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Center for Research and Development Strategy
Japan Science and Technology Agency



About CRDS

Center for Research and Development Strategy (CRDS) was established in 2003 as an affiliated institution of Japan Science and Technology Agency (JST) in order to independently carry out investigation and analysis and make proposals on science, technology and innovation (STI) policy.

Message from Director-General

Since its establishment in 2003, the Center for Research and Development Strategy (CRDS) has made a significant contribution by providing analyses of domestic and international trends in science and technology and by serving as a public think tank, providing proposals for policy-making in our country. We wish to continue to be a trustworthy navigator at the helm of the 'Nippon Maru', guiding the science and technology of our nation through rough seas.

Science, technology and innovation aims, of course, to enhance the well-being of the individual, ensure the safety, peace and prosperity of the nation, and, more universally, conserve the environment and sustain human life and culture around the world. While it is necessary to coordinate these activities globally, advancing on the basis of common agreement, there are urgent issues unique to our country. In addition to a huge accumulated public debt, Japan has a rapidly aging population, with a declining birth rate. There are also energy problems which are related to global warming. Poor in natural resources, our country has to find its own solutions.

For science and technology which support efforts to build a desirable future society, thought should be given not only to achieving greater efficiency and convenience in practical material terms, but also to fostering the social awareness which enhances respect for humanity and the preservation of basic human rights. By integrating the wisdom contained in the natural sciences, engineering, social sciences, humanities, etc., we must gain the unwavering trust of our society.

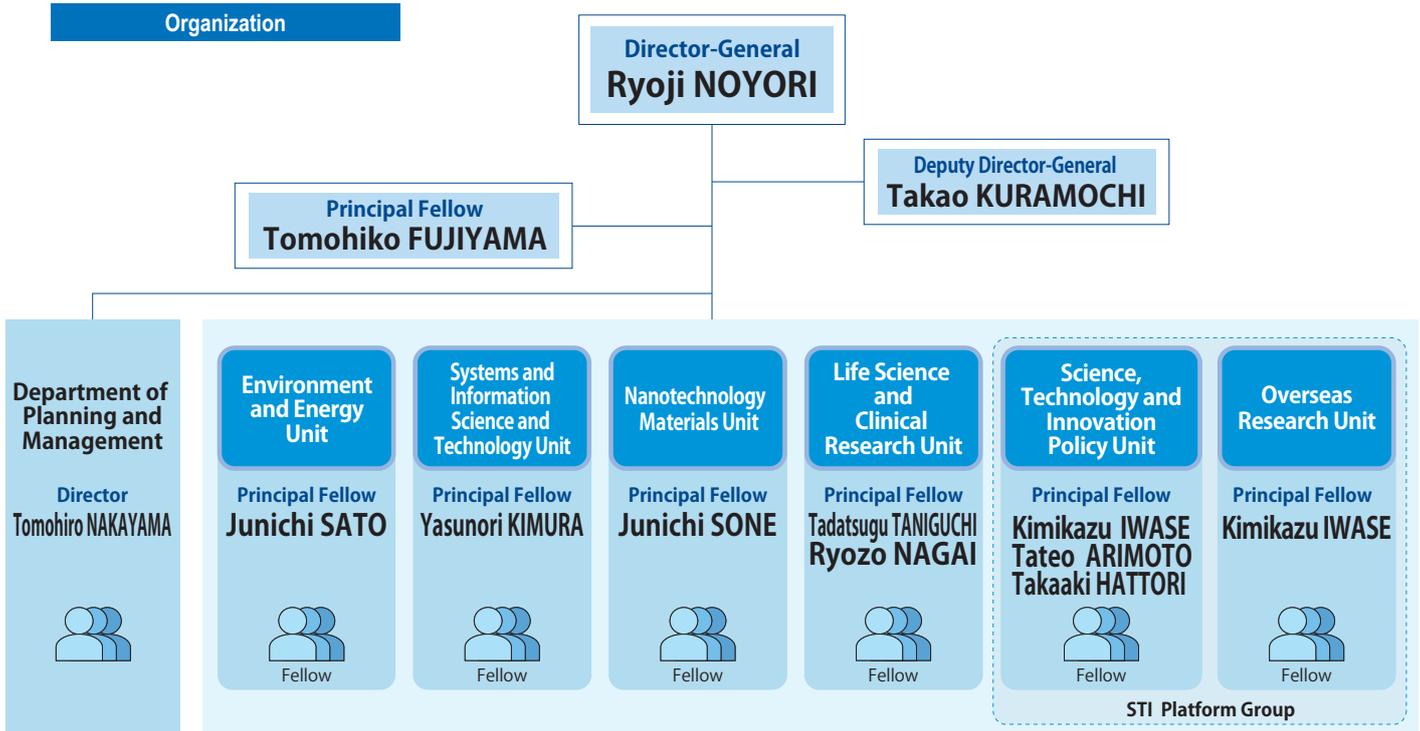
While the proposals of CRDS must be based on high principles, concrete measures have to be implemented at the same time. Although the training of the necessary human resources is essential, what can be achieved by the individual researcher or engineer, small collaborative groups or even a single institution is very limited. Most of the targets cannot be achieved unless they are matched by appropriate research systems, built on a number of key characteristics. In this era of open science, open innovation and the information network, close cooperation between industry, government and academia are indispensable, as are brain circulation and international cooperation.

I place my hope in the young generation, in their creative resourcefulness to invent the future, in their outstanding ability in science and technology, in their aggressive strategic action and, above all, in their high ideals.



Director-General
Ryoji NOYORI

Organization



The basic principles of CRDS activity

Vision

CRDS aims to be the think tank leading the advancement of science and technology as well as the creation of innovation for the purpose of the sustainable development of Japan and human society.

Duty

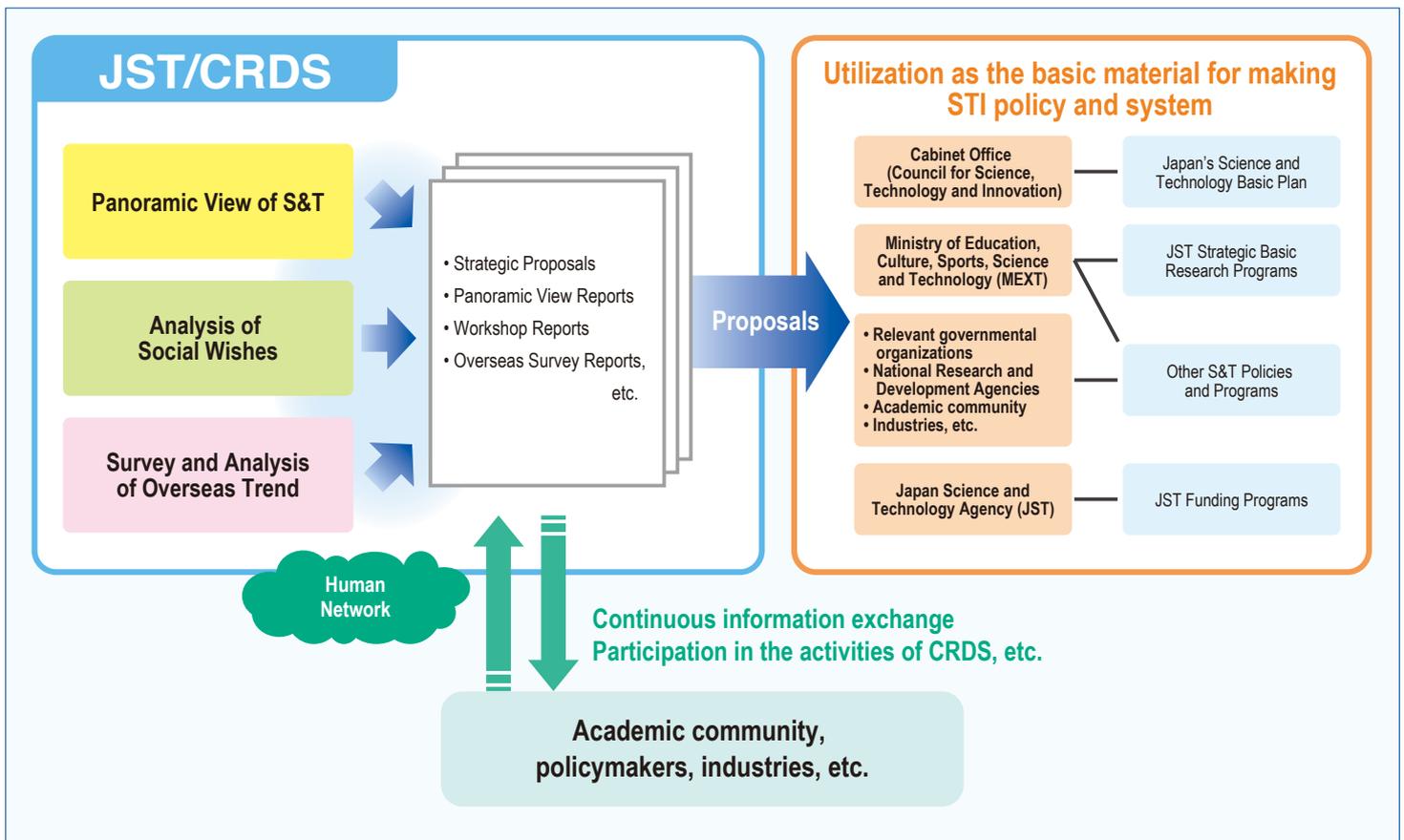
CRDS follows, overviews and analyses the trend of society, STI and their relevant policies in Japan and abroad.

Based on the above, CRDS extracts problems to be tackled, proposes STI policy and/or research and development strategy and works to bring them into reality.

CRDS bears in its mind, while carrying out its duty, that it should cooperate and exchange opinions with private, public and academic sectors as well as general stakeholders in the society, and further with foreign relevant institutions.

CRDS surely makes public the result of its activity.

Planning process for R&D strategies and activities in CRDS



Output

Strategic Proposals

High-quality proposals for R&D disciplines, themes and systems that will be required by Japan in the future.

(Refer to the final page)

Panoramic View Reports

The basic material for R&D strategic planning which summarizes the history, present state and future trend of the R&D field as well as international comparison of each key R&D area.

Reports

- Research reports
- Workshop reports
- Overseas survey reports
- G-TeC reports
- Other reports
- Books

The Strategic proposals and the reports will be provided to JST, the Ministry of Education, Culture, Sports, Science and Technology, the Cabinet Office and other government-related organizations to help the government to establish strategic sectors for the JST basic research program and to develop the Science and Technology Basic Plan and other S&T-related measures.

Units

Environment and Energy Unit

Energy and environment are fundamental and critical components for sustainable development of human society. In the aspect of energy issue, the aim of society is to achieve the reduction of greenhouse gas emission and reliable and affordable energy supply simultaneously. In the aspect of environmental issue, the aim of society is to maintain and develop harmonization of human and nature. We survey wider range of issues related to energy and environment including S&T trends, STI policies and strategies, national and international, social circumstances, and industrial activities. We also exchange opinions with people from private, public and academic sectors in the survey. Based on these, we develop proposals on future directions of R&D policies and strategies in energy and environmental field for Japan.

Systems and Information Science and Technology Unit

Systems and information science and technology is the foundation for a sustainable society. It consists of information and system technology, such as artificial intelligence, big data, robotics, security and systems science for social system design. In order to contribute to the realization of a vision of Society 5.0, the Systems and Information Science and Technology unit proposes strategies for research and development and social innovation, by overviewing the trend and the implication of technology, society and economy.

Nanotechnology / Materials Unit

Nanotechnology/Materials is a science and technology domain which handles microscopic structures reaching molecules or atoms and various phenomena occurring there, and includes life science and information technology with material science in the center. The fusion of those science and technology will produce new technological platform in terms of "green nanotechnology", "nanobiotechnology" and "nanoelectronics", which works as an engine producing innovations in the field of energy and environment, health and medicine, and telecommunication and electronics. In order to accelerate the R&D of Nanotechnology/Materials, this unit makes proposals not only of important R&D programs but also of R&D strategies for effective funding system, human resource development, globalization, and collaboration among government, academia, and industry.

Life Science and Clinical Research Unit

Life Science and Clinical Research unit covers a wide range of basic life science and applied life science/technologies, with a view to accelerating future life innovation and green innovation. Our unit helps promote inter-disciplinary collaboration between academia, industry, and government to sectors to develop novel clinical/medical/bio industrial/agricultural products and services.

Science, Technology and Innovation Policy Unit

This Unit focuses on STI policy and system which go beyond boundaries disciplines and specialties. Current activities include; 1) drawing "panoramic view maps" on STI policies in Japan, investigating 2) 'Science of Science and Technology Innovation Policy', 3) rational research funding system, 4) scientific advice on policymaking process and 5) effective cooperation between natural sciences and 'social sciences and humanities' (SSH).

Overseas Research Unit

The Overseas Research Unit provides reports on a timely basis to introduce the latest S&T and innovation policies released by overseas government agencies. We also conduct timely analyses of the latest information on overseas S&T policies that are of Center's interest and useful for the development of the national S&T and innovation policy.

Chronological Table

CRDS was established in 2003



Year	Major events related to the activities of the Center for Research and Development Strategy	Major events related to science and technology policies and others
2003	The Center for Research and Development Strategy (CRDS) was established. The Strategic Forum for the Future of Science and Technology was held, commemorating the establishment of the Japan Science and Technology Agency.	An incorporated administrative agency, the Japan Science and Technology Agency (JST), was established.
2004	The Strategic Workshop for the Future of Science and Technology (Materials Science) was held (planning of the "Elements Strategy"). <i>Strategic initiative: "IRT: Integration of IT and RT"</i>	National universities were incorporated. The international forum Science and Technology for the Betterment of Mankind was held (STS forum). The US Council on Competitiveness released the National Innovation Initiative report "Innovate America" (the Palmisano report).
2005	The seven societal visions of the CRDS were consolidated. The "Basic Policy for the Planning of Science and Technology Policy/Strategy: Comparison between Visions of Agencies and the Policy of CRDS" was formulated.	The European Union published the report "A New Start for the Lisbon Strategy." The US National Academy of Sciences published the report "Rising above the Gathering Storm."
2006	The International Conference on Science and Technology for Sustainability 2006, "Global Innovation Ecosystem" was held. <i>Strategic proposal: "Strategic Proposal on Clinical Research: Toward Fundamental Changes of Clinical Research Systems in Japan"</i> <i>Strategic initiative: "Construction of Information Technology Systems for Securing the Safety and Credibility of the Information Society: For New Dependability"</i>	The European Commission published the report "Creating an Innovative Europe" (the Aho report). President George W. Bush announced the "American Competitiveness Initiative." The Third Science and Technology Basic Plan (FY2006–2010) was approved by the Cabinet. Professor Yamanaka successfully generated IPS cells. The European Union Parliament adopted "The Seventh Framework Programme for Research and Development" (FP7).
2007	The Elements Strategy/Development of Alternative Materials for Rare Metals: A Cross-Ministerial Collaboration Symposium was held. The international conference Global Innovation Ecosystem 2007 was held (Tokyo). <i>Strategic proposal: "Overview of National Innovation Ecosystems and Related Political Issues"</i> <i>Urgent proposal: "Urgent Proposal on Rapid Promotion of Related Stem Cell Research with the First Generation of Human Induced Pluripotent Stem (iPS) Cells in the World"</i> <i>Strategic initiative: "Promotion of Integrative Celerity Research (ICR): Innovation in Health and Medicine"</i> <i>Strategic initiative: "Elements Strategy"</i>	The long-term strategy initiative "Innovation 25" was approved by the Cabinet. The America COMPETES Act was enacted. The Elements Strategy Initiative was enacted by the Ministry of Education, Culture, Sports, Science and Technology. The development project Alternative Materials for Rare Metals was initiated by the Ministry of Economy, Trade and Industry.
2008	The "International Comparison of Science and Technology/Research and Development 2008" (five fields) was issued. The international conference Global Innovation Ecosystem 2008 was held. <i>Strategic proposal: "Establishment of the Global Innovation Ecosystem to Solve Global-Scale Problems"</i>	Professors Nambu, Kobayashi, and Masukawa were awarded the Nobel Prize for Physics. Professor Shimomura was awarded the Nobel Prize for Chemistry. The G20 was inaugurated (the rise of BRICs). The global financial and economic crisis (the Lehman shock) occurred.
2009	The symposium "Research and Development Strategy for the Creation of Innovation" was held (in commemoration of the fifth anniversary of the CRDS). "The Handbook for Design of Research and Development Strategy" was issued.	The Obama administration was inaugurated in the United States. Administration by the Democratic Party of Japan was inaugurated in Japan.
2010	The Chemical Society of Japan-JST joint symposium Molecular Technology Initiative was held. "Design Methodology for Research and Development Strategy: Realizing a Sustainable Society" was issued. The symposium "Toward an Innovation Strategy to Realize an Affluent, Sustainable Society" was held. A trial was initiated for the encounter between societal expectations and R&D areas in the process of selecting a strategic scope.	The Gulf of Mexico BP oil spill occurred. Expo 2010 was held in Shanghai. The Hayabusa spacecraft returned to Earth. Professors Suzuki and Negishi were awarded the Noble Prize for Chemistry.
2011	The symposium "Future Science and Technology Innovation Policies: Toward the Recovery and Further Development of Japan, Scientist Roles and Responsibilities for the Accident at Fukushima Nuclear Power Station of Tokyo Power Electric Company" was held. <i>Strategic proposal: "Emergent Proposal on the Tohoku Earthquake: Prompt Implementation of Damage Surveys and Their Fulfillment"</i> <i>Emergent proposal: "Proposal for Recovery from the Tohoku Earthquake: From the Viewpoint of Science and Technology"</i>	The Great East Japan Earthquake and the Fukushima Daiichi nuclear disaster occurred. Reviews of research ethics and the code of conduct, as well as reviews of the advisory system for science and technology, were conducted. The Fourth Science and Technology Basic Plan (FY2011–2015) was approved by the Cabinet.
2012	The symposium "Concentrating Expertise to Promote Science and Technology Innovation: Toward the Network Formation of Think-Tank Functions" was held. <i>Strategic proposal: "R&D Funding System for Issue-Oriented Innovation"</i> <i>Strategic proposal: "Fundamental Technology of Energy Carriers for the Transportation, Storage, and Utilization of Renewable Energy"</i>	The Basic Energy Plan was revised (the three alternatives). Professor Yamanaka was awarded the Nobel Prize in Physiology or Medicine. The Science Council of Japan released a major revision of the "Code of Conduct for Scientists." The Energy Carriers Project was initiated (jointly between the Ministry of Education, Culture, Sports, Science and Technology and the Ministry of Economy, Trade and Industry). The Abe administration of the Liberal Democratic Party was inaugurated in Japan.
2013	The OECD Global Science Forum (GSF) Workshop on Quality Assurance of Scientific Advice and Scientist Roles and Responsibilities was held (Tokyo). The symposium "Japan's Strategy to be Adopted for Science and Technology Innovation" was held (in commemoration of the tenth anniversary of CRDS). The first "Panoramic View Report of Research and Development" was issued. The report: "Planning of Issue-Oriented Research and Development Strategy Based on the Encounters between Societal Expectations and R&D Areas (preliminary version)"	The Comprehensive Strategy on Science, Technology, and Innovation was approved by the Cabinet. "Establishment of Strategy and Promotion Headquarters for Health and Welfare" Tokyo was selected to host the 2020 Olympic and Paralympic Games. A review of the Fourth Science and Technology Basic Plan was initiated.
2014	The "Proposal for Issue-Driven Research and Development," based on the encounters between societal expectations and R&D was issued. The international symposium on science and technology "Systems Science and Technology Leading Innovation: Learning from Trends in the US, China, and Japan" was held. The symposium "Integration for Science and Technology Innovation" was held. <i>Strategic proposal: "Looking beyond the 2020 Tokyo Olympic and Paralympic Games"</i>	The EU launched Horizon 2020. The Council for Science and Technology was reorganized into the Council for Science, Technology, and Innovation. The Strategic Innovation Promotion Program (SIP) and the Impulsing Paradigm Change through Disruptive Technologies (ImPACT) were initiated by the Council for Science and Technology of the Cabinet Office. The international conference for Chief Science Advisors was held. Professor Akasaki, Amano and Nakamura were awarded the Nobel Prize in Physics.
2015	"The basic principles of CRDS activity" were established. Panoramic View Report of Research and Development (2015) <i>"The prospect for social change provided by information science and technologies - The innovation provided by "REALITY 2.0" -"</i>	National Research and Development Agency system was established. (JST was changed to this type.) The Japan Agency for Medical Research and Development (AMED) was established. General Assembly of United Nations adopted the Sustainable Development Goals (SDGs). Appointment of first-ever Science and Technology Advisor to the Minister for Foreign Affairs in Japan. Professor Ohmura was awarded the Nobel Prize in Physiology or Medicine. Professor Kajita was awarded the Nobel Prize in Physics.
2016	"Panoramic View Report - The Emerging Trends of Research and Development (2016) -" was issued. The symposium "The New Society brought by ICT" was held. <i>Strategic proposal: "Next Generation Manufacturing: Towards Creation of New Platform for High Value-Added Manufacturing"</i> <i>Strategic proposal: "Beyond "Smart society" designed by IoT - REALITY 2.0 -"</i> <i>Strategic proposal: "Funding Reform for the Fifth Science and Technology Basic Plan Period -Current Status and Future Direction of Related Policy Items for Stronger Research Capacity-"</i>	The Fifth Science and Technology Basic Plan (FY2016–2020) was approved by the Cabinet. The Third Mid-term Targets and Plans of National Universities Corporation was started. G7 Ise-Shima Summit was held. G7 Science and Technology Ministers' Meeting in Tsukuba, Ibaraki was held. Britain votes to leave the EU. Sixth Tokyo International Conference on African Development (TICAD VI) was held in Nairobi, the Republic of Kenya. Specific National Research and Development Corporation system established. Professor Ohsumi was awarded the Nobel Prize in Physiology or Medicine.
2017	The symposium Technology innovation for the IoT/AI era was held. Panoramic View Report of Research and Development (2017) <i>Strategic proposal: "Towards Optimal Development of Center of Excellence in Japan"</i>	The Trump administration was inaugurated in the United States. The "March for Science" held. The second annual Multi-stakeholder Forum on Science, Technology and Innovation for the Sustainable Development Goals (STI Forum) was held at the United Nations. Designated national university corporation system established
2018	<i>Strategic proposal: "Disruptive Computing - A Computing-Domain-Oriented Approach -"</i>	"Integrated Innovation Strategy" was approved by the Cabinet in Japan

Italics indicate issues addressed by the strategic proposals and various reports.

List of Strategic Proposals

● Environment and Energy

- Science on electronic and ionic control for innovative technology of reaction and separation- Aiming for a sustainable reaction process -
- Innovative Digital Twin - Establishment of fundamental technologies for advanced design and manufacturing in future industries -
- Fundamental Technology of Energy Network in the Future, and Science of Energy Demand - Toward a change in energy supply and demand structure in general households beyond 2050-
- Innovation of Reaction Process - Innovative chemical reaction in a low to intermediate temperature range through ionic and electronic control-
- Fundamental Technology of Energy Carriers for Transportation, Storage and Utilization of Renewable Energy
- Phase Interface Science for Energy Efficient Society

● Systems and Information Science and Technology

- Disruptive Computing - A Computing-Domain-Oriented Approach -
- Information science and technology for decision-making and consensus-building in a complex society
- Beyond "Smart society" designed by IoT - REALITY 2.0 -
- Wisdom Computing – Research and development for creative collaboration between humans and machines
- Research and development on fundamental technologies of cyber physical systems their social implementation -A case study on promoting aged people to social activities
- Research on integrated modeling system toward solving future water problems - Implementation of strategic research on building systems -
- Transdisciplinary research on integration of infrastructures for urban service system

● Nanotechnology/Materials

- Topological Quantum Matter Initiative - Device Innovation by New Developments in Quantum Physics -
- Innovations of Basic Technology for Robots through Integration of Nanotechnology, Information Technology, and Mechanics - Toward Smart and Human-Friendly Robots -
- Innovations in Separation Engineering - Separation Science and Technology for a Sustainable Society -
- Nanoscale Thermal Management for Device Innovation - Phonon Engineering -
- Materials Informatics: Materials Design by Digital Data Driven Method
- Element Strategy
- Foundation of Common-Use Nano-Tech Integration Center directing to Financial Independence

● Life Science and Clinical Research

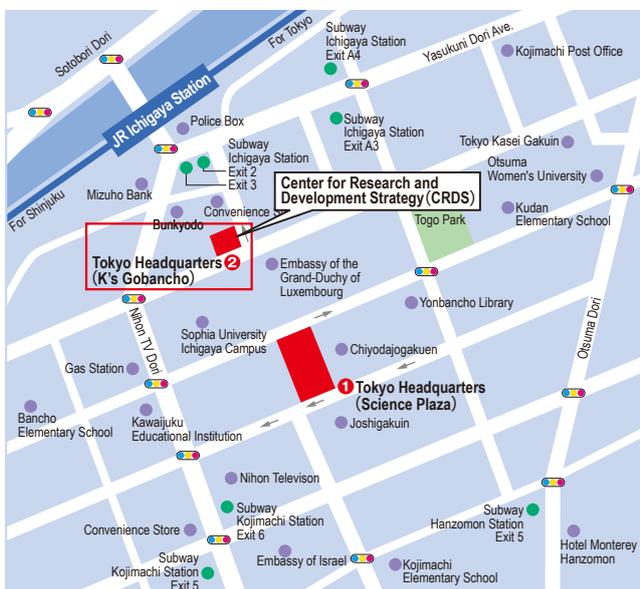
- Promoting of the Research on Plant-Microbe Interaction in New Era - Development of Novel Control and Application Methods for Agriculture/Biomaterial Production Based on Deeper Understanding
- Intergrated Promotion of Human Microbiome Study: New Development in Life Science and Health care
- Homeodynamics -Understanding and Control of Spatio-temporal Dynamics between Neural, Endocrine and Immunological Networks
- Promoting Preemptive Medicine in a Hyper-Aged Society
- Developing a new regulatory authority for Drugs and Medical Devices
- Integrative Celerity Research (ICR) for Medical Devices

● Science and Technology Innovation, etc.

- Towards Optimal Development of Center of Excellence in Japan - For the Formation of Sustainable Strength of Organization and Realization of Innovation -
- Funding Reform for the Fifth Science and Technology Basic Plan Period - Current Status and Future Direction of Related Policy Items for Stronger Research Capacity -
- Toward the Establishment of Principles Regarding the Role and Responsibilities of Science and Government in Policy making
- Proposal for Recovery from the Tohoku Earthquake (Emergent Proposal)
- Towards Realization of Evidence-based Policy Formation: Development of Science of Science, Technology and Innovation Policy

● Issue-Driven Research and Development

- Proposal for Issue-driven Research and Development I Future energy demand and supply landscape envisaged through a framework of cities
- Proposal for Issue-driven Research and Development II Research on integrated social infrastructure management system toward the realization of a tough and sustainable society
- Proposal for Issue-driven Research and Development III Promoting Life Course Health-care – Importance of Preemptive Medicine in pregnancy to childhood



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