Science and Technology Cooperation

First

The natural skating rink on the Rideau Canal wasn't open last year, but it opened this year. Ottawans enjoy the world's longest skating rink. The year 2024 is a leap year that occurs once every four years, and is the year of the US presidential election and the Summer Olympics. Since the beginning of the year, there have been many challenges due to the turbulent international situation. The more this happens, the more important multi-layered cooperation between Japan and Canada becomes.

Therefore, this time I would like to share with you the exchange and cooperation between Japan and Canada in the field of science and technology, as well as the geopolitical implications.

Source of National Power

This may sound a bit complicated, but Article 1 of the 1933 Convention on the Rights and Duties of States (commonly referred to as the “Montevideo Convention”) stipulates four requirements for states. Under international law, a state must have (1) a permanent population, (2) a defined territory, (3) a government, and (4) the capacity to have relations with other countries.

Currently, there are 193 countries that have met these four requirements and are members of the United Nations. National conditions vary widely, and so does national power. National power depends on a wide variety of factors, including land area, population, economic power, military power, and cultural power. There are also ways to think of it as hard power, soft power, or smart power. However, science and technology are a source of national power for any nation. They are connected to the basis of economic and military power. They also contribute to solving various issues facing society.

In particular, cutting-edge science and technology such as artificial intelligence (AI), quantum technology, big data, and cloud computing are directly linked to national security and create the foundation for economic competitiveness. These have the potential to influence the current harsh geopolitical situation and rebuild the national power of each country.

Therefore, the need for international governance has been pointed out, especially regarding AI, and the Hiroshima Summit to create international rules, keeping in mind the risks associated with generative AI, such as the spread of false information, and the “Hiroshima AI Process” has begun to move. The “Hiroshima AI Process” has been handed over to Italy which holds the G7 Presidency in 2024.

So Japan and Canada. Of course, both countries are putting effort into promoting science and technology and are cooperating. This also has great potential for business. Furthermore, given the current severe international situation, new horizons are opening up in the cutting-edge science and technology field for Japan and Canada, which share fundamental values and have built a multi-layered cooperative relationship.

In this regard, Prime Minister Kishida visited Ottawa in January 2023. After a very intensive Japan-Canada summit meeting, he attended a luncheon with economic leaders hosted by Prime Minister Trudeau. In his speech at that time, it was symbolic that he clearly stated, "We are focusing on science, technology, and innovation, and would like to further strengthen collaboration between industry, government, and academia in both Japan and Canada."

First, I would like to give an overview of the cooperation between Japan and Canada in the field of science and technology.

Japan-Canada Science and Technology Cooperation Agreement

Japan, which has a small land area and lacks natural resources, is naturally a science and technology-based country. And those involved in science and technology instinctively know that "two heads are better than one." Japan has concluded science and technology cooperation agreements with major countries, stipulating the form of activities, the framework for intergovernmental consultations, the treatment of intellectual property rights related to the results of cooperation, information exchange, researcher exchange, and joint research. The joint committees meet regularly to confirm progress and set guidelines for the future.

Science and technology cooperation with Canada dates back to 1972, more than half a century ago. The delegation responsible for Canadian Science and Technology Cooperation Agreement visited Japan. The results were included in a Japan-Canada joint statement. The Japan-Canada Science and Technology Consultations was established and held once every two years, six times by 1984. Based on these achievements, the Japan-Canada Science and Technology Agreement was signed and entered into force in May 1986. Cooperation and exchange between Japan and Canada spans a wide range of areas, including both the public and private sectors. This science and technology cooperation agreement is the cornerstone of this progress, which is continuing in a variety of ways.

The joint committee based on the agreement has been held every two to three years. The most recent joint committee meeting was the 15th, held in March 2022. It was still held online due to the influence of COVID-19. The content was rich and the discussion profound, especially regarding the Canada-Japan joint innovation mechanism and opportunities for mutual contributions. In particular, the importance and potential of cooperation in innovative fields such as artificial intelligence, quantum technology, high-

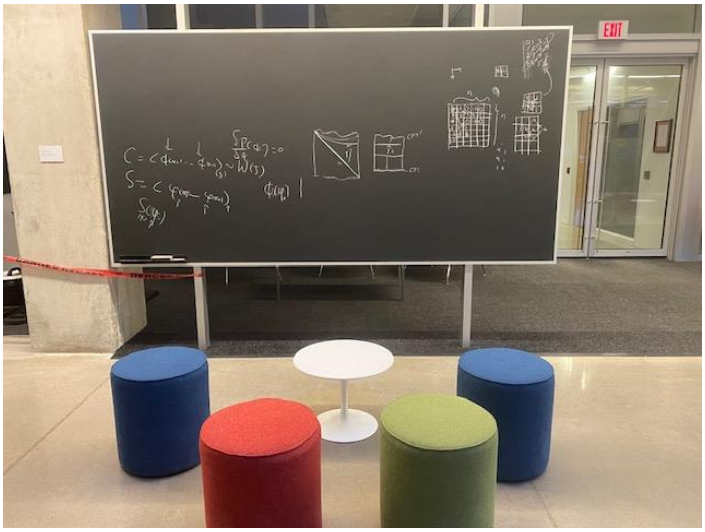
performance computers, health and medicine, and the environment were emphasized. The 16th joint committee is scheduled to be held this year.

15th Canada-Japan Joint Committee on Science and Technology
(Source: Ministry of Foreign Affairs)

Promoting Japan-Canada Cooperation

Cooperation in science and technology is difficult to understand from the outside. For example, when I visited the Stephen Hawking Centre at the Perimeter Institute for Theoretical Physics in Waterloo, Ontario, a world-class centre for quantum research, I saw a complex mathematical formula written on a giant blackboard. To be honest, I didn't get it at all. It's the kind of thing that only cutting-edge researchers can understand. As they say, "Rome wasn't built in a day." It takes a huge amount of time and a lot of trial and error before the results of cutting-edge research become visible to the general public. In other words, the process is extremely important.

Therefore, I would like to give some concrete examples of the science and technology cooperation that is progressing between Japan and Canada.



Perimeter Institute for Theoretical Physics - Stephen Hawking Centre Blackboard
(Source: Embassy of Japan in Canada)

●Accelerating Research Exchanges

In December 2023, JST (Japan Science and Technology Agency) and AMED (Japan Agency for Medical Research and Development), which are the core implementation agencies of Japan's science, technology, and innovation policy, cooperated in Adopting Sustainable Partnerships for Innovative Research Ecosystem (ASPIRE). They have adopted new tasks to be implemented in cooperation with partner countries. Out of a large number of applications, the two institutions selected a total of 52 topics in 8 fields. This will support research funds of up to 500 million yen per topic.

Seven proposals involving Canadian researchers were adopted in the fields of AI/information, communications, quantum, semiconductors, and healthcare. It is hoped that further progress will be made in the exchange of researchers between Japan and Canada.

●AI Joint Research for an Aging Society

In October 2022, the Japan Science and Technology Agency (JST) collaborated with the National Research Council Canada (NRC) in the Strategic International Collaborative Research Program (SICORP) and issued a public call for international joint research on “AI technology that contributes to welfare of the elderly.” Through joint research with Canada, which has strengths in AI, it is hoped that AI will greatly contribute to building a more elderly-friendly society in Japan, which is the first country in the world to become an aging society and is facing various challenges. The results of this research and development will also be needed by countries that will eventually face aging populations.

●Research Cooperation in the Quantum Field (University of Tokyo x UBC x Max Planck Institute (Germany))

In 2021, the University of Tokyo, the University of British Columbia (UBC), and the Max Planck Institute announced that they will extend their joint research in the quantum field for another five years. Back in 2010, the University of British Columbia established the Stewart Blusson Quantum Matter Institute, which focuses on research and development of quantum materials. In 2017, the University of Tokyo signed a three-way university-wide agreement with UBC and the Max Planck Institute in Germany, creating a framework for joint research. The three institutions have pooled $2.5 million over five years to form the Max Planck-UBC-UTokyo Center for Quantum Materials, a global research centre that leads the world in the field of materials science. They promote world-class collaborative research.

Although quantum technology is still under development, it is expected to bring about revolutionary advances in a variety of fields, including new drug development, alleviating traffic congestion, carbon recovery technique, financial market risk assessment, and even artificial photosynthesis.

●Joint degree between Kyoto University and McGill University, etc.

In April 2018, the “Kyoto-McGill International Collaborative Program in Genomic Medicine (Joint Ph.D.)” was established at the Kyoto University Graduate School of Medicine. Kyoto University, which is one of the world's top universities in genome analysis, and McGill University implemented a joint degree program in close collaboration, leveraging the characteristics of each university to create a mutually complementary program that cannot be achieved by a single university. They promote high-quality education and research, develop human resources who are proficient in various analysis techniques that utilize real-life big data, and who can contribute to the future development of preventive medicine.

●Cooperation in Space

In 2009, Astronaut Dr. Koichi Wakata assembled the Japanese Experiment Module "Kibo" on the International Space Station (ISS) using Canadarm2, which was developed by Canada. In addition, astronauts Dr. Akihiko Hoshide (2012) and Dr. Kimiya Yui (2015) used Canadarm2 to grasp the Japanese space station supply ship "Kounotori" (HTV) on the ISS. Collaboration and cooperation were realized. Most recently, in May 2020, Canadarm2 captured “Kounotori No. 9.”

In this regard, I also visited the Canadian Space Agency (CSA) in June 2022 and exchanged opinions with Director-General Lisa Campbell. I felt that Japan-Canada cooperation is progressing in the space field,

thanks to close cooperation between CSA and JAXA, notably with the possibility of cooperation on the issue of climate change between Japan's “Daichi-2” and Canada's RADARSAT. There is also close and further collaboration between CSA, JAXA and the German Aerospace Center in human resources management among others.

Astronaut Dr. Koichi Wakata and Canadian astronaut Colonel Jeremy Hansen
(Source: Embassy of Japan in Canada)

Japan-Canada joint receipt of the Nobel Prize in Physics

Now, the joint research and cooperation mentioned above is just a part of it. Now let's talk about Japan and Canada jointly winning the Nobel Prize.

In 2015, Dr. Takaaki Kajita, a professor at the University of Tokyo, and Dr. Arthur B. McDonald, a professor at Queen's University, jointly won the Nobel Prize in Physics. This marked the achievement that confirmed that neutrinos have mass. It was widely reported in Japan as well. Ever since Dr. Hideki Yukawa, the first Japanese to be awarded a Nobel Prize in Physics, particle physics has been Japan's specialty. Another point of interest was that it was the result of observations made at the huge facility Super-Kamiokande, which was the work of Dr. Masatoshi Koshiba, who had received the same award in 2002.

Neutrinos are one of the elementary particles that are the smallest units of atoms, which are the basis for creating matter. They were created in large quantities at the moment of the birth of the universe 13.8 billion years ago, and they still exist today. There are three types of neutrinos. It was an established theory that they had no mass because they are extremely small (10 to the power of minus 18 meters) and have the property of being able to pass through anything, even the Earth.

In 1998, observations and research at the cosmic ray observation facility "Super-Kamiokande", located 1,000 meters underground in the former Kamioka Mine in Hida City, Gifu Prefecture, shocked the world. The person who led this observation was Dr. Yoji Totsuka, a disciple of Dr. Koshiba. Dr. Totsuka's disciple is Dr. Kajita. In short, they found traces of a phenomenon called “neutrino oscillations,” in which neutrinos changed shape as they passed through the Earth, suggesting that neutrinos have mass. This was an observation that overturned conventional wisdom about particle physics.

However, it seems that this cannot be said to be scientifically conclusive proof. That's where Canada comes in. Dr. Macdonald, who received his degree from Halifax's prestigious Dalhousie University, researched at Princeton University, and became a professor at Queen's University, led his team to a project located 2,100 meters underground at the “Vale’s Creighton Mine” in the Sudbury region of northern Ontario. At the Sudbury Neutrino Observatory, solar neutrino oscillations were directly demonstrated.

Dr. Totsuka and Dr. MacDonald jointly received the Benjamin Franklin Medal in 2007 for Dr. Totsuka’s 1998 observations on Super-Kamiokande and Dr. MacDonald's observations at Sudbury Neutrino Observatory, as well as their subsequent detailed measurements and proofs. This research was highly praised and was sure to win the next Nobel Prize. However, Dr. Totsuka passed away in 2008. Dr. Kajita, who carried on Dr. Totsuka’s ambition, jointly received the 2015 Nobel Prize in Physics with Dr. McDonald. It is a symbol of the exchange between world-class researchers from Japan and Canada in cutting-edge research fields that hold the key to uncovering the full story of neutrinos and the origin of the universe.

Dr. Kajita, University of Tokyo and Dr. McDonald, Queen's University
(Source: https://en.m.wikipedia.org/wiki/File:Arthur_B._McDonald_%26_Takaaki_Kajita_5172-2015.jpg)
Photo: Bengt Nyman

Super-Kamiokande (Source: Institute for Cosmic Ray Research, University of Tokyo (ICRR))

Research Security

The recent remarkable advances in science and technology are contributing to solving problems and promoting economic development, but they are also directly linked to national security. “academic freedom” and “open innovation” should be at the core of academic research. However, amidst the harsh geopolitical realities of the 21st century, serious discussions about research security are underway in each country. Therefore, I would like to share the latest information on the situation in Canada.

On January 16, 2024, Minister of Innovation, Science and Industry François-Philippe Champagne, Minister of Health Mark Holland, and Minister of Public Safety Dominic LeBlanc announced the “Policy on Sensitive Technology Research and Affiliations of Concerns.” They briefly explained the background.

“Canadian research is at the forefront of discovery and invention, and today's research is powering solutions to humanity's most pressing challenges. Canadian-led research is characterized by excellence and collaboration. On the other hand, its openness may make it a target for foreign influence, raising the potential risk that research and development efforts could threaten national security.”

There are two lists attached to this policy. In the first one, 11 fields were identified that fall under sensitive technology research, including digital, quantum, AI, life science, and robotics and more. In the second, research institutions associated with the military, national defense, and national security agencies that may pose a risk to Canada's national security were identified. They are the institutions of China, Russia, and Iran.

Research security surrounding cutting-edge science and technology will lead to even closer joint research between Japan and Canada, which are like-minded countries that share fundamental values.

The passion of Senator Stan Kutcher, Co-Chair of the Canada-Japan Inter-Parliamentary Group

As mentioned above, research in cutting-edge fields can have a geopolitical impact as well as the potential for big business in the future, making cooperation between Japan and Canada more important than ever for both sides.

Therefore, I would like to take this opportunity to share with you the science and technology cooperation advocated by Senator Stan Kutcher, an independent member from Nova Scotia, who is co-chair of the "Canada-Japan Inter-Parliamentary Group", which is a leader in friendly and cooperative relations with Japan in the Canadian Parliament.

Senator Kutcher is a medical doctor and has served as the Director of the WHO Collaborating Centre in Mental Health Policy and Training. Since science and technology are the basis for strengthening strategic foreign relations and are directly linked to economic and national security, he is convinced of the need to further advance science and technology cooperation. In particular, he highly values Japanese research and is actively working to strongly promote science and technology cooperation between Japan and Canada.

For example, the presidents of four key institutions for science and technology cooperation in Canada: the National Research Council Canada (NRC), the Natural Sciences and Engineering Research Council of Canada (NSERC), the Canadian Institutes of Health Research (CIHR), and the Social Sciences and Humanities Research Council (SSHRC) held a meeting at the Japanese Embassy and had a useful exchange of opinions.

Based on the discussions at this conference, a white paper was prepared under the leadership of Senator Kutcher and with the NRC playing a central role, with the aim of further strengthening research cooperation between Japan and Canada. This white paper has been shared with stakeholders, and discussions are deepening regarding specific measures. Senator Kutcher visited Japan last November with Canada-Japan Inter-Parliamentary Group Co-Chair Terry Sheehan. He had a fruitful exchange of opinions with Dr. Yoichiro Matsumoto, Science and Technology Advisor to the Minister of Foreign Affairs.

As stated in Prime Minister Kishida's speech, close collaboration between industry, government, and academia is essential for promoting science and technology cooperation. Senator Kutcher's passion and vision are accelerating collaboration.

Exchange of views with Senator Stan Kutcher and others
(Source: Embassy of Japan in Canada)

Conclusion

Finally, I will introduce the latest developments in cutting-edge fields between Japan and Canada. It is about nuclear fusion (fusion energy), which is said to be the energy source of dreams.

In September 2023, “Kyoto Fusioneering Ltd.”, a Japanese startup based on the world's most advanced technology originating from Kyoto University, signed a Strategic Alliance Agreement with “Canadian Nuclear Laboratories (CNL)”. Through this agreement, the two companies will begin a new joint project related to the fuel cycle system, which is essential to realizing fusion energy. Although it is still at a stage where only those in the know have the details, it is attracting a lot of attention from people both inside and outside of Japan. Expectations for the future are increasing.

Strengthening cooperation in the fields of science and technology is leading to further development of Japan-Canada relations.