was originally a military term but has been in the business vocabulary in recent years.

awareness of social implementation, and thus during the revision of the Basic Law, the term 'innovation' became included. Innovation is not something that merely aims to create economic values. Rather, it originally refers to what creates new social values and systems and contributes to solving social issues, and that is probably why a key term such as 'convergence of knowledge' was suggested in the first place.

Then, RISTEX can be said to have arrived at a similar idea and has been putting it into practice from quite early on. Recent S&T policy has become more inclined towards innovation policy, or public policy, and the intention to use the R&D outputs to create economic and social values is increasingly apparent. Research is no longer completed in the laboratory as it used to be, transcends the academic boundary and becomes used in society. And what was impossible in the past is rapidly becoming feasible. This is particularly true for information and bio technologies.

While more things are rapidly becoming feasible, questions that need to be addressed are **whether what really need to be implemented are feasible, and whether there are things that are feasible but should not be implemented**. Without relying entirely on scientists, society as a whole needs to engage in these questions and for that, approaches from SSH is indispensable. Such efforts, which have been referred to as research in ELSI since the 1990s, require approaches that are interdisciplinary as well as transdisciplinary for these need to look into the use of knowledge, and thus such research is something that is accordant with RISTEX's philosophy.

Researchers in S&T are required to take it as their obligation to consider what meaning the knowledge they produce have in society, while researchers of SSH should consider how to appropriately control the immense production of knowledge in S&T. These are examples of changes in academia that are required now.

Lastly, I would like to address how pure science in the conventional sense is going to be positioned in such a trend. From the viewpoint of pure scientists, there would be a criticism that the current trend places too much emphasis on S&T as a tool for innovation and social contribution. And they may assert that pure scientific thinking is essential as a foundation for S&T that can contribute to society, and thus a training for pure science is essential. Ultimately, we arrive at a fundamental question of **whether S&T should be something useful**, which imposes us to reconsider the freedom and responsibility of academic research. As to what should be questioned of science in the 21st century, would it not be how the era and society affect academic 'curiosity'? We may not need to assume that there is a mutually exclusive dichotomy between social contribution and researchers' curiosity. In the Dialogue #1, YOSHIKAWA Hiroyuki expressed that it was perfectly natural for us to have intellectual curiosity about issues of global environment and other social problems insofar as we live in modern society. Of course, it does not resolve every question related to pure science, but it is certainly an opinion worth listening attentively to.

社会技術 (S&T for Society): Incorporating the Idea of the Use of Scientific Knowledge

Connecting Curiosity-Driven Scientific Knowledge to Society

The concept of 社会技術 (*shakai-gijutsu*; S&T for Society) which RISTEX advocates, was scrutinized and shaped during the year 2000 by the Study Group on the Promotion of R&D of S&T for Society established in the then Science and Technology Agency. YOSHIKAWA Hiroyuki served as its chairperson, and applied his expertise in design theory/engineering to S&T in general to expand the potential of academic research in providing solutions to social issues by the use of scientific knowledge, expressing such a conduct 社会技術. To this day he continues to be a key figure in 社会技術, for articulating its theoretical aspects and advocating its importance. He generously accepted to take part in the first session of the dialogue series, to look back on the 20 years of 社会技術.



YOSHIKAWA Hiroyuki

Served as the president of the University of Tokyo, the president of the Science Council of Japan, the president of the International Council for Science (ICSU), and Director-General of the Center for R&D Strategy (CRDS), JST. Currently the president of the International Professional University of Technology in Tokyo/Osaka and a professor emeritus of the University of Tokyo. Major publications include: *Design Methodology for Research and Development Strategy*, CRDS, JST, 2012; "General Design Theory and a CAD System," *Proceedings of IFIP Working Group 5.2-5.3*, 1981; and *General Design Theory*, 2021 (in Japanese. The English version will be published in 2023).

Conceptualization of 社会技術 and Its Background

KOBAYASHI Tadashi (KT): It has been 20 years since the establishment of RISTEX (System), the predecessor of current RISTEX. I want to start our conversation with the term 社会技術 in the Japanese name of this organization. If we were to translate this term literally in English it would be something like 'society's technology,' which is very different from the official English name, the Research Institute of Science and Technology for Society. It seems obvious that the term 'Science and Technology for Society' derives from the Budapest Declaration in 1999.

YOSHIKAWA Hiroyuki (YH): I was invited to speak at the opening session of the Budapest Conference*¹ and gave a talk about how scientific knowledge should be 'used,' from the perspectives of my expertise in design engineering. The Budapest Declaration you mentioned was put together and announced at the end of this conference, and it was titled "Declaration on Science and the Use of Scientific Knowledge." In this phrase, the term 'use' had a significant meaning.

KT: Then you were serving as the president of the Science Council of Japan (SCJ), which is a huge responsibility, and on top of that you became the president of the International Council for Science

*1 An international scientific conference held in Budapest, Hungary, from June 26 to July 1, 1999, that was cosponsored by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Council for Science (ICSU).

(ICSU).^{*2}

YH: Yes. Back then, the ICSU consisted mainly of basic scientists and engineers were mostly observers. However, Bruce Alberts, then president of the National Academy of Sciences (NAS) was thinking ahead about the future roles of the ICSU. He approached me and said that the ICSU needed to engage more deeply with society, that science was mostly concerned with analysis and was not seriously considering how its knowledge could be applied to society, and that approaches and logics developed in the field of engineering would become increasingly more important in future. And he asked me to help him realize such future of the ICSU. At the time I was very busy due to the administrative reform in Japan as the president of the SCJ, but in the early summer of 1999, I became one of the candidates for the president of the ICSU and was elected at a meeting held in Egypt in September. I think it appeared rather odd to the circle of scientists in Japan that someone with an engineering background like me was welcomed in the ICSU, but international academia was already problematizing the dichotomy between science and engineering.

KT: I see. Unlike the term 科学技術 (*kagaku-gijutsu*) in Japanese, literally meaning 'science-technology' which implies certain vagueness in distinction between the two, the English term 'science and technology' treats them as separate entities linguistically. But in reality, academics were becoming more aware of the importance of bridging them by the 'use' of knowledge in order to address social issues.

YH: While I was the president at the ICSU, we consolidated what were called the ICSU family, 20 or so specialized committees each targeting different issues, into eight committees. It was very challenging because each had different interests, but we persuaded them over three days at a plenary meeting, convincing them that society needed us to work with more comprehensive frameworks. The eight committees emerged then later became the foundation of the Future Earth^{*3} initiative.

KT: So that is how different disciplines started to work together to deal with global-scale problems.

YH: Yes, and also, there was a clear motivation in academia to bring about a new trend in science, that is, to position 'environment' as a subject of basic science. Jane Lubchenco, who later become the administrator of the National Oceanic and Atmospheric Administration (NOAA), was among such advocates. She claimed that scientists should be able to express their opinions freely as they have autonomy regardless of their affiliation.

KT: She coined the term the 'social contract for science' as I recall.

YH: Yes. Scientists claim their autonomy and conduct whatever the research they want, but many of their research activities are publicly funded. Then, **why aren't they challenging the grave problems that humanity is facing? Not many researchers seem to be directing their intellectual curiosity to ethical problems, but is that acceptable? Shouldn't basic research include the consideration of how science could be used and the development of science desirable for society?** — she raised such questions, initially in the greeting speech as the president of the American Association for the Advancement of Science (AAAS), which was later published as an article in *Science*.^{*4} This had a tremendous impact. Incidentally, she became the president of ICSU after me, so I had a privilege of working with her for a year and a half. I recall her as a warm-hearted person.

KT: So internationally, there was a growing awareness of the importance of using academic knowledge for the benefit of society. Meanwhile in Japan, the Study Group on the Promotion of R&D of S&T for Society was set up in 2000. The group consisted of prestigious members with you as the chairperson.

YH: It was remarkable and left a strong impression. Discussions we had were incredibly fruitful.

KT: Its report defines 社会技術 as follows: "there is a

^{*2} A non-profit international academic institution established in 1931. It promoted international cooperation in S&T and provides advice to governments and society on S&T related issues. In 2018, it merged with the International Social Science Council (ISSC) to become the International Science Council (ISC).

^{*3} An international research network established in 2015. It aims to realize a sustainable society through research and innovation while collaborating with society.

^{*4} Jane Lubchenco "Entering the Century of the Environment: A New Social Contract for Science" *SCIENCE* Vol 279: 5350, 1998.

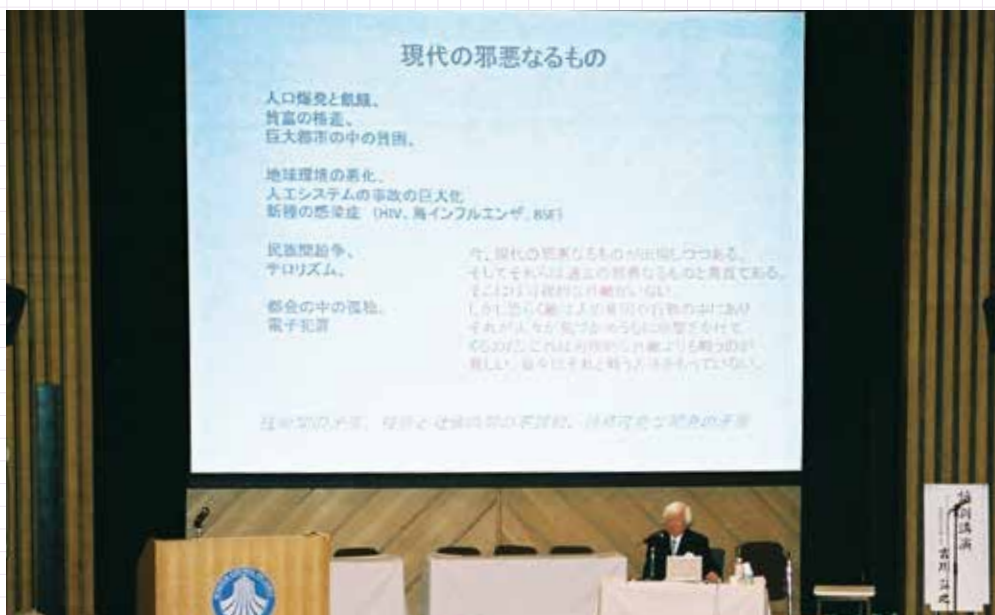
need to bring together technical knowledge mainly of natural sciences and knowledge of social sciences and humanities that analyze the nature and behavior of individuals and social groups, in an attempt to harmonize S&T with society, which includes the challenge of formulating new relationships between S&T and humans/societies. Technology (as an application of knowledge) **that synthesizes knowledge from multiple disciplines of natural sciences and social sciences and humanities to construct new social systems are regarded as 社会技術.**" What is described here 20 years ago still holds today. As it happened, the 6th STI Basic Plan was launched this year (FY2021), and it uses the expression 総合知 *sogo-chi* (convergence of knowledge). What it seems to refer to is practically the same as what were discussed in the Study Group then. That makes us realize how sharp the Group's visions were, and also wonder how we should accept that we are still stuck with the same problems today.

YH: We can interpret it as our framework finally gaining certain public legitimacy. At the time of the Study Group, there was a succession of nuclear accidents*⁵ and thus nuclear research was under heavy criticism. So, there was a need to think of a scenario for the betterment of future by analyzing the situation as carefully and objectively as possible. I suggested

that we needed to create a new discipline in which we could contemplate why such incidents occur, and expand the discussion to include the considerations of various other problems of the contemporary society.

KT: The definitions of 社会技術 and 文理融合 (SSH integration) seemed to vary considerably among academics.

YH: 社会技術 has been interpreted mainly in two ways. To some scholars it meant establishing a new discipline to respond to society's various needs, but my interpretation was that it aimed to use knowledge produced in basic research to solve social issues. Thus, **researchers who possess autonomy would and should direct their current curiosity to global and large-scale social problems which require interdisciplinary approaches, and such should be the responsibility of today's academia.** Natural science can be considered to have corresponding 'technology' which is its application. Likewise, I think there should be 'technologies' which are the applications of various findings in social sciences that solve social issues or that improves policymaking. That is what I consider as 社会技術. Then, despite the difficulty in integrating natural and social sciences, there would be a common language between the two



Symposium "The 10 years and the Future — 10 Years after Declaration on Science and the Use of Scientific Knowledge: Science in Society and Science for Society —" 2009. As Director-General of CRDS, JST

*⁵ In March 1997, a fire broke out at a reprocessing facility of the Power Reactor and Nuclear Fuel Development Corporation, and 37 people were exposed to radiation. In September 1999, a criticality accident occurred at JCO's nuclear fuel processing facility, resulting in two deaths from radiation exposure. The Japan Atomic Energy Research Institute, which was responsible for research on nuclear energy at that time, was dissolved in 2005 and became the Japan Atomic Energy Agency.

that expresses how and why knowledge is used, which may enable the integration.

KT: That's fascinating. So, the desire to transform Japanese academia was embedded in your concept of 社会技術.

社会技術 and Functionality as a Common Language

KT: I understand that is how the 'use of knowledge' became a global topic of interest at the turn of the century. There was an increasing international awareness of the need to deal with global environmental issues, and this prompted the conceptualization of 社会技術 in Japan, which materialized in RISTEX. It was one unique form of response Japan has made.

YH: Yes, I think it stemmed from the feeling of responsibility to make a real change.

KT: Regarding how to pursue research in 社会技術, "Basic Ideas About Research System" section of the report describes top-down, bottom-up and interactive communication between the two as the 3 approaches to promote research. As a top-down approach, RISTEX initially set up Mission Programs, in which appointed researchers conducted in-house research on given topics. However, after the organizational restructuring, its focus has shifted to the funding of research in 社会技術. Regarding the bottom-up approach, the report describes how surveys and hearings should be conducted widely to gather voices of citizens and experts, of which analysis serves as the foundation for a new funding scheme. Social issue surveys are still conducted today as the first step of establishing a new program.

YH: Supporting research on 社会技術 can be extremely difficult. For example, it is not easy for young researchers to write academic papers as it is not a simple conduct-experiments-and-collect-data procedure.

KT: That's one of the persisting problems. There always

are ambitious young researchers who are willing to commit themselves to social issues but doing so is less likely to result in academic papers that receive recognition. Thus 社会技術 is exciting but a risky option in terms of the academic career path.

YH: There are so few employment options for those engaged in this field, except for those already in tenure positions. **Not having an ecosystem to comprehensively nurture academia from regional to national levels is a serious problem.** Regarding research funding which are either national, industrial, or from other resources, there are more budgets from charities in the UK and the US compared to Japan, and this is where we see some cases of development of new disciplines.

KT: I agree. Also, there is a growing interest in forecasting and discussing, by integrating sciences and arts, issues related to social applications of AI and biotech. For a decade or so, research centers open to people with diverse backgrounds have been emerging around the world. Meanwhile in Japan, **there hardly are such cross-sectoral research centers** even within universities. RISTEX functions as such to some extent but I think it is too small to be impactful.

YH: I have high hopes for RISTEX, but there should be more social support. As we are trying to bring in more S&T in society, I think it is our duty to prepare a discipline that integrates natural sciences and SSH from early stages of conceptualization. As there are people from the corporate sector who agree with us, it seems feasible but the problem lies in the lack of incentives in the academia.

KT: I understand that design engineering which is your specialty is exactly the discipline that aims to achieve that, and in fact, I believe that is the objective of engineering. Japan though has long been used to being good at adopting and improving models and standards developed in other countries, and has not really tried **to come up with new standards for novel ways to solve problems.**



A scene from the online dialogue

YH: I think Japan is inexperienced in thinking in abstract terms when solving problems, as it is more accustomed to approaches based on physical objects. However, I think this is where design engineering truly exhibits its potential. In *General Design Theory* published in 2021, I suggested to look at various objects from the perspective of their 'functions' before considering materialistic and existential aspects.

By theorizing functionality, we realize that when we make things we are producing artefacts with different types of functions but they share the fact that they all have functions. When things are converted into physical things, they become specific artefacts but at the root, they all have **the common language of functionality**, and there is no division between natural sciences and SSH in such a language.

KT: I see. By focusing on functionality, we are free from the materialistic conditions of what exhibits the function and thus no longer bound to individual artefacts. So, if we were to focus on 'calculating' as a function, it doesn't matter whether it is delivered by proteins or silicon. Such an approach seems useful for R&D in S&T for Society.

Pursuit of Intellectual Curiosity and Research Rooted in Society

KT: What do you think would be typical examples of S&T for Society (STfS)?

YH: After the Great East Japan Earthquake, a sociologist NITAGAI Kamon conducted a survey in the affected areas, but the local people were reluctant to talk about the disaster. Then he noticed that they relaxed and spoke spontaneously whilst they were having foot baths provided by volunteers. So, he wrote down and analyzed the words they uttered. This I think is a model approach. Also, the ongoing COVID-19 pandemic would be a good example of problems to be tackled with STfS, as people's mobility and globalism are at the root of this issue. Perhaps it is possible for economists to lead R&D of STfS to devise new economic policies that would not accelerate further infection, for example. This would be a very timely challenge of STfS today.

As RISTEX has accumulated experiences of tackling complex social issues for 20 years, I think analyzing these and disseminating prototypes of research useful to society would expand the recognition of RISTEX's unique values. Communicating across R&D projects and programs is essential and so is archiving the research activities and achievements to accumulate

and pass on knowledges, especially to avoid the findings from previous projects becoming forgotten or lost during the process of official communication among affiliated ministries and agencies.

KT: I agree. We should try to prevent new projects starting from scratch each year because we lose contact with completed projects and fail to pass on their knowledge to new ones.

As we are nearing the end of this conversation, I would like to ask you for a message to those who are willing to engage in STfS. You once wrote in your book that researchers should be able to conduct curiosity-driven research freely, but they are somehow affected by the age they live in. Yet out emerge some researchers who contemplate what meanings their research may have to society, and that is the most desirable development of research.

YH: Yes. I once asked the audience “what is curiosity?” in an international conference. They all laughed, as they assumed that it was not something that needed a definition. However, we should remember that many centuries ago, people had curiosity about unknown substances and movements and thus tried to find out what those were. Then, **is it not natural for us to be curious about what would happen to the**

future of the earth? Contemporary malice such as environmental damage, population problems and warfare must be the subjects of our utmost curiosity - I remember serious academic discussions stemming from such conversations. **Not because you are asked to, but because you are curious and want to pursue should be the way research is conducted.** In many cases, such an idealistic pursuit doesn't fit into existing research frameworks, but I want the researchers to keep trying. Such research must be literally ideological, and the researcher should sincerely wish to make a contribution to society through academic activities. **I believe that is how future academia emerges and how academic contributions to the betterment of society is realized.** Once knowledge enters academia it is passed on to the next generation through education. Therefore, we seriously need to think how to realize such research. Of course it is important to write papers and secure academic positions, but I hope future researchers can conduct good research, with a free will, pursue intellectual curiosity and contemplate what they seek to understand.

KT: Thank you so much for sharing such meaningful and precious words.

(Tokyo/online, December 14, 2021)

Science, Technology and Humanity/Society: One Materialization of STfS

Dealing with Uncertainty and Importance of Meta-Analysis

MURAKAMI Yoichiro had been involved in the establishment of RISTEX (System) which later became RISTEX (Center), and acted as the Program Supervisor for Social System & Social Technology Theory, one of the earliest funding programs, and later, for Science Technology and Humanity program. He contributed to the establishment of a style characteristic to RISTEX, that is challenging tangible social issues by co-creation between researchers and stakeholders, and simultaneously furthering relevant theoretical consideration regarding science, technology and society. These programs have derived further R&D schemes, talents, and a management style which have been passed on to later programs. In this dialogue, the history of STfS was looked back by him and the Director-General KOBAYASHI Tadashi, who had participated in a project funded in Social System & Social Technology Theory and served as the Assistant Program Supervisor in Science Technology and Humanity.



MURAKAMI Yoichiro

Served as the Director of the Research Center for Advanced Science and Technology, the University of Tokyo, and the President of Toyo Eiwa University. Currently he is a professor emeritus at the University of Tokyo, and International Christian University, the Director of the Center for Next-Generation Civilization at Toyota Technological Institute, and Deputy President of the Aspen Institute Japan. He has numerous publications including: *Questioning Science at Present*, 2000; *Science of Safety and Security*, 2005; *What Is Science to Humanity?*, 2010; *Living in the Post-Corona World*, 2020; and *Who Is the Expert?*, 2022 (all in Japanese).

What Were Discussed at the Birth of 社会技術 (S&T for Society: STfS)

KOBAYASHI Tadashi (KT): 20 years ago, RISTEX (System), the predecessor of current RISTEX, was established. It is a privilege to look back the past 20 years with Professor Murakami. Then I was a member of a project led by FUJIGAKI Yuko*1 in Social System & Social Technology Theory, a funding program by RISTEX (System), of which Program Supervisor was you. In a subsequent program, Science Technology and Humanity, which started after the restructuring of RISTEX, I worked side by side with you in its management as you were the Program Supervisor and I was the Assistant Program

Supervisor. So in total, you served as the Program Supervisor for 12 years, which is astonishing! First of all, I would like to ask you about the birth of RISTEX (System) 20 years ago. If I remember correctly, you were a member of the Study Group on the Promotion of R&D of S&T for Society, which prompted the establishment of RISTEX.

MURAKAMI Yoichiro (MY): Yes. At the committee, we discussed **whether the term 社会技術 was meaningful in the first place** (as it is a neologism). While it is important to develop technologies that bring changes to society, it is also important for these to be implemented, and for this purpose experiments

*1 "Public Technology Governance: Towards the Construction of Social Technology Theory" project

need to be performed in the social setting, but such experiments are intrinsically different from those in the lab - as they unavoidably influence the actual society however little it may be. To what extent is that acceptable? Or should it be acceptable at all? The discussion expanded and we covered numerous fundamental questions.

KT: The report of this committee was released in 2000 - 20 years has past but what it says is still relevant today.

MY: Then there was an urge to give rise to a concept that was brand new as there had been a series of nuclear accidents and related scandals.

KT: In the report, the “characteristics of 社会技術 and challenges of R&D promotion” are described as “(1) technologies aimed to solve social problems, (2) technologies attainable by the integration of natural sciences and social sciences and humanities, and (3) technologies on which the market mechanism has little impact.” These expressions are still used in the description of current RISTEX.

MY: That (2) is important in achieving (1) is the core message here - **since a society consists fundamentally of people, we cannot neglect the contributions of research about people and society.**

KT: In the description of the principle of 社会技術, it is stated that knowledge has become fragmented in the process of S&T advancement and thus is losing ability to view comprehensively what is going on. I think this still applies today. That is why social issues need to be challenged with research that is open to society.

MY: Yes. Then science, technology and society (STS) was already established overseas as an academic discipline that focused on issues related to S&T and society, but Japan was still in the early phase of setting up an academic society for STS.

Funding Programs: Social System & Social Technology Theory and Science Technology and Humanity

KT: I would like to hear about your experience as the Program Supervisor, firstly, of Social System & Social Technology Theory.

MY: There were many interesting projects, such as the project led by WATANABE Yutaka.*² He looked into the problem of trailer trucks loaded with imported container cargo rolling over on curves, even at a speed below the legal limit. In the worst case, the fall resulted in the death of a pedestrian. So he tried to deal with this problem, and carried out experiments using the actual truck.

KT: It was a practical R&D of a system which detects the truck’s center of gravity, so it had an immense social impact. Later on, the Ministry of Land, Infrastructure, Transport and Tourism issued a handbook on the safe transportation of imported containers, which included a measure against such accidents, so the system developed in this project became no longer needed. But perhaps this project had an indirect influence by raising the social awareness of this issue, so it is difficult to evaluate the project’s impact appropriately. What about the subsequent program, Science Technology and Humanity? I remember many on-site visits and research retreats.

MY: We also organized an international conference. There was a great variety of projects and that was very interesting. For example, in the project led by a lawyer, NAKAMURA Tamiko,*³ it was expressed that the court was a place to determine the winner and the loser, rather than a place to seek the truth - I never thought of it that way, so it astonished me.

KT: I too remember it clearly. When lawyers who possess such an interest collaborate with scientists who seek truth in a project together, the difference in problem recognition due to disciplinary differences becomes vivid. Also, we needed to contemplate what was at stake, that is, winning at the court by

*² “Creating Safe Logistics in an Import-Dependent Society” project

*³ “Legal Decision-making under Scientific Uncertainty” project



skillfully using science, and how to handle uncertainty associated with science.

MY: When you think about it, there is uncertainty in most of the problems in our society today, like COVID-19.

KT: I agree. In the case of COVID-19, what scientists were saying last year is completely different from what they claim now, but that is not because they were wrong then. They are merely **trying to figure out what is happening but there is always uncertainty associated with scientific investigation.**

MY: Hence the importance of focus on uncertainty, to this day. Global warming is the same, is it not.

KT: Talking about uncertainty, it reminds me of the complexity and difficulty we had to face when the Great East Japan Earthquake hit just before Science Technology and Humanity program ended. Besides, it is very important to gather research outputs and analyze them for the production of meta-knowledge after projects have ended. Or to continue discussions and examinations in order to review or update existing knowledge. Sadly though, it is yet difficult to secure a budget for such meta-analyses and activities in Japan. Some researchers are willing to do so, but there hardly is a lasting system in which they can engage in such activities autonomously. This is probably a problem of

funding.

MY: Why don't you start a new program with that as the research theme? Research of funding agencies by a funding agency. That would be an important meta investigation. I think RISTEX is about the only funding agency which can put it in practice.

KT: That is intriguing. Incidentally, RISTEX has been funding R&D in science, technology and society after the two programs you supervised: Human-Information Technology Ecosystem (HITE) and Responsible Innovation with Conscience and Agility (RInCA). The latter is a program that looks at ethical, legal, and social issues/implications (ELSI) and responsible research and innovation (RRI) of emerging science and technology. In these programs, some, if not many, researchers who gained experiences and networks that were built in your programs are indeed flourishing. Looking around, we notice that it is becoming increasingly more common to require publicly-funded large-scale research projects to appropriately address ELSI, especially if they are aiming for social implementation that could have a significant social impact.

MY: Yes. I am currently in charge of organizing Aspen Seminars*⁴ in which leaders of various industries, and sub-top talents from corporations are invited to read

*4 Seminars organized by the Aspen Institute Japan in which leaders and future leaders in various sectors engage in intense dialogue regarding the reading of classic texts.

and discuss classic texts, and I find them very keen to discuss corporate governance and corporate ethics. When I talk to them about ELSI, they immediately understand the idea. So in a sense, the notions of ELSI and RRI are gaining more recognition in society, which makes me feel that such ways of thinking and dealing with potential social impact is surely being nurtured.

Importance of Problem-Setting from a Wide Perspective and Highly Abstract Discussions

KT: The other day, I learned from my friend the term 'public understanding of philosophy.' Apparently, Angie Hobbs, a researcher of ancient philosophy at the University of Sheffield, UK, was appointed to a position titled so. I don't think such a concept would come about in Japan.

MY: What a skillful expression that is. While we know that 'public understanding of science' was an important framework in the consideration of science, technology and society, particularly in 1990s' Britain, I didn't know about such an intriguing derivative.

KT: I also hear that the UK Research and Innovation

(UKRI) has set up a funding scheme called Trustworthy Autonomous Systems (TAS) Hub. What should be taken into account in order to realize a trustworthy autonomous system? - this is the grand research question they set. Then, a wide range of topics fall under this umbrella, including autonomous driving, robots, avatars, and even computational finance. This enables them to **conduct research at a more abstract level, without being bound to individual technologies.**

MY: Perhaps such abstractness is not as highly regarded in Japanese research culture.

KT: It tends to be expressed negatively such as 'hard to understand' and 'ambiguous.' But after all, is it not Japan that ends up being stuck in the very narrow competitions of individual spec improvement within a ready-made system that comprises of overseas discourses and concepts.

MY: Then, it may be possible to say that continuing to have poor meta perspectives is in a sense detrimental to the benefit of the nation. I think such philosophical consideration needs to be thoroughly scrutinized especially when we consider the positioning of Japan



Website of 'Interaction Between Science, Technology and Society' subprogram of Science Technology and Humanity R&D program



As the Program Supervisor for Science Technology and Humanity (2014)

in the global society. The key lies in how bad we are at looking at things from meta perspectives. This is a crucial impediment.

KT: To approach from meta perspectives is exactly what we have been pursuing in our specialty, that is, history and philosophy of science, and STS.

MY: In the University of Tokyo where we were, the courses provided by the Department of History and Philosophy of Science were a part of liberal arts education, and I would think amateurism was its philosophical attitude. That is, to regard free speech as a fundamental value, and historically speaking, it was originally outside of academia but became specialized into a discipline. There are many outstanding researchers, but perhaps they are not so distinctively making contributions from meta perspectives. When the Japanese Society for STS was established, I remember asking them **not to place too much weight on publishing academic papers.** Nevertheless, academic research conduct is unavoidably inclined towards production of papers as experts. There seems to be certain reluctance towards stepping back and grasping the issue from a different perspective.

KT: I understand. And that seems to result in many researchers backing off from problems that go beyond their specialties, as they are 'out of their scopes.' **There**

certainly are more experts but do we have more intellectuals? Policymakers too are increasingly more aware of the necessity of ELSI, which is good, but there also is a criticism against such a trend, claiming that it waters down the critical mindset that was fabricated in the notion of ELSI. A balance between these two is extremely difficult.

MY: What industries and policymakers refer to as ELSI now is not the same thing as the ELSI which have been discussed in such a manner, is it?

KT: No. I think with the changes in the nature of S&T in society, the establishment is beginning to pronounce that ELSI is important, as a gesture to acknowledge the new approaches and significant changes in addressing such a matter.

MY: When the S&T Basic Law was enacted, it excluded social sciences and humanities (SSH), but this was amended recently, and science, technology and innovation (STI) policy has shifted to actively seek collaboration with SSH. As SSH is now positioned as essential in the promotion of STI, this phenomenon needs to be examined from a meta perspective. In that sense, perhaps we should consider, say, 'public acceptance of humanities.' In other words, we ought to really comprehend the importance of humanities in the public world.

KT: Meanwhile, there always exist some science students who are interested in issues related to social aspects and ethics of science.

MY: Yes. But many graduate schools in S&T regard them like dropouts although they are indeed precious talents.

KT: I agree. I think it is important to secure at least one lab that looks into such topics in science departments because then, such students can reach us, and perhaps we can secure future researchers of STfS.

MY: It would be ideal if the same from SSH is possible, but I think that is much harder. It seems more practical

to start by building a career path from sciences. To go even further, we may no longer need to restrict our scope to the conventional S&T if we were to seriously consider the future of STfS. If 'public understanding of philosophy' is a valid framework, I'm sure 'SSH and society' can be a topic of STfS. This dialogue made me realize this, so I shall note it for future consideration.

When engaging in STfS, or more generally, something that would make better the society, perhaps we must consider the relationship between society and 'scientia,' the original Latin word for science that means knowledge as a whole.

(Tokyo, December 21, 2021)

Seeking the Mechanism for Accumulation and Succession

Anticipated Roles of the S&T for Society Research Forum

KOBAYASHI Shinichi, who has long been committed to the research and practice of S&T policy, was also a key person in establishing RISTEX (System), the predecessor of current RISTEX. He introduced to relevant officers and institutions the theories that founded the concept of S&T for Society (STfS) and conducted surveys to further the consideration. Moreover, he set up the S&T for Society Research Forum, which was designed to function as a sustainable cycle of knowledge that allowed knowledge and experiences of STfS to be accumulated and applied further. Although the Forum was discontinued after the organizational reform, a need for such a mechanism is increasingly more apparent today. In this dialogue, such functions of the Forum in securing the future of STfS was scrutinized.



KOBAYASHI Shinichi

Served as the Director of Research at the National Institute of Science and Technology and Policy, a Professor at the University of Tsukuba, the Director at Center for Technology and Social Research, the National Institute of Advanced Industrial Science and Technology, and a Senior Specialist at the National Diet Library. Currently, he is the Director of the Research Institute for Higher Education and the Dean of the Graduate School of Humanities and Social Sciences at Hiroshima University. Major publications include: Wen and Kobayashi “Exploring collaborative R&D network” *Research Policy*, 2001; “Savages in a Civilized Society” in *R&D Strategies in Japan* (Etoh ed.), 1993; and “Technology Assessment Activity at the National Diet Library of Japan” in *Technology Assessment in Japan and Europe* (Moniz and Okuwada eds.) 2016. He is known for the Japanese translation of *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies* by Michael Gibbons et al.

The Aim of the Forum: a Mechanism to Sustain STfS

KOBAYASHI Tadashi (KT): It’s been 20 years since the birth of current RISTEX’s predecessor, RISTEX (System). Then there was a ministerial reform and in the newly established the Ministry of Education, Culture, Sports, Science and Technology (MEXT), after the merging of the Science and Technology Agency and the Ministry of Education, Science Sports and Culture, there was a discussion about what roles the ex-S&T Agency should play.

from researchers in various disciplines, and obtained a list of research topics. These I think became the original candidates of research topics that RISTEX was to engage. But we struggled to attain an umbrella concept that described the essence of these topics. After much consideration, 公共技術 (public technology) was suggested but it had a nuance of civil engineering, so we continued to seek the right expression and finally arrived at 社会技術.

KT: Which is equated as ‘S&T for Society’ in English. This is a part of the phrase, “science in society, science for society” of the Budapest Declaration.

KOBAYASHI Shinichi (KS): Yes. So I sought for ideas

KS: Yes. In fact, I was the one who decided to use S&T for Society, and then I wanted to incorporate both 'in' and 'for.' RISTEX (System) was established by the joint effort between JAERI*¹ and JST. I think the series of nuclear power related incidents then influenced on the decision. As S&T 'in society' was just beginning to gain certain recognition then, I didn't think many people were yet convinced by the idea, so I adopted S&T 'for society' alone.

KT: What was your position then?

KS: I was in charge of practical matters as the Vice Chairperson of the S&T for Society Research Forum (Forum), which was a section of RISTEX (System).

KT: We can still access online JST's announcement about the establishment of RISTEX (System) on July 18, 2001.*² It says that JAERI and JST jointly promote research by establishing RISTEX (System) as a practical institution to promote technologies for building new social systems by integrating multiple disciplines from natural sciences, social sciences and humanities (i.e., STfS). Further, it describes the structure of practice as consisting of 3 programs: (1) Mission Programs (by JAERI), (2) Funding Programs (by JST), and (3) S&T for Society Research Forum (by JAERI and JST). You were in charge of the (3), **the Forum which was to extract the fundamental problems underlining social issues and to discuss continuously how to deal with such problems by the conduct of issue-driven research.**

KS: Within RISTEX my role was the management of the Forum, but I was involved in RISTEX from its establishment, and was engaged in designing its programs and functions. Based on such experiences, I think the Mission Programs had certain difficulties in collaborating with RISTEX (System) itself and also with surrounding organizations because it was allocated a large budget from JAERI and thus became like an independent organization within an organization. As for the funding program, there was no established format yet. So the Forum was to coordinate the two programs. The funding program of RISTEX (System) was unusual in many ways compared to conventional programs.

This is due to the experience of experimental efforts at the Takeda Foundation which was established in 2001. They started funding research on advanced S&T and society from the perspectives of people living in society, and I was involved in trying out various approaches to the project selection procedure. **For example, we set up a session in which research proposers needed to discuss with each other, for them to remain candidates.** We tried novel approaches as the most important thing in promoting good research is setting good research topics and building a good organizational structure with a good combination of people. That call was international, so the discussion was actually conducted online and in English. Candidates were apprehensive at first, but once it took place, they understood why it was important and thus the procedure received good feedback.*³

KT: That sounds interesting. What was behind such a novel selection procedure?

KS: In the 1990s, the Swiss National Science Foundation (SNSF) had already started transdisciplinary pursuits such as public participation and open discussions especially about environmental issues. When I saw that, I realized that we were already in need of different approaches to conventional basic research.

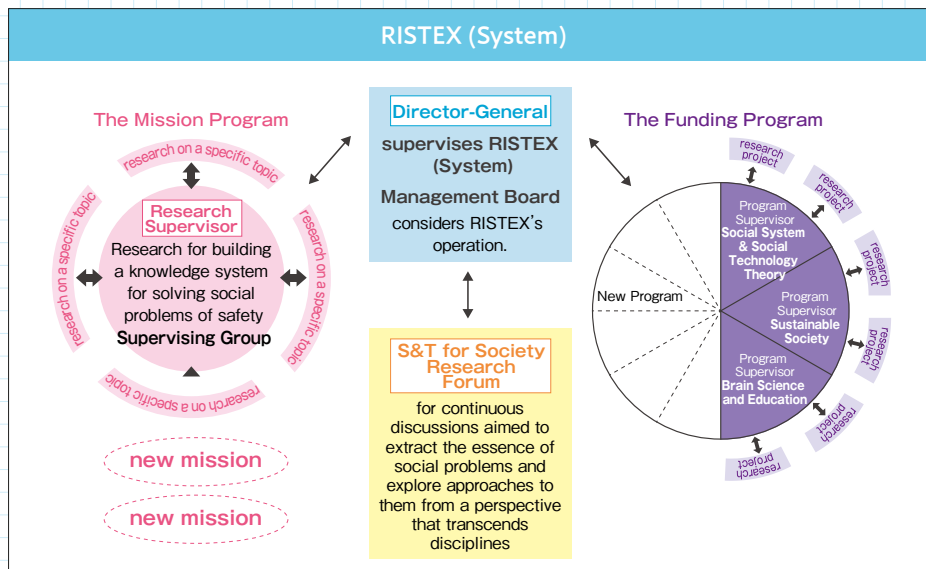
KT: That way of thinking sounds like a typical 'Mode 2' approach, of the theory of knowledge production modes, which argues that there are two types of relationship between S&T and society. In Mode 2, knowledge is not produced within the established framework of given academic disciplines, but starts with the recognition of specific problems and incorporates various knowledges to solve these. For that, new knowledge may be willingly produced, and that can transcend the existing disciplinary boundaries. You were experimenting a new approach to the conduct of research.

KS: Yes. While studying the transdisciplinary activities that were developing in Europe, I was wondering what could be done in Japan. And we took actions whenever we could, such as including the stakeholder

*1 Japan Atomic Energy Research Institute

*2 <http://www.jst.go.jp/pr/announce/20010718/sankou.html>

*3 Kazuyoshi Shimada, Mitsuo Akagi, Tohru Kazamaki and Shinichi Kobayashi "Designing a proposal review process to facilitate interdisciplinary research" *Research Evaluation*, 16:1, 2007.



participation in the proposal requirement. Since the Mode 2 knowledge production starts from defining the problem which is not done solely by researchers, the crucial part is in initiating a co-design / co-creation process. With that in our mind, we attempted various approaches. Other than that, I was involved in designing the research retreats for the Mission Program. As Mission Program research was conducted without setting a clear goal, we organized the retreat so that researchers could discuss the directions of their research.

KT: The culture of retreats is still a core characteristic of R&D in RISTEX, although these are currently conducted largely online due to the spread of COVID-19.

KS: Talking about the characteristics of RISTEX, I gave a speech in a Forum session about 'demonstration and implementation' based on the discussion in Europe. Unlike basic research, STfS **is expected to be conducted with clear outputs**. But the actual implementation needs to rely on NPOs and corporates. So, based on what these terms signified in the European discussion then, I translated demonstration as 試行 of which literal meaning is experimental trials, and implementation as 活用, literally, utilization or application, because there was yet a fair degree of reluctance toward implementation per se. Retrospectively, I think my role was in the

articulation of these notions, that what could be done within the framework of research is demonstration, and application which is prior to the actual implementation. I would also emphasize that social implementation is an idea that can only come from mode 2, as the classic linear model of innovation is progressive and assumes diffusion spontaneous.

KT: Now we hear social implementation emphasized in many places, but at RISTEX, we still regard R&D as conducting not the implementation itself but one step before it. Besides, the Mission Program and the funding programs directly promoted research, but the Forum was somewhat different in its nature as I understand it.

KS: I chose the term 'forum' to signify a place where anyone interested could gather and deliberate - people who are interested, and members of completed projects could gather, and share the network and knowledges accumulated.

When RISTEX (System) was about to start, I had frequent meetings with the director in charge at the MEXT. There, we realized that **a mechanism to facilitate the continuous R&D in STfS** was needed, and we considered setting up a unit like an independent lab, which looked across projects and identified what would become necessary next. This idea was further elaborated and we decided to add a function as an open 'forum' in which various

opinions could be expressed. **We wanted to build a mechanism to involve people who engaged in important activities, in order to share and accumulate academic knowledge as well as the practice of identifying potential research topics, researchers, and methodology, as that could be the engine for driving STFS.** Otherwise, methods and networks of people cannot be used widely by others and become wasteful. New research topics were bound to emerge if people with the experience of STFS gathered and discussed, but perhaps it was too bold an approach at the time. Then the initial projects had just started, and the mechanism which was designed to function after the completion of projects could not be realized, which was unfortunate.

The Importance of Researchers and People in Society to Think Together in a Transdisciplinary Manner

KS: The term 'transdisciplinary' is still translated as 超学際, literally 'super-interdisciplinary.' This often gives a wrong impression that it is a superior version of interdisciplinary research, which causes a problem of not positioning stakeholders rightly as equal partners, and thus, mistakenly regarding social aspects too lightly and assuming researchers as benevolent figures who do research for people. To avoid that,

Europeans today describe transdisciplinary research as 'interdisciplinary research plus co-creation with society.'

KT: And in Japan, co-creation with society tends to be equated with the academic-industrial alliance. 総合知 *sogo-chi* (translated as convergence of knowledge, but literally, comprehensive knowledge) should also have the connotation of transdisciplinarity, but some arguments assume its implication very narrowly to merely mean a tool for innovation. In that sense, R&D with stakeholders that RISTEX has been promoting is truly transdisciplinary in its nature.

KS: I agree, and I think RISTEX was very aware of that especially in early times. For example, the project for tsunami evacuation lead by KATADA Toshitaka, and the project for simulating infectious diseases led by NISHIURA Hiroshi (for both projects, see the Timeline) had significant social impacts. The fact that RISTEX has provided research opportunities to such projects implies how cost-effective RISTEX is even among other JST programs. Then, I think **it is important to make what have been achieved in RISTEX visible.** In other words, **a core unit or entity that functions as a living archive is needed,** so that any inquiry about the past achievements can be easily referred to. Just having a list of projects is not very meaningful. All the more



The Danish Board of Technology, 2002



reasons why we should always be able to grasp the accumulation of STfS.

Speaking of 総合知, recently I have been concerned about the way the politics and the government decide the direction of S&T, which began to be observable since the Thatcher administration in the UK, and I have argued that in a paper.*⁴ Historically, in Japan, the only instance politicians interfered in research and education was in the prewar army, but lately there has been a tendency for politics to judge what is good for research and education.

KT: Today's authorities around the world are increasingly more interested in controlling the direction of research so that more social impact can be generated efficiently.

KS: 総合知, if driven in a wrong direction, could become detrimental to R&D. But the reality is, **we can no longer generate innovation or develop solutions to social issues such as poverty, or more generally, disparity, without transdisciplinarity - we need to incorporate what we can gather.**

KT: Hence poverty, or disparity, can be a potential research topic in RISTEX, but if we were to set up a corresponding funding program, coordination is required between us and the MEXT which has jurisdiction over JST, as well as the Ministry of Health, Labour and Welfare and the Ministry of Economy,

Trade and Industry. Then, we really do have to take into consideration the influence of politics and determine how much freedom we have. Around 2016, I attended a meeting for presidents of universities in Europe and Japan. There I heard one British president saying that society was becoming less generous to universities. **Universities used to be respected, but nowadays people ask what they can do for them.** That was striking as the same could be said in Japan, too. With such a social change, what do you think should RISTEX, as a funding agency that has been promoting transdisciplinary research for 20 years, be aware of in future? And how do you think should universities change in future?

KS: There are merits to government officers and politicians deciding research topics but ultimately, **researchers and people in society need to think together to identify what the truly fundamental problems are.** In fact, there already existed an argument in the 1970s about the need for a platform where people with various interests could gather and discuss when deciding important research topics. There was a question about research structure, that is, whether to conduct research in projects or in organizations. Project-based research is promoted by JST and Japan Society for the Promotion of Science (JSPS), but **Japan is lacking a platform for organization-based research.** As a result of the weight on competitive research fund, much of the research has

*⁴ Shinichi Kobayashi and Eriko Fukumoto "The Endless Overcontrol and Overadaptation: Consequences of National University Reform in Japan" *Hitotsubashi Business Review*, 69:2, 2021.

become project-based. This is of course important, but we are yet to achieve a mechanism of organizational research which can continuously engage in discussions across various disciplines, prior to identification of individual research topics. **Issue-driven research is important, but discovering problems is the most essential. Current S&T policy is running without that mechanism. What I hoped for was such a function to be equipped in RISTEX.**

KT: After the Great East Japan Earthquake, I had an opportunity to discuss with bureaucrats and NPOs, and I asked them what they expected from experts. To that, **everyone answered that they wanted experts to think along with them. They wanted experts not to instruct them, but to think together with them.**

KS: Universities must understand that. And although current strategies look to achieve more outputs efficiently in short periods of time, they should know that Japanese S&T is actually not bad in terms of the stock of research resources and outputs. But these days, research areas are disappearing. **Although there still are many studies that are considered rather important worldwide, not much is passed on.**

It is important to make good use of their legacy, also it would be accordant with the concept of SDGs.

KT: Researchers tend to be interested in being the front runners in their research fields, but development targeting surviving markets are in fact valuable. Also, RISTEX normally calls for research proposals for 3 years, and funds individual projects typically for 3 years. However, for issues such as the aging society continues long after the program is ended. Thus, **without a mechanism to preserve knowledges accumulated, we may need to repeat starting from scratch,** which is my concern.

KS: In that sense, my biggest regret is that we could not realize such a function. It would be great if we could create such a system.

KT: Today I have realized once again that the mechanism for the continued pursuit of STFS, which was lost in the past is increasingly more necessary now. Thank you very much for a very important input.

(Hiroshima, December 27, 2021)

Facilitate S&T for Society and Pass on to the Future

From the perspective of R&D Planning and Management

ARIMOTO Tateo is a practitioner who has been actively participating in international discussions about science, technology and innovation (STI) policy as a bureaucrat. He had served as the Director-General of RISTEX from 2006 to 2012, for nearly 7 years, during which time RISTEX's R&D management was established. He experienced the Great East Japan Earthquake as the head of RISTEX and devoted himself to the urgent call for proposals and implementation focusing on the recovery of the affected areas. He is currently a Principal Fellow at the Center for Research and Development Strategy (CRDS), JST, a Visiting Professor at the National Graduate Institute for Policy Studies (GRIPS), and a Fellow of International Science Council, committed to provide international forums and agendas that are directly linked to STI policy, and to promote international discussions about transdisciplinary research and scientific advice. In this dialogue, he pointed us to the perspectives important for future RISTEX and Japanese R&D in general, based on his many years of experience.



ARIMOTO Tateo

A Visiting Professor at the National Graduate Institute for Policy Studies (GRIPS) and a Principal Fellow at the Center for Research and Development Strategy (CRDS), JST. He served as the Deputy Director-General for Science and Technology Policy, the Cabinet Office, the Director-General, Science and Technology Policy Bureau, the Ministry of Education, Culture, Sports, Science and Technology (MEXT), and many more. From 2006 to 2012, he served as the Director-General of RISTEX. Major publications include: Sato & Arimoto Ch24: Japan in *UNESCO Science Report*, 2015; Sato & Arimoto "Five years after Fukushima: scientific advice in Japan" *Palgrave Communications*, 2016; and "The opportunity of COVID-19 to redesign our scientific advice systems" *International Network for Government Science Advice (INGSA)*, 2020.

The 2nd Science and Technology Basic Plan, Budapest Declaration, and S&T for Society

KOBAYASHI Tadashi (KT): You are the longest serving Director-General in the history of RISTEX. 20 years ago, you were involved in formulating the 2nd S&T Basic Plan. In 1999, the Budapest Declaration was adopted in the UNESCO World Conference on Science - there indeed were some drastic changes related to science and society then.

ARIMOTO Tateo (AT): Yes. In March 2001, the 2nd S&T Basic Plan was approved by the Cabinet, of

which contents had been discussed for more than a year previously in a task force of the former Science and Technology Agency. Then I was the Director in charge of the task force. In January 2001, the Council for Science and Technology Policy (CSTP) was established in the Cabinet Office, to which I was transferred, and my first job was to participate in the making of the Basic Plan. There, at the very end of the designing process, we decided to include a whole chapter on issues related to science and society. It came to materialization thanks to the works by great academics such as Professor YOSHIKAWA Hiroyuki, Professor IMURA Hiroo, and Professor ISHII Shiro. Their discussions paved the way to the

establishment of RISTEX (System) as an organization for the actual implementation. It was initially based on a cooperative partnership between the Japan Atomic Energy Research Institute (JAERI) and JST, which later became integrated entirely into JST and re-established as the current RISTEX in 2005. At that time, we had to concentrate our resources on research projects, but when we had enough cases in our hand, there should have been a mechanism to systematically analyze accumulated cases at a meta-level to improve the designing of new funding programs as well as the R&D management. I am regretful that I could not set that up in RISTEX. Marking the 20th anniversary, perhaps now is a good time to reconsider such a system.

KT: You became the Director-General in 2006.

AT: When I took over from Professor ICHIKAWA Atsunobu, the first Director-General of RISTEX, he said to me that we had to discuss with scientists while also exchanging opinions with the government and citizens. As the Director-General needed to have the ability to do both, being generous was a particularly important temperament. He also said that both researchers receiving funding and the management staff at RISTEX were experiencing many difficulties as they were challenging something radically different from the conventional scientific research. So, the Director-General should always take that into account. He further asked me to make efforts in increasing the presence of RISTEX which was a novel organization. As for the practical aspect, he said that the quality and performance of a program depended on who became the Program Supervisor, so a great care should be taken when deciding who should take up this role. Finally, he said that he considered 社会技術 *shakai-gijutsu* (social science and engineering) as a process. Being able to take over his wish for this 'process' to be given full consideration was a privilege for a practitioner such as myself.

KT: I understand that the exact procedure of deciding a research topic and designing a corresponding funding program, as well as the details of how to actually manage the program had been established

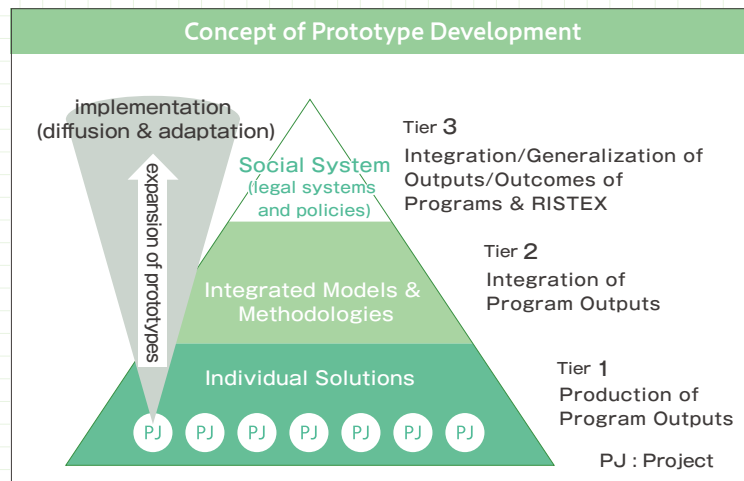
whilst you were the Director-General.

AT: I think RISTEX is avant-garde as an S&T funding agency, for constantly experimenting something. It takes care of the entire process from designing, funding, managing, and evaluating, to giving back to society what have been achieved in R&D. What is more, the R&D in RISTEX engages in solving problems of local communities of which conditions, cultures and histories are different, not only as individual projects, but also as a funding program. When I was the Director-General, I attempted to analyze more than 100 projects to elucidate common methods, characteristics, and other peculiarities. There is a diagram of the three-tier structure of RISTEX, which is still used in its brochure. This is what previously mentioned Professor ISHII proposed by pointing out the similarity between RISTEX's method of R&D promotion and the three-tier circulation model of modern civil law. The diagram indicates that in the first tier, the level of individual projects, various cases are collected and in the second tier, these cases are classified to extract methodology and similarities. I believe such synthesized and generalized knowledge makes RISTEX unique compared to other JST and government wide funding programs, whilst making its methodology easily applicable to other programs. Upholding STFS means its scope is society as a whole. It is hard but it is its strength.

KT: It would be great, though, if we could collaborate more with other sections in JST, especially CRDS that functions as a think-tank.

AT: At the beginning, the method employed by RISTEX was not understood by others, including those in JST. Today, however, there are many funding schemes outside of RISTEX that also aim to solve social issues. I hope knowledges and methods become shared throughout JST and government agencies effectively. The same applies to the collaborative efforts with the SciREX program.*¹ Perhaps (as a little joke) we should dig a hole at the entrance of JST and bury our vision of 'S&T for Society 2030,' as a gesture of our commitment to ensure this is realized by the time we compile the 30-

*1 Science for REdesigning Science, Technology and Innovation Policy (SciREX) is a governmental program that focuses on research and education for establishing evidence-based science policies (<https://scirex.grips.ac.jp/en/>).



year chronicle of RISTEX.

To Strengthen Japan's Research Abilities

AT: The 6th STI Basic Plan boldly incorporated unprecedented values such as the social transformation and well-being. We need to be seriously committed to it. Otherwise, we will face criticisms in 5 years' time.

KT: Regarding one of the key terms, convergence of knowledge, RISTEX has in fact a history of such practice, but how could this be more widely known among the government officers?

AT: As we are entering the era of seeking sustainability, resilience, and well-being, there is a stronger need for the government to improve its capabilities. This is referred to as the 'dynamic capability' in OECD. For instance, when a Japanese researcher wins the Nobel Prize, mass media in this country tends to focus on telling stories about the laureate's families and pupils. But I think they should also look into **how it was supported, particularly with institutional and financial systems that are implemented in our research community.** Professor KAJITA Takaaki's research that won the prize for the discovery of neutrino oscillations was enabled with a large funding. When Professor KOSHIBA Masatoshi was awarded the Prize for detecting cosmic neutrinos, I asked Japan's *Science News* to write a feature article

narratively about how it was made possible. At that time, Mr. HIRUMA Teruo, the president of Hamamatsu Photonics, developed supersized photomultiplier tubes (PMTs), and thus was able to install numerous PMTs underground. In addition, then Director of the former Ministry of Education accurately recognized the importance of Kamiokande. He realized that the process of examination and decision-making for large-scale academic projects then was too slow to reach a conclusion by the time neutrinos generated by a large explosion in the Large Magellanic Cloud reached the earth, so he intentionally sped up the process.

Collaborative efforts by various stakeholders such as this is hardly told. However, such a story of division of labors being widely shared is extremely important - that being able to express the 5W1H, passing on the knowledge and the experiences for everyone to share and use them - should strengthen the research capabilities in Japan.

KT: The same can be said about RISTEX in terms of how it has been devising creative ways of management.

AT: When setting up a new funding program in RISTEX, I said we should organize a large workshop with a wide range of stakeholders, and when a topic of importance was identified, we should go and interview at least 100 people across the country.

KT: You are the one who made this flow of work?

AT: Yes. Conducting surveys of social issues comprehensively from various perspectives and discussing which issues require particular attention based on the survey results, so that we have a 'stock' of potential topics for funding programs. When one topic is selected, interviewing a wide variety of people who possess diverse sets of values, problems and needs and live in various regions - I think it is similar to how EU's Horizon Europe sets up a new program now as they also frequently organize workshops and seminars. After interviewing 100 people, the topic is made more specific and smaller workshops are held, during which time persons suited to become the Program Supervisor and Advisors are identified based on how they direct the discussion.

KT: Once there was a question about the fairness in the project selection and to that I remember you saying "it may be so technically, but when starting a funding scheme in a novel and exploratory manner, it must be acceptable as we are trying to make something good, and I will take the responsibility for it." Logically speaking, participants of such workshops are advantageous in applying for the funding, but when creating something new with such a topic, you need to be determined to an extent. I took your words as a message to all of us and I was greatly impressed by it.

AT: There were cases where I had to push forward certain decisions by adjusting perfunctory rules so that we could achieve the objective. As a matter of comparison, Japan Society for the Promotion of Science (JSPS) is more widely known than JST in the research community as the grants are more easily attained and



the funding scheme is easier to comprehend as it is the standard style adopted worldwide. Meanwhile, JST's funding is more competitive and requires more labor. And those who know RISTEX are even fewer. On top of that, RISTEX's programs cost more as it designs, manages and finishes up each program through trial and error. Funding research in a bottom-up manner like JSPS is important but promoting research that solves social issues such as the opportunities provided by RISTEX is also important, and that is costly. **We need to ensure that people understand that this is an investment towards the mission-oriented STI policy.**

KT: The EU's Horizon 2020 enables employment of non-researchers who specialize in connecting people. Meanwhile in Japan, employing people with such talents is not a widely shared notion yet, but that too needs to be understood as a necessary investment. **An aircraft flies not merely by a pilot, fuel, and the aircraft - flying is enabled by an entire system including staff on the ground. S&T is the same.** In this regard, perhaps RISTEX should proclaim more of its achievement as an experienced avant-garde experimenter. Talking about RISTEX's management system, the most essential is the Program Supervisor as you mentioned earlier. What did you consider as important when you decided the Supervisor?

AT: Academic achievements, but not in a narrow sense - **achievements based on a wide range of interests, knowledge, experience, and networks of people.** And **leadership, with broad-mindedness. Courage and determination at times. And the attitude of never taking lightly our administrative work.**

KT: I see. Someone with a common sense who understands that we are equal partners with different roles.

AT: Yes, and **the one who can narrate a story to which people can relate themselves.**

KT: Preferably someone who can put those into words through the program.

AT: The description of calls for proposals is extremely important, too. As you point out elsewhere, while various research funds are available, **it is important for both researchers and funders to be aware of exactly what each grant system is trying to achieve.**

Japanese funders don't have enough capability and art of interactively accompanying researchers, and I think that is a part of the reason why Japan's research capabilities are declining. That is why the description of calls for proposals is so important - what and how it is written - and researchers need to understand, act accordingly and continue to do so in the actual research management, so that the program runs appropriately even if the staff changes. For this, ensuring JST's and the MEXT's understanding is also essential.

RISTEX and the Great East Japan Earthquake

KT: I would like to ask you about the Great East Japan Earthquake, which occurred when you were the Director-General of RISTEX.

AT: As the top of the organization, I figured out that an immediate action was needed, so I urgently secured 60 million yen. With that budget the Promotion of Social Implementation of Solutions Related to the Great East Japan Earthquake program was launched. Quickly setting a specific target issue and to work on it on-site for recovery and reconstruction by organizing a collaborative research team with relevant stakeholders - with such framework, a project to recover the aquaculture in Ofunato Bay was conducted, for example. It assisted the recovery of the bay and the restoration of oyster farming by collaborating with the local fisheries cooperative and a nationwide network of technical colleges. I visited the bay frequently as a representative of RISTEX.

KT: I heard about your numerous visits. Your active participation is wondrous.

AT: Of 1,100 oyster-farming rafts, 3 survived after the tsunami, and the young oysters that remained on them



Rapeseed Project for Restoring Tsunami-Salt Damaged Farmland
Photo by courtesy of Project PI, NAKAI Yutaka

grew larger every time we visited as a result of using microbubble generators, and they were large enough to be edible by February next year. This was moving. I am grateful to many of the local people, technical college teachers and students. As another episode, at the time of the Great Hanshin-Awaji Earthquake, the entrances of the temporary houses were positioned back-to-back and did not generate conversations between neighbors, which resulted in uncomfortable living environment. Based on this experience, there was a demonstration experiment in which temporary houses were situated with their entrances facing each other, and on top of that, benches were placed to induce conversations. There was a hospital which kindly examined its effect and revealed that it decreased residents' hospital visits. In another case, researchers at Tohoku University wanted to run an experiment with rapeseed at the coastal area of Sendai City, which was totally washed away by the tsunami. This was a project to examine the growth of the plants using various soil samples such as those with high salt concentrations, and to determine how the damaged soil could be improved. What impressed me was the yellow blossom carpeting the land the following spring, against the desolate large-scale disposal facilities for tsunami waste in distance. It appeared to me as a symbol of restoration.

Transdisciplinary Research (TDR) and Future RISTEX

AT: In December 2011, after the Fukushima nuclear

accidents, *Nature* published an editorial which severely criticized the lack of sound scientific advice to the government in Japan.*² This had a great impact on the politics and prompted the reinforcement of scientific advice in Japanese policy-making led by Professor YOSHIKAWA who was the Director-General of CRDS then. As a result, many of the experiences and case studies in Japan started to be shared worldwide, and we also managed to have an article published in *Science*. Subsequently, I had an honor of acting as a chair of a study project that made an international comparison of scientific advice mechanism in the Global Science Forum (GSF), OECD. After this, I also chaired a study project of an international comparison of transdisciplinary research (TDR) and compiled a report. This was chaotic at first as 'transdisciplinarity' was defined differently by various experts from various viewpoints. So, we set its working definition as interdisciplinary research in S&T that transcends disciplines of natural sciences and social sciences and humanities (SSH), with engagement of various stakeholders, and collected a range of cases, one of which is RISTEX. In Japan, with your prompt suggestion, we could settle on translating TDR as 学際共創研究, literally, interdisciplinary co-creation research. After consulting OECD, we have also managed to hold an international workshop on S&T for society in Paris. Recently, we could also organize an international workshop on case studies of TDR. It attracts attention worldwide, so international networking is very important.

KT: I appreciate your insight. Lastly, may I have your words regarding the future of RISTEX? While daily work as a funding agency is of course important, I feel there should be a way to oversee the R&D outputs and to generate meta-level knowledge.

AT: We need a mechanism of collecting cases and analyzing them to identify common features, which

generates meta-level knowledge that can further be developed into theories - though I think this is a structural defect of Japan as a whole. It is a process of going back and forth between individual cases and the entire picture - **developing our own diverse knowledges, accumulating experiences, collecting cases, and analyzing them at a meta-level.** Then converging them to design what would be required to develop a new academic discipline or to solve social issues. This is what RISTEX, or JST as a whole should do as they possess a variety of cases. From my experience as the Director-General of RISTEX, and of the involvement in the restoration of the region affected by the earthquake, I came to realize indeed that there already existed many good cases especially in university-business cooperation. **We do have our own cases, from which knowledge can be structured, and with confidence we can exhibit Japan's unique values to the world. Thus, I believe the next challenges are: to continue funding research targeting specific issues while assisting the projects all way through, to accumulate cases, to analyze cases at a meta-level, and to cultivate the skills and knowledge for designing.** Balancing analysis and design is important. In other words, building up the skills both at the individual and the collective levels. Be it STI for SDGs or ELSI/RRRI, proposing agendas from Japan, and organizing international discussions based firmly on actual cases rather than discussing abstract notions are extremely important. As it is relatively easy to organize online events these days, now is a chance to make and expand networks nationwide and worldwide. It would be great also to connect with networks of young researchers such as the Global Young Academy to attract their interest.

KT: I agree. Thank you very much for your insightful suggestions.

(Tokyo, January 14, 2022)

*2 Critical mass, *Nature*, 14 December, 2011, <https://www.nature.com/articles/480291a>

Post-Dialogue Note

KOBAYASHI Tadashi

with YOSHIKAWA Hiroyuki **社会技術 : Incorporating the Idea of the Use of Scientific Knowledge**

In the dialogue, Professor YOSHIKAWA shared with us unique episodes and opinions based on his many years of central roles in various academic scenes. It became a valuable historical narrative which contains the details of Yoshikawa Committee, which provided a theoretical pillar of the establishment of RISTEX, and the link between the Budapest Conference which advocated the notion of 'science for society' and RISTEX which adopted the expression in its English name. I am particularly grateful that he told us the meaning and importance of the word 'use' in the Budapest Declaration, "Declaration on the Use of Science and Scientific Knowledge." It became clear that academic discussions worldwide were revolving around the concept of 'use' in the context of how post-Cold War science should be.



Also, his claim that mission-oriented research and curiosity-driven research do not need to be mutually exclusive was extremely memorable. I look forward to thinking over again about how curiosity sprouts from being alive in this society, and not from some vacuum.

with MURAKAMI Yoichiro **Science, Technology and Humanity/Society**

Professor MURAKAMI is my respected teacher. In this session, our conversation extended to many topics including my personal history, which was of course omitted in the article, but we shared a nostalgic and enjoyable moment. Also, it was revealed how his roles as the Program Supervisor for Science Technology and Humanity program was benefiting from his long-term and in-depth expert engagement in the consideration of S&T and society, and indeed, of knowledge and society.



Readers would notice from the dialogue that he is extremely concerned about the lack of meta-perspective in intellectual activities in Japan. I absolutely concur with him, and I think it is not limited to S&T but also applicable to SSH. I feel re-reminded that RISTEX, which upholds STfS, embodies meta-perspective in such a way that it is obliged to clearly show what STfS means.

with KOBAYASHI Shinichi **Seeking the Mechanism for Accumulation and Succession**

Shinichi is the only participant in this dialogue series who is in the same generation as myself. He is my comrade in initiating and advancing STS research, and setting up its academic society in Japan. As described in the article, he was also heavily involved in discussions that led to the establishment of RISTEX. In a sense he was the producer 'behind the scenes.'



At the end of the 20th century, there was much discussion and attempts were made in how to use the knowledge of S&T. Shinichi was well aware of it and looked into what would be called transdisciplinary research today, for which he created an institutional environment. This was the unique achievement of his. And in order to develop this new research

style, he thought it was necessary to build a mechanism which enabled continuous discussions, accumulation of experiences and analyses of such experiences, for researchers to use knowledge produced widely. However, RISTEX has not yet realized such a mechanism. The dialogue session with him reminded me strongly the implication of RISTEX being called 'R&D Center' in Japanese, and convinced me the importance of realizing what he described as a 'platform for organization-based research.'

with ARIMOTO Tateo **Facilitate S&T for Society and Pass on to the Future**

Mr. ARIMOTO was the longest serving Director-General in RISTEX. It is no exaggeration to say that he has created the basics of RISTEX's current activities. Moreover, he was a high-ranking bureaucrat. Whilst he was the Director-General, I was involved in RISTEX first as a member of a project, and then as the Assistant Program Supervisor in the program supervised by Professor MURAKAMI. Witnessing how he behaved as the Director-General, I wondered how on earth such an unconventional bureaucrat could emerge. He was truly fascinating. I think the dialogue article shows some facets of his charismatic attraction.



He narrated the academic climate around the time RISTEX was established, from a slightly different perspective of a practitioner from that of Professor YOSHIKAWA. It was as if I could picture him engaged in heated exchanges with the academic leaders at that time. It was also his skill as a practitioner that enabled RISTEX to establish the style which is now called transdisciplinary research, and to develop the method to spend enough time to explore social issues. It is unforgettable that he shared with us the episodes of how he engaged in the response to the Great East Japan Earthquake that occurred when he was the Director-General.

Editorial Postscript

We call ourselves Research Institute of Science and Technology for Society (RISTEX), and we describe ourselves on a daily basis as a funding agency that promotes R&D that contributes to solving social issues, but we rarely reflect on the meaning of STfS in depth. At this 20-year milestone, we had the great fortune of hearing valuable historical episodes and receiving precious messages from great figures who have been involved in RISTEX with passion and philosophy to promote STfS for the betterment of Japanese society in the 21st century. We would like to express our deepest gratitude to Professor YOSHIKAWA, Professor MURAKAMI, Professor KOBAYASHI Shinichi, and Mr. ARIMOTO for generously participating in the dialogue series.

We originally planned to comprise this booklet from sections of 'past,' 'present,' and 'future,' and to gather words from many people for each section. However, the impact of COVID-19 was unavoidable, and we needed to focus only on the 'past' part in 2021. Nevertheless, we believe it was of a tremendous historical value that we could dig up historical documents, and hear and record the live voices of figures who have literally built the path up to the present RISTEX.

Unfortunately, we could not afford to ensure the diversity of speakers this time, but we are very willing to collect and widely share voices of various ages and genders, as well as the voices of frontline workers and researchers engaged in social problems, who would weave with us the present and future of STfS.

How can we design the future of RISTEX in the face of the need for convergence of knowledge? In order to expand STfS, we should humbly receive and learn from what have been accumulated through the efforts and passion of past and current Director-Generals and many staff members, Program Supervisors, Advisors, researchers and stakeholders in various fields, so that we can build the foundation for future activities. And through conversations with diverse people from varying backgrounds, we want to draw a picture of 'RISTEX from now on.' We sincerely hope that this booklet makes the first step towards such a pursuit.

'20 Years of RISTEX' team

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