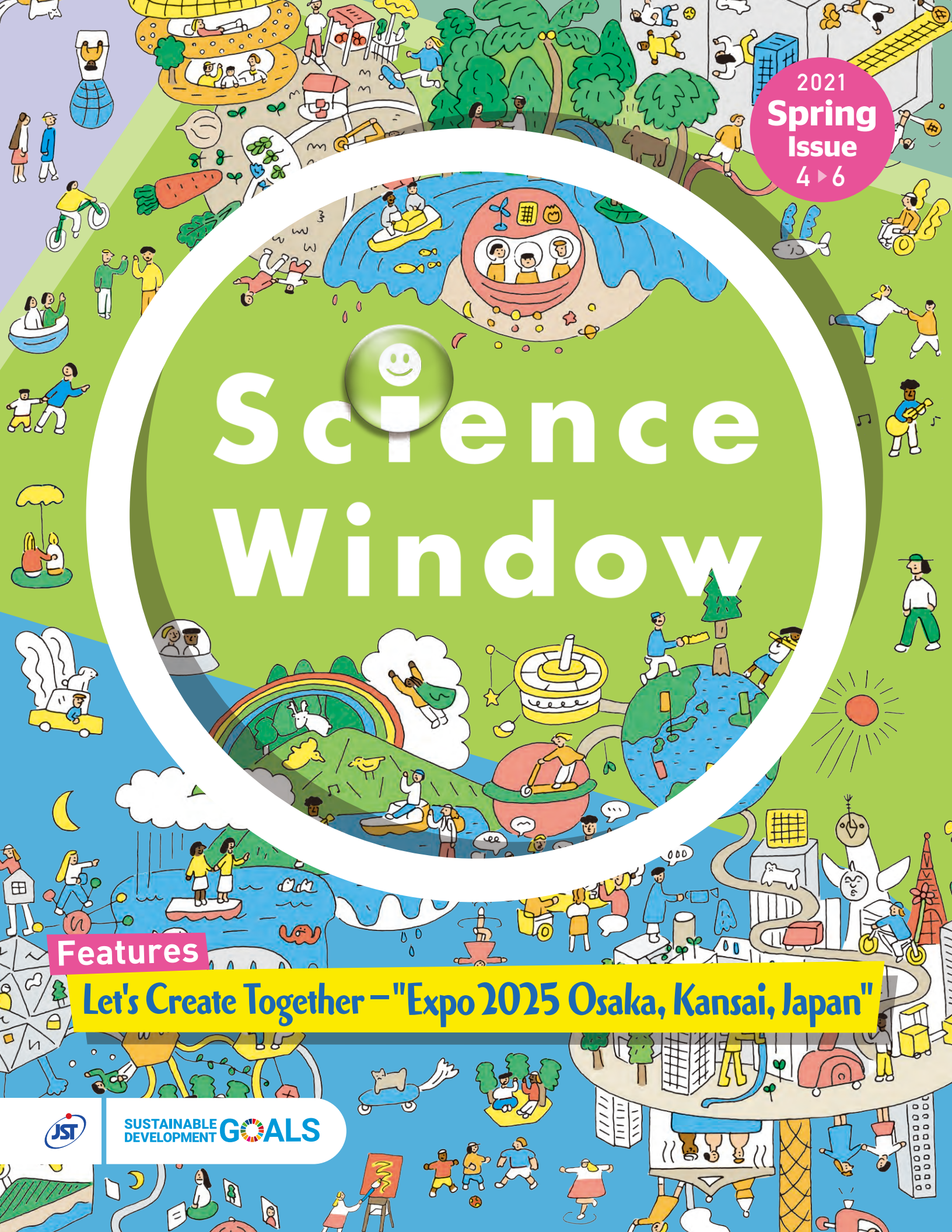
2021
Spring
Issue
4 ▸ 6
Science
Window
Features
Let's Create Together —"Expo 2025 Osaka, Kansai, Japan"
JST
SUSTAINABLE DEVELOPMENT GOALS

Science Window

2021 Spring Issue 4▶6

CONTENTS

Features

Let's Create Together ——"Expo 2025 Osaka, Kansai, Japan"

All article translation in this issue was done by Science Japan (https://sj.jst.go.jp/) except for Chapter 01 translated by Sakura Science Club (https://ssp.jst.go.jp/sns/top.html) Secretariat.

About the Features of 2021 Spring Issue

Expo 2025 Osaka, Kansai, Japan, with the theme of "Designing Future Society for Our Lives" — Activities such as "TEAM EXPO 2025" have already begun ahead of the 2025 event. We introduce what kind of Expo they aim for and the initiatives of schools and companies in Osaka, Kansai.

About the Cover

"Expo 2025 Osaka, Kansai, Japan" will take place in 2025. The cover tells the image of an Expo created by everyone, using the illustration of "TEAM EXPO 2025" (provided by Japan Association for the 2025 World Exposition), based on the Yumeshima site in Osaka, the event venue.

What is Science Window?

The world is full of science and technology, which enriches our daily lives and gives us the joy of learning about the natural world. We hope that the future will be brighter with the development of science and technology. "Science Window" is an online magazine that provides easy-to-understand and enjoyable information to make science and technology more accessible to as many people as possible.
The latest issue and back numbers are available on the JST website.

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About the 2021 Annual Theme "SDGs"

The deadline for achieving the Sustainable Development Goals (SDGs), adopted by the United Nations General Assembly, is 2030. We have less than ten years left. The world has been hit by an epidemic of a novel coronavirus infection, which has revealed the vulnerability of society, leading to higher-than-ever expectations for science and technology.

What kind of "sustainable society" can we realize, applying the lessons of the disaster? Let's think together about the way happiness and society should be.

COLUMN

The Footsteps of World Expositions and the Development of Transportation, Communication, and Exhibition Technologies

(by Science Portal Editorial Department)

"The original Expo was not to predict the future, but to reflect the society of the time and to carve the footprints of humanity." That is, an Expo is "a method of grasping the world," according to Mayuko Sano.

Japan's relationship with Expo began in the late 19th century when the country's national isolation ended, and full-scale exchange with other countries started. A Japanese delegation attended the second Expo London in 1862, and the Meiji government officially participated in Expo Vienna in 1873. In 1928, after World War I, the rules for holding World Expos were discussed at an international conference held in Paris. In November of the same year, the Convention on International Expositions ("BIE Convention") was adopted, for which thirty-one countries, including Japan, signed.

"The Japan World Exposition" was decided in 1940, but the Cabinet approved "postponing the event" due to the prolonged Sino-Japanese War ("Phantom Japan Expo"). The first-ever World Exposition in Japan was the Expo Osaka, which took place in 1970 under the theme "Progress and Harmony for Mankind", with a record number of more than 64 million visitors. It allowed the use of admission tickets for the Japan World Exposition that had been indefinitely postponed from 1940.

Expo Osaka introduced the typical transportation and communication technologies that contributed to the development of the Expo and the photographic and video technologies relevant to the exhibits.

Reference: Diplomatic Archives of the Ministry of Foreign Affairs of Japan, "BIE Convention and the Showa Expo Project"

"The footsteps of World Expositions and the development of transportation, communication, and exhibition technologies" (Compiled by Science Portal Editorial Department)

CHAPTER 01

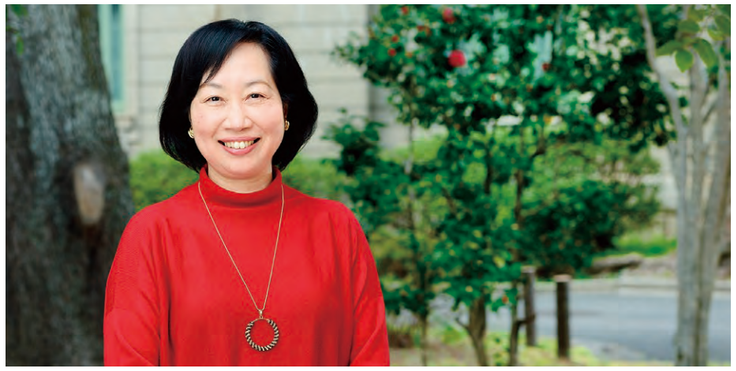
International Expositions, an Attempt to Understand Human Progress: From Exhibition to Dialogue

——Interview with Mayuko Sano, Historian

An international exposition (“expo” hereafter) is coming to Japan soon. It is “Expo 2025 Osaka, Kansai, Japan” that will take place in 2025 with the theme of “Designing Future Society for Our Lives.” The word “Expo” is familiar to everyone, but not many people will answer the following question with confidence — “What is an Expo?” Perhaps “A worldwide exhibition of science and technology” or “a huge event to show us a future society” — such vague images seem somewhat different from the Expo’s original intention. We spoke with Mayuko Sano, a professor at Kyoto University, who studies expos as a historian and tries to capture the history of human society.

Expos began “in the hope of learning about the world”

— How did expos begin? The first World Expo is the one that took place in London in 1851. Sano believes that expos emerged from the combination of three significant movements: trade fairs held mainly in France, attempts to educate ordinary citizens in England through exhibitions, and a move to open Royal Collections to people as public property. However, the first World Expos did not necessarily start with a firm principle.



Mayuko Sano, who studies World Expos (international expositions) as a historian

Sano: “We could say the first World Expo was something they just attempted, with motivations as simple as,‘Why not hold a big exhibition we’ve never had before?,’and ‘We might as well invite overseas exhibitors.’”

— The expo that began out of a sense of “might as well” was later held in New York and Paris before returning to London in 1862.

Sano: “When the process of the second Expo London started, the idea of keeping the Expo going was born. The desire to invite enough countries to represent the entire globe also began to grow, and for the first time the word ‘international’ was added. In my opinion, this is when the history of the expo began in the truest sense.”

An enormous event born through the development of transportation technology

— The 19th century, when the expo was born, was the time of significant growth in transportation technology, with steamships put into practical use. According to Sano, the birth of a technology that allowed people to travel far was the driving force behind the expo’s development.

Sano: “It became possible to go to the other side of the world if you wished and so the idea of gathering things from distant places and exhibiting them in one place was born. Now, exhibiting things would in turn grow people’s desire to see, know, and visit other places. It was a time of synergy between the growth of transportation technology and the desire to collect and display things that had never been seen before. These forces came together to produce an expo.”

— Sano sees communication technologies such as the Internet as an extension of transportation technologies in terms of transmitting knowledge and information. She focuses not only on the growth of these transportation and communication technologies but also on their “underdeveloped” aspect. Back then, the international telegraph was in its early days and was not in practical use extensively.

Sano: “I think that expo was born somewhere between a certain degree of development and underdevelopment in transportation and communication technology. Not everyone could travel far, and that’s what made it special. I believe that this delicate balance gave birth to this huge event like a miniature Earth.”

A place to confirm the progress of mankind

— When you think of an expo, you may imagine it as a place where each participating country introduces the “products they pride themselves on” to the world. Sano says there was a more genuine desire to learn about the world at the root of the minds who started the expo. Also, expos are often associated with the key word “future,” and many people may think that it is an event to describe the “future” of humanity. According to Prof. Sano, however, that is not what expos originally intended.

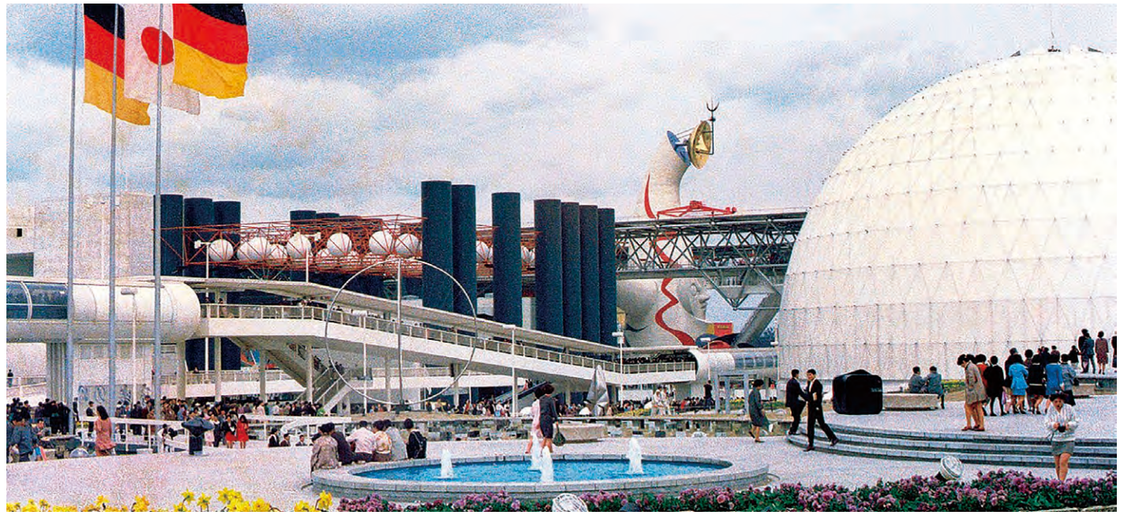
Books edited by Sano (*Expos and Human History* (SHIBUNKAKU Publishing, 2015), and *Expo-logy: Expos as a Method of Grasping the World* (SHIBUNKAKU Publishing, 2020)). “The Expo is a method of grasping the world,” says Sano.

Sano: “At its resource library, I once searched to what extent the word ‘future’ was used in the collection catalogue of BIE (Bureau International des Expositions). There were few hits from the old days, and it was only relatively recently, from the 1990s, that ‘future’ started to appear pretty often. This shows that, the expo’s original purpose was not to depict the future.”

— Rather from its early days, expos have been firmly linked to the concept of the progress of human society. Prof. Sano focuses on the fact that when the organizers of the second London Expo discussed holding the Expo every ten years, they were very aware that each expo was to confirm the progress of humanity over the recent decade.

Sano: “Humanity has come so far — whether it’s in terms of technology or the way we think about things. We can show it, confirm it, learn from it, and discuss how much further we can go until the next expo. I believe that is what expos were about initially.”

Expo London (1862)



Expo '70 Osaka: It presented a "flat world" that was unthinkable back then, welcoming the largest number of newly independent countries in the history of the Expo. (Provided by NOMURA Group)

Expo '70 Osaka presented a "flat world"

— People often refer to Expo '70 Osaka as a brilliant symbol of Japan's era of rapid economic growth. However, Sano points out a different aspect. Its theme was "Progress and Harmony for Mankind." In the 1960s, when it was decided for Osaka to host the event and preparations were underway, colonies of the world became independent countries one after another, and the shape of the world was changing dramatically. Expo '70 welcomed the largest number of newly independent countries in the history of World Expos, as the world was undergoing significant changes.

Sano: "Expo '70 was the first major world exposition held in a non-Western country. Since Japan is a non-Western country, I suppose we were not so consciously aware about welcoming emerging countries, but it was a wonderful thing. We were able to create a "flat world" unthinkable until then. This was so precious, and I think it deserves more revaluation."

— Another important outcome of Expo '70 Sano stresses was human resource development: The Expo produced "stars," including Kurokawa Kisho in architecture and Koshino Junko in fashion. They were still young at the time, but would later become leaders in a variety of fields.

Sano: "An expo is the world's largest official event. As an international enterprise, it lasts six months from its opening after a preparation period of several years, during which it mobilizes expertise and resources on an incomparable scale to any other event. Expo '70 was symbolic that it produced such top stars of the next generation, but the same is true for all aspects of society, not just them."

— The essential point is that the Expo developed human resources in a wide range of social sectors, not limited to prominent figures in architecture and art. This is Prof. Sano's perspective.

Sano: "For example, building pavilions, installing new vending machines, or coordinating and negotiating for the movement of a huge number of people safely for six months — many such challenges condense to make up an expo. Those skills will have been used later in various parts of society. In that sense, I think Expo '70 had the value of fostering Japan's human resources on an unprecedented scale."

Exhibition has changed from objects to photographs, videos, and beyond

—Of course, the "progress of mankind," on which expos have etched their footprints, includes science and technology. Not only did advances in science and technology become the subject of exhibitions, but they also significantly impacted how they are displayed. For example, in the second Expo London, photography became a new field of the exhibition.

Sano: "In the beginning, they exhibited the photographic technology itself, i.e., machines used to take the pictures. Later, mainly from the 1930s, people presumably began to use photographs in various fields to convey information instead of exhibiting actual objects. Then, it became possible to show the scenery of each country through photographs as it is never possible to bring in real scenery. This way, the content of exhibitions also changed."

— Following on from this, the method of exhibiting has evolved from objects to photographs and now to video. Because videos constrain the viewer's time, the design of pavilions and the flow of visitors have fundamentally changed; and subsequently, the meaning of visiting a pavilion has also changed. As the "age of videos" that began around Expo '70 Osaka continues today, Prof. Sano thinks it's about time we should move beyond that.

Sano: "Although digital technology is now heavily used, the way of exhibiting things through videos has not changed much. How we overcome this situation is one of my interests towards the next Expo."

Expo 2025 will return to "people"

— How will expos, which were born out of a situation in which "the technology to go far away was born, but not everyone could go," change now that "many people can go?" Prof. Sano continues, "This may seem like an outlandish idea."

Sano: "Exhibits have changed from real objects to photos and videos. When I think about what's next, I just want people to be there. The theme of Expo 2025 is 'Designing Future Society for Our Lives.' I want the event to be a place where real people from various cultures and backgrounds can thoroughly discuss current life issues. You visit the pavilions of each country, the people of that country will welcome you, and you can tell each other what you are thinking and discuss it in person — That's good enough, and that's what I think is new."

Expo 2025 Osaka, Kansai (Image of the venue): Under the concept "People's Living Lab," it aims to realize the theme, "Designing Future Society for Our Lives." It will take place for six months, starting April 2025 in Yumeshima, Osaka. (Provided by Japan Association for the 2025 World Exposition)

— Over 170 years, expos, which began with a "curiosity to learn about the world," have reflected human activities, changing the contents and methods of exhibitions.

Sano: "Hosting an expo means bringing the world to your place and becoming the host of the world for that period. This notion has not changed since the day it started. Without forgetting the meaning, I would like to make it something that can only happen in the year 2025 by people in the flesh, not just showing off technologies."

PROFILE

SANO Mayuko

Professor at Kyoto University

Graduated from the Department of Humanities and Social Sciences, the University of Tokyo. MPhil in International Relations, the University of Cambridge. Ph.D. from the University of Tokyo. After working for the Japan Foundation and UNESCO Headquarters, she was a faculty member at Shizuoka University of Art and Culture and the International Research Center for Japanese Studies before assuming her current position in 2018. She specializes in the history of diplomacy and cultural exchange, and cultural policy.

Image of "Expo 2025" venue (Provided by Japan Association for the 2025 World Exposition)

CHAPTER

02

"Expo 2025 Osaka, Kansai, Japan" Begins in Earnest!

A "Huge Cultural Festival" to Co-create the Future

Akina Horikawa and Takayuki Honda, Fellows at Knowledge Mobility based System Institute (KMS) and Science Communicators

"Expo 2025 Osaka, Kansai, Japan" is the first international exposition held in Japan since "Expo 2005 Aichi, Japan" 20 years ago. Its logo, which expresses the theme of "Designing Future Society for Our Lives," became a topic of conversation immediately after the announcement. We interviewed Mr. Harutoshi Imamura, Division Chief (at the time of the interview), Strategic Business Planning & Promotion Department, Public Relations Strategy Bureau, Japan Association for the 2025 World Exposition, who is preparing the event.

Mr. Imamura, Japan Association for the 2025 World Exposition (Interview conducted in March 2021)

A "New Expo" begins in the Expo city

Osaka is a city of expositions. The Japan World Exposition (Expo '70) held in 1970 at Senri Hills (Suita City, Osaka Prefecture) is still in the hearts and minds of the people of Osaka even after half a century.

Expo '70 became an opportunity for Japan to boast about its rapidly growing science and technology sectors and exude presence to the world amid a period of rapid economic growth. Under the theme of "Progress and Harmony for Mankind," the Expo brought together new technologies and cultures worldwide. The future of science and technology, seen from that time, such as linear motor cars, electric cars, and cell phones, remained in the eyes of some 65 million visitors.

While expectations are growing for Expo 2025 Osaka, Imamura says, "I believe that this Expo will be something that overturns the conventional image of the event."

"When I asked elderly men and women about Expo '70, they would say, 'I miss it. I'm looking forward to the next one. So, what kind of "tower" will be built this time?' In this Expo, we will not present one particular symbol, but I would like to work with everyone to create a new Expo." (Mr. Imamura, hereafter)

"Designing Future Society for Our Lives"

A "World Expo" is an "international exposition" held based on an international treaty called the BIE Convention, upon approval by the Bureau of International des Expositions (BIE). BIE began in 1928, with its headquarters in Paris, France. As of May 2021, the number of member countries has reached 169.

Japan has hosted five expositions to date: the Japan World Exposition (Osaka, 1970), the Okinawa International Ocean Exposition (Okinawa, 1975), the International Science and Technology Exposition (Ibaraki, 1985), the International Garden and Greenery Exposition (Osaka, 1990), and the 2005 World Exposition, Aichi, Japan (Aichi, 2005) (See Table 1).

International expositions are divided into two main categories: "registered expositions" (Registered Expo) and "specialized expositions" (Specialized Expo). Formerly, they were divided into "general expositions" (General Expo) and "special expositions" (Special Expo), but the BIE Convention was revised in 1988 to create the current classification.

Expo '70 was held as a General Expo. The upcoming Expo 2025 Osaka is a Registered Expo, which has to have a broad and latitudinous theme and is held every five years for a maximum of six months. On the other hand, a Specialized Expo lasts for three months or below and only takes place once between two Registered Expos with five-year interval (exceptionally, the Okinawa International Ocean Expo and the International Science and Technology Expo lasted six months).

So, what is new about Expo 2025 Osaka, Kansai? The most important feature of the Expo is that it aims for co-creation. "The Expos in the past were places to demonstrate national prestige and the latest science and technologies. The Expos of the new era value the notion of creating together," says Imamura.

To realize the theme of "Designing Future Society for Our Lives," 150 countries and 25 international organizations, as well as corporations and citizens' groups, will participate in Expo 2025. It aims to achieve the Sustainable Development Goals (SDGs) and depict the future beyond the goals (See Fig.1).

"Contributing to achieving the SDGs is one of the vital missions of this Expo. 'Lives' in the theme does not refer to human life alone. Since ancient times, Japan has had a saying, 'all things have a spirit.' I believe that the Expo will be an opportunity to think about diverse lives of all living things, and even of the earth that nurtures them."

Year	Name	Theme	Purpose / Features
1970	The Japan World Exposition (Expo Osaka, Expo '70, Japan World Expo)	"The Progress and Harmony for Mankind"	Many exhibits were shown pursuing the high ideals of humanity in this theme, "progress and harmony," which are difficult to coexist. "The Tower of the Sun" was a brilliant symbol of the Expo as the "starting point" of the "origin."
1975	The Okinawa International Ocean Exposition (Okinawa Ocean Expo, Ocean Expo)	"The Sea We would like to See"	Held to commemorate Okinawa's return to Japan and celebrate the event with the entire nation. It was the world's first international exposition to have the theme of 'the sea.' Okinawa Prefecture raised funds from the business community and the people of Okinawa Prefecture to exhibit the "Okinawa Pavilion," introducing the history and culture of Okinawa.
1985	The International Science and Technology Exposition (Science Expo, Expo Tsukuba, Science Expo Tsukuba, Tsukuba '85)	"Dwellings and surroundings - Science and Technology for Man at Home"	A special exposition held to present a vision of science and technology that would create the 21st century and deepen understanding of science and technology. The exhibition discussed the mutual exchange of science and technology, the contribution of science and technology to the arts, the expansion of human living space, the interrelationship between humans and machines, and ultimately the way human beings should be.
1990	The International Garden and Greenery Exposition (Flower Expo, Osaka Horticultural Expo, Expo '90)	"The Harmonious Coexistence of Nature and Mankind"	Aimed to create an affluent and prosperous society towards the 21st century looking at the relationship between flowers, greenery, and human life. It was a specialized exhibition based on the BIE Convention and the first major international horticultural exposition in the Orient.
2005	The 2005 World Exposition, Aichi, Japan (Expo 2005 Aichi, Japan)	"Nature's Wisdom"	Proposed to explore the relationship between nature and human beings in the 21st century. Impressed by the "wonderful mechanisms of nature and the power of life," the Expo was held with broad participation and exchange to create a global society where diverse cultures and civilizations coexist while learning from various ways and wisdom of interacting with nature in different parts of the world.

Table 1: International expositions (World Expo) held in Japan in the past and their themes (Compiled from exposition materials)

What is "TEAM EXPO 2025" that symbolizes co-creation?

The specific ways to participate in Expo 2025 include exhibiting at pavilions and sponsoring themed projects undertaken by eight front runners from various fields. From among these, the "TEAM EXPO 2025" program ("TEAM EXPO" hereafter), which will run from before through to after the event finishes, is a participatory program that invites proactive groups from the general public to join in. It is going to break through the conventional notion of "An Expo is something you go and see. "

There are two ways to enter TEAM EXPO. One is the "Co-Creation Challenge,"

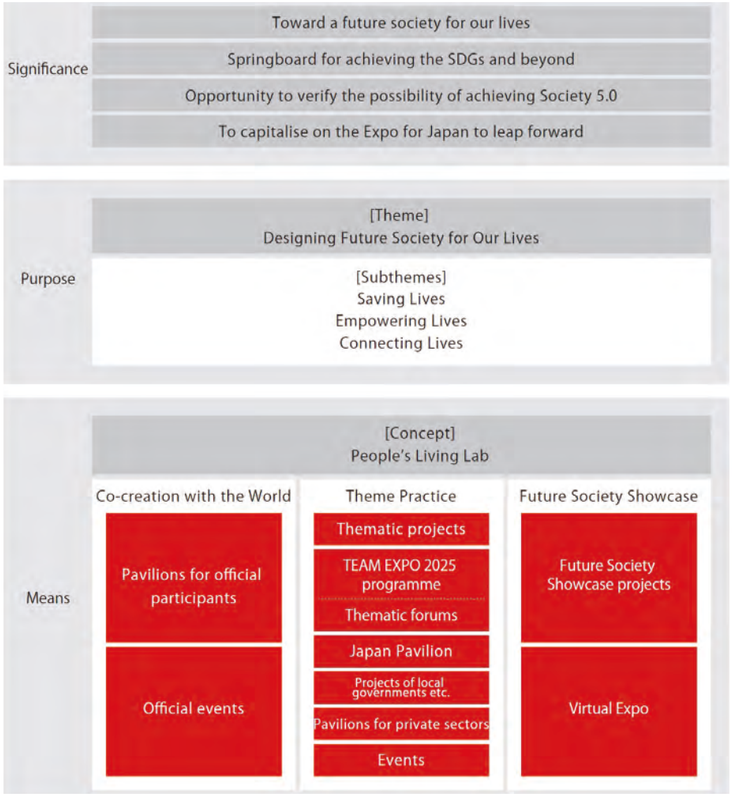


Figure 1: Project Structure of Expo 2025 Osaka, Kansai, Japan (Prepared with reference to the master plan for the 2025 World Exposition, p.18)

which is open to individuals and teams taking or planning any proactive action to realize the theme; this indeed requires the power of individuals.

The other is an entry as “Co-Creation Partner,” which calls for corporations and organizations responsible for creating and supporting various co-creation challenges. They are required to endorse this program and develop their unique activities that match the program proactively and continuously.

There used to be inevitably a gap in how people interacted: For example people on stage compared to those in the audience. However, he appeals, “In the upcoming Expo, everyone can take a leading role. Let’s work together to create the Expo.”

“I expect participants, through TEAM EXPO, to work with other members to solve as many issues at hand as possible and pile up experiences by which you can feel society has become a little better. I believe that the key to solving the big issues of the SDGs surely lies in the voices of individual people and communities.”

A “Huge Cultural Festival” on a global scale

The application process for TEAM EXPO started in October 2020, and in the six months up to March 2021, 105 individuals/groups have registered for the “Co-Creation Challenge,” and 59 organizations have come forward as “Co-Creation Partners,” with the number still growing. “There are various projects: some are with a regional focus and others have an eye on overseas expansion. We have received more ideas than we had imagined, and I’m excited about future developments,” says Imamura.

For example, the robot science club of Otemon Gakuin Otemae Junior and Senior High School is proposing ideas to contribute to the achievement of the SDGs under the theme of “Osaka’s Youth Challenge: Robot Development Project to Solve the SDGs.”

The light music club of Osaka Prefectural Sakurazuka High School has joined the program under the theme of “Promoting the Expo to the World with Original Music!” The students wrote and composed an original song to cheer the Expo and prepared an English version to distribute to the world via YouTube, which was not a request from the association but a spontaneous action of their own.

Co-creation partners have also organically linked with individual co-creation challenges, creating synergistic effects beyond the association’s expectations. These projects will not end just as each group’s effort but should develop into something bigger involving other challenges and partners. It is indeed “Creating an Expo together,” under the theme of co-creation.

Imamura talking about TEAM EXPO 2025 program

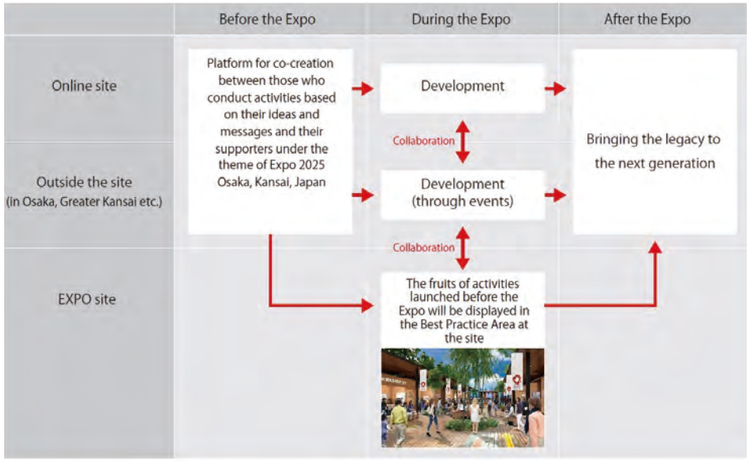


Figure 2: TEAM EXPO 2025 program encourages co-creation and participation (Prepared with reference to the website of the Japan Association for the 2025 World Exposition; Image provided by Japan Association for the 2025 World Exposition)

In addition, Expo 2025 will provide TEAM EXPO participants with both real and virtual (online) communication opportunities (see Fig.2). It is expected that sharing the results of pre-Expo activities will create new collaborations and co-creation, transcending time and space constraints.

“Thanks to TEAM EXPO, there are no longer any restrictions on the Expo’s duration or venue. Expo 2025 has already begun, and there is no need to specify an end in 2025. We want to expand the circle of activities further and encourage people worldwide to participate so that the activities of TEAM EXPO will remain as a legacy even after the Expo is over. In that sense, an Expo could be a ‘Huge Cultural Festival.’”

Each of us will open a new era

Each of us takes a leading role and expresses life. Expo is about to become a place that embraces and accepts this idea. Imamura strongly felt this when he took charge of the project to create the logo mark, announced in August 2020.

Imamura with the logo of Expo 2025 in the background

What do you associate this logo with? People searched for something that resembled the logo on the Internet, such as a plant called guarana or a doughnut, and it was like a big comedy game.

“I was amazed at the great response to the logo and thought that if everyone enjoyed themselves and participated spontaneously, it would lead to ‘Creating an Expo together.’ As long as you meet certain requirements, you can participate in TEAM EXPO in various ways on any theme you wish to work. I hope that you will consider registering with the co-creation challenge or co-creation partner even now.”

Imamura says that he wants the younger generation in particular, to use the Expo as a platform to put out what they like and what they want to do.

“I believe that there are people who want to try something but don’t know how to go at it. Our co-creation partners include groups that back such thoughts and ideas. I hope that students, in particular, will make use of TEAM EXPO. Let’s work together to boost Expo 2025!”

Expo 2025, Osaka, Kansai, Japan, has already begun to expand its circle of activities with its participatory approach. From Japan to the world, a big step forward is about to open up a new era with the energetic power of each individual.

PROFILE

IMAMURA Harutoshi

Former Division Chief, Strategic Business Planning Division, Strategic Business Planning & Promotion Department, Public Relations Strategy Bureau, Japan Association for the 2025 World Exposition

Completed Environmental Engineering study at Graduate School of Engineering, Kyoto University in 2009. After working in the private sector and local government, he worked in planning and public relations strategy for Expo 2025, Osaka, Kansai, Japan, for about two years, from April 2019. He was in charge of the TEAM EXPO 2025 program and logo designing project.

Members of the Robot Science Club at Otemon Gakuin Otemae Junior and Senior High School

CHAPTER

03

Creating a Society where “Everyone Can Smile” through Robotics Education and SDGs

—TEAM EXPO 2025 Otemon Gakuin Otemae Junior & Senior High School Robot Science Club

The Robot Science Club at the Otemon Gakuin Otemae School has gone beyond the boundaries of school club activities to realize many full-scale “robot projects.” Their activities cover a wide spectrum, winning prizes at international robot contests, developing robots that solve social problems, and providing robotics education to local people. The students set their themes, work together to solve problems, and spread information, and outside parties have evaluated their efforts highly. The club has also registered for the “Co-Creation Challenge,” a TEAM EXPO 2025 program promoted by the Japan Association for the 2025 World Exposition in preparation for Expo 2025, Osaka, Kansai, Japan. We will introduce the unique initiatives of these junior and senior high school students working to “create a better society through robot development.”

Students set their theme and work together on the “robot project.”

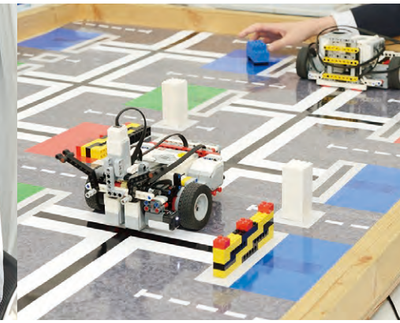
Daring to challenge the world’s top robotics contest

As we passed through the school’s historic gates, a new prefab building was in stark contrast to Osaka Castle tower in front of us. Inside the building, about 30 students were working in groups. Some discussing their ideas, some looking at computer screens, and some making something with Lego blocks. We were in the “Tech Lab,” the club room of the Otemon Gakuin Otemae Junior and Senior High School’s robot science club.

Up ahead, a robot made with “Lego Mindstorms” carried blocks of various colors. Watching it in earnest was a team of three people entering the WRO (World Robot Olympiad), an international contest for autonomous robots.

“We can’t control the robot during a competition, so we have to program all the movements in advance,” explained club member Nakamura, who is in charge of software. “It’s difficult to build effective communication so that Nakamura can program,” said another member, to whom Nakamura replied, “Because I’m asking too much.” Another different member cuts in, “We do fight sometimes.” Exchanges such as this showed us the good teamwork of those who aim to make a better robot.

“This year, we want to win first place at the WRO Japan and go to the International Final,” — I felt the quiet confidence in their words.

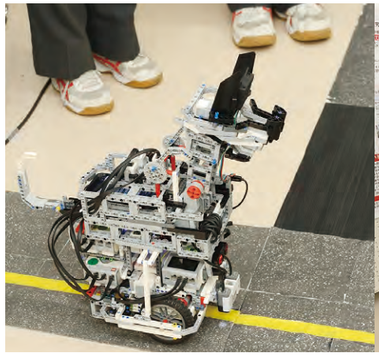


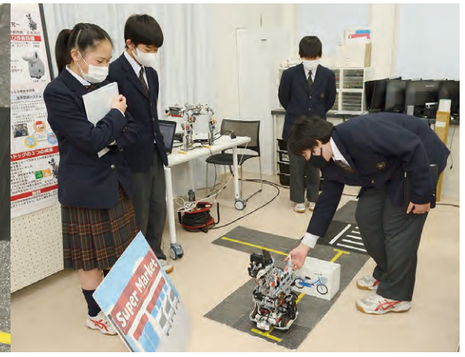
Three students challenging the global robotics contest, WRO, are all known as “the strong ones” who have won top prizes in past competitions. From right to left: Nakamura, Nishizumi, and Shimizu.

An advanced guide-dog robot that has inherited the technology of their predecessors

Right behind the WRO team, a miniature “city” with features resembling a hospital, traffic lights, and roads was built, and a dog-shaped robot was sitting on top of it. “It’s a guide dog robot called ‘Ai-dog*,’” said Furumoto, in charge of information sharing for the team. “Currently, about 3,000 people in Japan need guide dogs, but there are less than 1,000 available guide dogs. We have developed this robot to solve the problem.”

After being activated, Ai-dog asked me, “From where to where do you want to go?” I answered, “From my house to the supermarket,” then it began to move. It ran autonomously, following the Braille blocks embedded in the road, bypassed obstacles, stopped at a red light, and proceeded again at a green light. When it reached its destination, it wagged its tail and it stopped.





Guide Dog Robot “Ai-Dog” that automatically runs to a voice-directed destination.

Ai-dog is the second model, taking over and improving the first model made by their predecessors. The tires are bigger to go over level differences, the signal recognition rate increased, and the total size is smaller. A quadrupedal robot that can climb stairs is also under development for testing on public roads shortly. Furumoto concluded her demonstration by saying, “We aim to create a society where everyone can smile.”

IoT power strips contribute to relieving climate change issues

Two more club members, Iga and Minakata have developed an IoT power tap that remotely controls the power switch and the output to prevent electricity waste. Minakata gave us a demonstration of controlling the air volume of a fan connected to the tap.

For the theme of “climate change,” the two students discussed how to solve the problem many times with their advisor, Fukuda-sensei (teacher). Iga, who had little experience in robot development, was initially like, “I have absolutely no idea what Minakata is saying” “But I made this after doing my research, understanding the words, and thinking about how I could get them

* The name of “Ai-dog” derives from the meanings of supporting the owner’s eyes and being close to the heart to support the mental aspect (i.e., “love” in Japanese).

The IoT power strip (left), which prevents electricity waste by remote control of devices like cellphones, won the best prize in the open category at the WRO Japan 2020. This project also contributes to achieving the SDGs.

across better." She pointed to the poster that outlines the development in an easy-to-understand manner.

On the other hand, Minakata, who has a wealth of experience in robot development, says that he was surprisingly "gloomy" as a junior high school student. As he developed robots, he gradually gained confidence in his skills. "I think I was able to grow up looking at my seniors, who told me that I was 'better than they were'," he said, looking a little embarrassed.

Sharing information at SDGs seminars using robots

The team lead by Yamamoto, the club manager, has been working on the planning and managing of "Save Our Earth," a seminar to think about the SDGs and global environmental issues through robots. The large diorama on the floor is a model expressing various environmental problems. Seminar participants can operate robots on this model and learn about environmental issues by turning off the lights in the houses, separating plastic bottles from empty cans, removing garbage from the ocean to clean it while having fun.

The members who created the model said they had a hard time making the design easy to understand and enjoyable for the participants. "This time, we tried to build the robot with just a 'push' action. Children were like 'Oh!' when they saw the house lights go off with the 'push' button." The members who spoke also seemed to have enjoyed running the seminar.

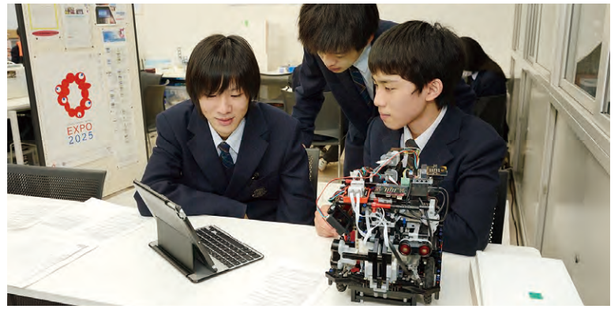
Participants are not only from Osaka but also from neighboring areas. Yamamoto said that it was essential to spread their activities, not just to develop things. She would like to continue developing programming materials and sharing information after going to university. Miyagawa, the deputy club manager, expressed his thoughts on the future, saying, "There used to be nothing that interested me, but now I hope to get a job where I can use my strengths through programming."

Club members and the handmade dioramas that members used in the "Save Our Earth," a seminar that helps people understand the SDGs and global environmental issues through robots.

RoboCup Junior Disaster-Relief Robots Compete using Practical Technology

One robot moves around the maze-like field. Surrounding it are students trying "the RoboCup Junior Rescue Maze." The maze resembled a disaster area, and the competition is to deliver relief supplies to victims as quickly as possible. The shape of the maze changes each time, and obstacles resembling rubble are placed randomly. "We program the maze through trial and error so that participants can pass through any field," said a member in charge of software. "The appeal of this project is that you can be of use to society while learning technologies."

The only junior high student (2nd grade) in a senior high team, Fujimura, talked about the charm of cross-grade interaction. "I can absorb things from senior students — things that I wouldn't understand if I were with students of the same grade." At first, he was unsure of what to expect, but he gradually became closer to them as he worked with his seniors. Egawa, the team leader, added, "It is an education method in which seniors teach juniors instead of teachers."



The "RoboCup Junior" team, where seniors and juniors work together to compete with programming skills

Mr. Fukuda, the advisor, watches over the students

Over in RoboCup Junior, where the competition is in practical technology, Otemon has many strong rival schools. "Schools that have processing facilities can build full-scale metal robots. We can't beat them with power (equipment), so we compete with programming (knowledge)." In his remarks, we could feel his pride and belief that he would not lose to them with software.

Oil spill recovery robot developed in collaboration with a private company

At the back of the room, a pure white machine caught our eyes. It looked like a water wheel, different from other Lego robots. It was an oil spill recovery robot developed by Egawa and Kuratomi. Kuratomi said, "We started developing this robot after the oil spill accident in Mauritius." The idea of recovering oil spills by combining water purification agents manufactured by a company they met through club activities and robot technology was born.

The mechanical model the two students invented, the "pure white water wheel," was prototyped using a 3D printer. To get prototype funds, they applied for a grant from a foundation that supports technological development. "It's not unusual to look for supporters by ourselves," said Egawa. "Fukuda-sensei also tries to look for one for us, but basically, we do it ourselves and give a presentation to potential supporters."

The oil spill recovery robot developed using a water purification agent produced by a company they met: They bought the 3D printer for the prototype with grant money. They created the robot through trial and error, seeking opinions from university professors and private companies.

What I'm most happy about is seeing my students grow

During the interview, the advisor, Fukuda-sensei, left all the explanations to the students and never cut in. The students also spoke freely and conveyed their initiatives in their own words. Fukuda said, "The students who participate in the competitions give electrifying presentations." But, he added, many of them wanted to join an athletic club but couldn't or are a little withdrawn. "I am most happy when I see these children grow up and the lights switches on in them. That's what keeps me doing this job," he smiled.

PROFILE

Otemon Gakuen Otemae Junior and Senior High School Robot Science Club

The club started in April 2014 with six members from junior and senior high schools and teacher Tetsuya Fukuda as an advisor. In 2020, the club registered for the "Co-Creation Challenge," a TEAM EXPO 2025 program, with a "robot development project for solving SDGs by young people in Osaka."

A video of the clubs "WRO2019 Otemon Challenger" (Advanced Marine Debris Recovery Robot) presentation can be seen at the following link (YouTube):
https://www.youtube.com/watch?v=21R_0-SNZ8s

CHAPTER
04

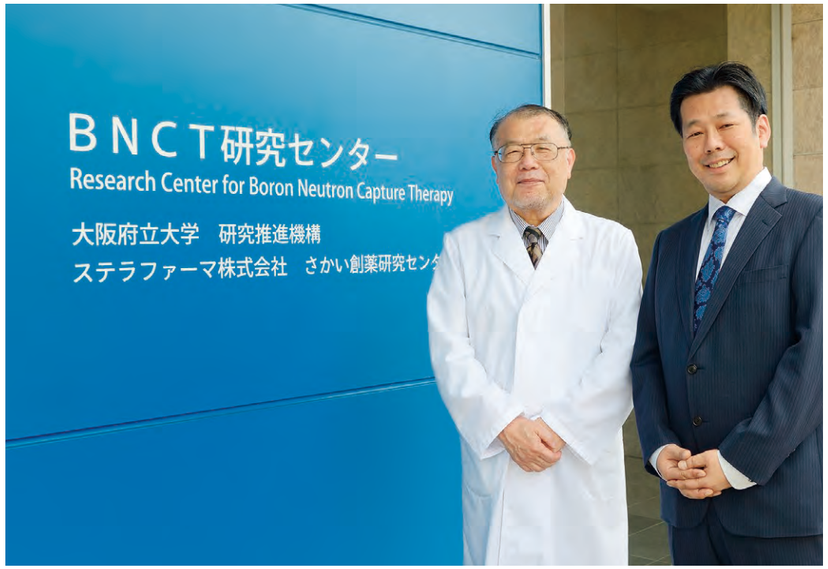
Japan's "Fifth Cancer Treatment," BNCT, Finally Off the Ground

As we move towards Expo 2025 Osaka, Kansai, Japan, new technologies ahead of the world are successively emerging from the Kansai region. One of these is a new cancer treatment called BNCT (Boron Neutron Capture Therapy), which started in May 2020. We asked Mitsunori Kirihata, Professor at the Research Center for BNCT, Osaka Prefecture University, and Tomoyuki Asano, Chairman of Stellar Pharma Corporation, about its development background. They contributed to the practical application of BNCT, which is expected to become the "fifth cancer treatment."

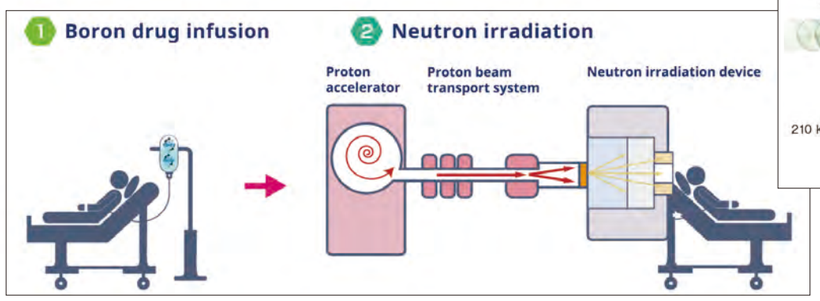
A cancer treatment with less burden on patients

Currently, there are four methods of cancer treatment in the medical field: surgery (surgical treatment), drug therapy such as anti-cancer drugs, radiation therapy, and immunotherapy. The treatment chosen is determined in consideration of the cancer type, the degree of progression, and the patient's condition, but there is always a need for more effective and less burdensome methods in the medical field.

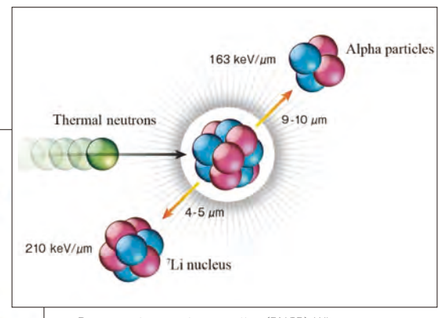
Within this field, BNCT is drawing attention as a "fifth cancer treatment" that can expand the options for cancer treatment. BNCT treats cancer by administering boron drugs and using an irradiated neutron beam, which does not harm the body and can have a therapeutic effect in basically a "single (one day) treatment," placing less burden on the patient compared to other cancer treatment methods. This feature is due to BNCT's mechanism.



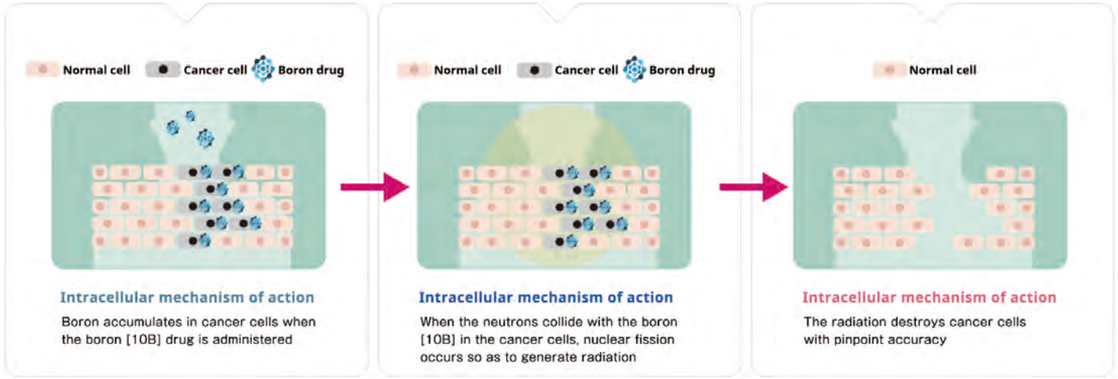
Dr. Kirihata, Professor at the Research Center for BNCT, Osaka Prefecture University, who developed BNCT boron pharmaceuticals, and Mr. Asano, Chairman of Stella Pharma Corporation. In front of the Research Center, their research and development base.



BNCT is expected as the "fifth cancer treatment." It treats cancer by administering boron drugs and irradiating them with a neutron beam. (Source: Stellar Pharma website(https://stella-pharma.co.jp/en/))



Boron neutron capture reaction (BNCR): When neutrons hit boron 10 in cancer cells, Boron-10 undergoes nuclear fission, producing radiation (alpha rays and lithium nuclei).
(Source: Japan Society of Neutron Capture Therapy website (http://www.jsnct.jp/e/index.html))



In BNCT, radiation generated by the nuclear fission of boron (Boron-10) taken up by cancer cells destroy the cells with pinpoint accuracy. For this reason, BNCT is also called "cancer-cell selective therapy." (Source: Stellar Pharma website(https://stella-pharma.co.jp/en/))

The mechanism of killing cancer cells

BNCT is an abbreviation for "Boron Neutron Capture Therapy." As the name implies, two particles, boron, and neutrons play the "leading roles" in BNCT. In the treatment method, cancer patients are firstly given a boron drug consisting of a boron isotope (Boron-10) compound. This compound has the property of being selectively taken up by cancer cells. Then, when a weak neutron beam irradiates the diseased area, it hits the Boron-10 in the cancer cells and causes fission, producing radiation (alpha particles and lithium nuclei). This radiation destroys the DNA and mitochondria within the cancer cells, subsequently killing them. Assuming that a cell is about 20 micrometers, it is possible to destroy cancer cells with pinpoint accuracy since the generated radiation only travels about 10 micrometers.

Kirihata explains the features of BNCT, "Inside cancerous tissues, cancer cells don't exist in a homogeneous lump, but as a mix of cancer cells and normal cells. As a so-called 'cancer-cell selective therapy,' BNCT can kill cancer cells and minimize the impact on normal cells."

The Beginning of Boron Drug Development

The development of the boron drugs used for BNCT began with the encounter between Kirihata and Asano.

In the late 1990s, Stella Chemifa, a chemical manufacturer based in Osaka Prefecture, developed its own Boron-10 enrichment technology and started selling it as a neutron absorber for nuclear power generation. Asano, who was working in the company's research laboratory, was assigned to develop further applications for Boron-10.

"The enrichment plant for Boron-10 is located in Izumiotsu City (Osaka Prefecture). There was a nuclear reactor laboratory owned by Kyoto University in nearby Kumatori City, and I went there thinking that they might want Boron-10 from us."

After investigating, Asano learned that Boron-10 was already used in BNCT research.

Stella Pharma's Sakai Drug Discovery Research Center, inside the Research Center for BNCT, Osaka Prefecture University: Research and development of BNCT boron drugs are underway through industry-academia collaboration.

After Stella Pharma was established, Asano began to work in earnest on developing BNCT boron drugs. Back then, however, there was no precedent for boron-based medications at all.

"I found out that the boron drug for BNCT was being developed by a person named Dr. Kirihata at Osaka Prefecture University, which is very close to our company, so I immediately swung by his laboratory."

Kirihata was taken aback by Asano's sudden visit, as he had never dreamed that there would be an enrichment plant for Boron-10, a difficult to obtain material, right by his university. Until then, Kirihata had been importing Boron-10 from an American company, but slow delivery times and the high price made it difficult to proceed with his research.

"When I asked Mr. Asano how much Boron-10 his company was producing, he replied, 'We have a plant that produces Boron-10 by the ton,' which surprised me even more because until then, we had been importing a few dozen grams at a time." Asano recalls, "Dr. Kirihata asked me if he could have around 10 grams. I said, 'It may be a lot, but I'll bring one kilogram.'"

Stella Pharma Goes Independent

About half a year later, an industry-academia collaboration organization started to develop BNCT, and Asano undertook the development of BNCT boron drugs. BNCT was gradually gaining recognition, and the path to the development of boron drugs became clear. Around that time, he learned that Sumitomo Heavy Industries, Ltd., conducting research and development with Kyoto University, had begun full-scale development of a neutron generator to be installed in hospitals. It was a small cyclotron-type accelerator, and if completed, it would make it possible to introduce BNCT to ordinary hospitals.

Asano says, "That was a big 'breakthrough' for us." Stella Pharma was then spun off from its parent company, Stella Chemifa, to focus on BNCT boron drugs.

"During the unprecedented drug development, the idea of Stella Chemifa's chairman that 'Doing something for the world and people will eventually lead to profit for the company' supported us." (Kirihata)

Development of pharmaceuticals for the benefit of people and society

As a result of this, the development of BNCT boron drugs started, but at that time, there was no precedent for the use of boron in cancer treatment, let alone for BNCT. It was necessary to verify "everything from scratch" through discussions with the Ministry of Health, Labour and Welfare (MHLW) and the Pharmaceuticals and Medical Devices Agency (PMDA), who approve pharmaceuticals and medical devices under the MHLW. "For example, in the case of cancer drug development, we could refer to what major pharmaceutical companies had done before, but in the case of BNCT, there was no precedent at all, so we needed to conduct thorough clinical trials," recalls Asano.

In general, it costs between ten to a hundred billion yen to develop a single anti-cancer drug. There was a fear that the development of the unprecedented BNCT boron drug would be even more costly. It was tremendously risky for a small company with a few dozen employees to enter the pharmaceutical industry for the first time. The company could have abandoned development at any time, but with the help of various measures, they were able to pass the approval process, which usually takes 12 months, in six months.

After more than 20 years of research and development, in May 2020, BNCT began at two locations: The Southern Tohoku BNCT Research Center (Fukushima Prefecture) and the Kansai BNCT Medical Center, Osaka Medical and Pharmaceutical University (Takatsuki City, Osaka Prefecture). (Provided by Sumitomo Heavy Industries, Ltd. and Osaka Medical and Pharmaceutical University)

Another great aspect of support in the development process was the boost from Ms. Junko Fukada, the then chairperson of Stella Chemifa, the parent company. Fukada's belief that "Doing something for the world and people will eventually lead to profit for the company" backed them all along. The two say their feelings of "We want to save people who have cancer. We will develop products for the benefit of people and society," heightened even further.

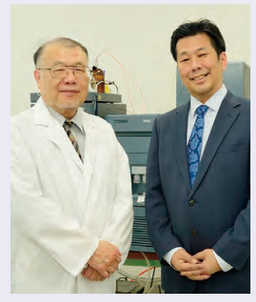
Making a New Light for Those Fighting Cancer

So, with various boosts from collaborators in industry, academia, and government, Kirihata and Asano steadily progressed toward the significant goal of realizing BNCT. And finally, in March 2020, the BNCT boron drug, together with the cyclone accelerator, obtained pharmaceutical approval targeted for head and neck cancers (face, mouth, nose, throat, etc.). Later in May, the drug became covered by health insurance. BNCT treatment for ordinary patients started at the Southern Tohoku BNCT Research Center in Fukushima Prefecture and the Kansai BNCT Medical Center of Osaka Medical and Pharmaceutical University in Osaka's Takatsuki City. Both centers have received inquiries from all over Japan, and the number of treatments is steadily increasing.

Asano focuses on further expansion of BNCT, saying, "Next, we would like to expand the scope of treatment to include brain tumors and increase the number of medical institutions where BNCT is available." Kirihata is working on research that goes even further, "At present, we only have one type of medication, but in the future, we would like to realize 'tailor-made medicine' to make boron drugs according to the characteristics of each individual."

"We want to save as many people as possible by giving hope to those who have given up without being able to be treated. We hope BNCT will be a new light for people fighting cancer." With this strong desire in their hearts, their quest will continue.

PROFILE



KIRIHATA Mitsunori

Professor (Director) at Research Center for BNCT, Osaka Prefecture University

Ph.D. in Agriculture from Osaka Prefecture University. Having retired in 2012 after working as a professor at the Graduate School of Agriculture and Biological Sciences / Life and Environmental Sciences, Osaka Prefecture University, he assumed his current position as a project professor of Research Center for the 21st Century and Organization for Research Promotion.

ASANO Tomoyuki

Chairman & CEO of Stella Pharma Corporation

After graduating from the Graduate School of Applied Chemistry, Kansai University, he joined Hashimoto Kasei (now Stella Chemifa) in 1996. Having engaged in the company's R&D work. In 2012, he became President of Stella Pharma, established in 2007, and assumed his current position in June 2020.

CHAPTER
05

What You Need to Know Before Expo 2025!: Kansai's Unique Technology that Contributes to the SDGs

Akina Horikawa, fellow at Knowledge Mobility based System Institute (KMS) and science communicator

Ahead of the 2025 Japan World Exposition (Expo 2025 Osaka, Kansai, Japan), all eyes are on Science and Technology Innovation developments (STI for SDGs) to achieve the Sustainable Development Goals (SDGs). Kansai is a region of commerce, and many companies and organizations aim to contribute to the SDGs worldwide by using their unique technologies. We introduce Smileyearth (Izumisano City, Osaka), which has reduced the environmental burden of towel production, and the Research Center for BNCT of Osaka Prefecture University (Sakai City), which leads industry-academia-government collaboration towards the spread of new cancer treatment methods.

The Challenge of the Towel Company Began in Japan's Dirtiest River

"Monozukuri Nippon Grand Award," sponsored by METI, the Ministry of Economy, Trade and Industry, shines a light on people who take on the challenge of manufacturing in the new era. Smileyearth, which won the 7th METI Minister's Prize in 2018, has only five employees but has had a strong presence with its enthusiastic efforts toward the SDGs, including winning the Excellence Award at the JST-sponsored "STI for SDGs" Awards in 2019.

The Senshu area of Osaka is the birthplace of Japan's towel production and boasts a history and tradition of about 130 years. Tatsumasa Oku, the president of Smileyearth, was born and raised in this area as the third generation of a towel manufacturer. In 1998, the Kashii River, which runs through the area, was ranked lowest in a nationwide survey of river water quality conducted by the Ministry of Environment. Oku, who was in the fifth grade at the time, felt pained to learn that his family's towel business was one of the reasons for this.

Mr. Oku, the president of Smileyearth, talking about the future of towel manufacturing (Provided by Smileyearth)

Generally, a large amount of water is used in towel production. Towels are highly absorbent, but their raw material, cotton, contains oil and repels water. This resulted in massive spills of treated water from the chemical agents and dyes used to remove oil and impurities.

"It is said that 500 grams of chemicals are needed to make one kilogram of towels. At times, annual production was tens of thousands of tons, and half that amount of chemicals were also used."

Japan's towel industry peaked around 2000 but has been shrinking ever since. Dominated by inexpensive imported products, the number of towel-related companies in Senshu, which used to be over 700, has now fallen to less than 100. However, Ryuichi Oku, the father of Mr. Oku, turned this challenge into an opportunity.

Unique technology that focuses on cotton's natural purification

Towel manufacturing is generally divided into companies that make yarn from cotton, weave companies, and dye companies. While many of his competitors went out of business, Ryuichi bought their machinery and equipment and established an integrated production system at his company. He also approached Yuichi Kashiwada, who was undertaking organic cotton cultivation in Uganda at the time. Tatsumasa, the current president, also went to Uganda after graduating from university, and this was when the challenge of creating a genuinely organic towel began.

In general, even organically grown cotton is treated with chemicals when being made into towels. Oku questioned whether such towel production was "truly organic" and started to investigate on his own. He discovered that cotton has a self-purification function and then developed the "self-cleaning cotton method" that maximizes this function. He achieved the same effect as the conventional chemical-based scouring process using only cotton and water, reducing the amount of water used to about one-fourth and the chemical agents to one-fifth.

Smileyearth is pursuing sustainability of towel production and the global environment with STI for SDGs. As an "SDGs manufacturer," the company has set nine goals to tackle — "Responsible consumption and production" "Life below the water," and others — out of the 17 SDGs goals.

Ultimately, Oku hopes to build a recycling system that reuses treated water as a water resource for cultivating crops and other purposes to realize a "Nature Towel Factory," a towel factory for a new era. Now, people connected through "water," like local farmers and fishermen, push him forward.

Tatsumasa Oku and Partner farmers in Gulu, Uganda (Provided by Smileyearth, photo taken in 2013)

Boron sheds new light on cancer treatment

The SDGs also include the goal of "Good health and well-being for all." There is growing hope for STI for SDGs in the medical field as well. The Research Center for BNCT at Osaka Prefecture University is playing a central role in industry-academia-government collaboration to promote the spread of a new cancer treatment method called Boron Neutron Capture Therapy (BNCT). The BNCT drug the center developed obtained pharmaceutical approval for the first time globally and then got covered by insurance in 2020.

BNCT is a type of radiation therapy. The boron drug is administered intravenously so that boron can be taken up by the cancer cells in advance, and then be irradiated with a low-energy thermal neutron beam to destroy the cancer cells. Since it does not damage normal cells, it is expected to be a treatment method with a lower physical burden.

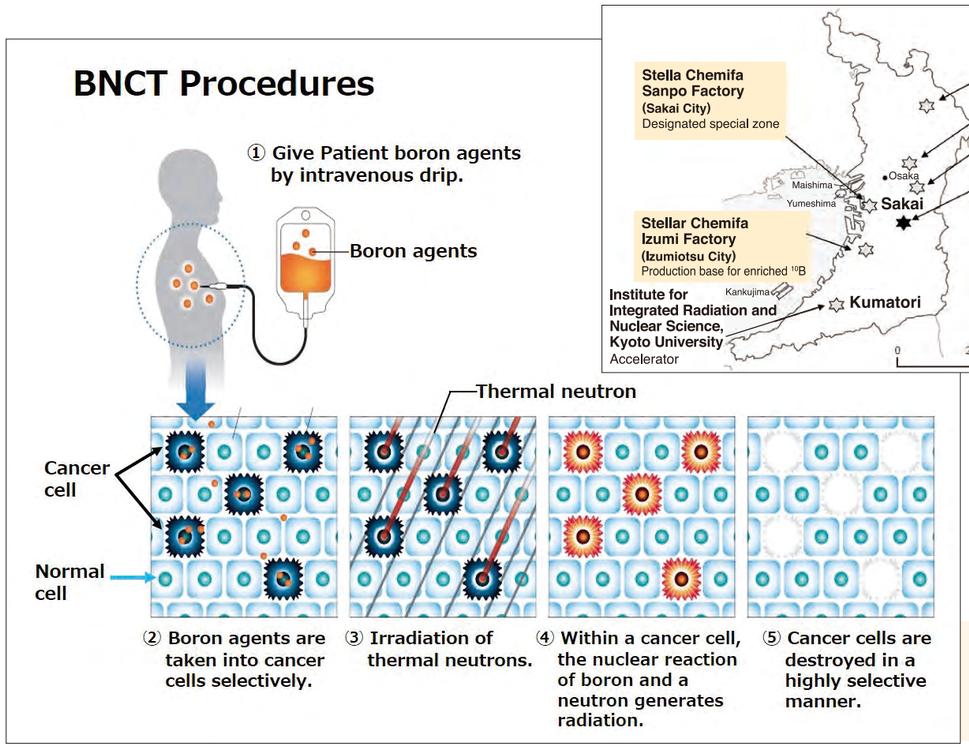
BNCT's principle was put forward in the United States in 1936, and its research had been going on for a long time. However, Mitsunori Kirihata, Director of the Research Center for BNCT, Osaka Prefecture University and Project Professor of the university's Organization for Research Promotion, says, "Solving the two bottlenecks was essential to succeed in the clinical application of BNCT."

The first issue was boron. There are two boron isotopes, boron-10 (^{10}B) and boron-11 (^{11}B), that exist in nature at a ratio of 1:4. However, only boron-10 splits in response to thermal neutron radiation. In other words, technology to enrich boron-10, which only occurs at a rate of 20% naturally, was required.

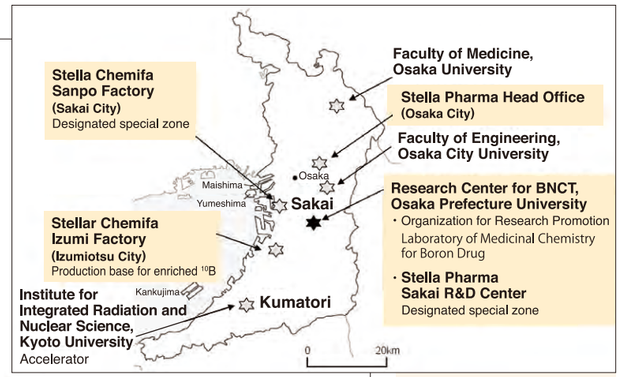
Stella Chemifa, a chemical manufacturer headquartered in Osaka City, made this possible in Japan. In 1999, Kirihata met Tomoyuki Asano, an employee of the company, which led to the full-scale development of boron compounds for BNCT. Today, Stella Pharma, a subsidiary of Stella Chemifa and chaired by Asano, is the only company in Japan engaged in developing drugs exclusively for BNCT.

	Chemical agent usage	Water usage	Fossil fuel usage	Amount of industrial waste
Conventional technology	~ 500g	~ 200ℓ	~ 3ℓ	~ 60g
Current technology	~ 1g	~ 55ℓ	~ 0ℓ	~ 0g

Numerical reduction table of Smileyearth (Self survey): Chemical agent and water usage are comparisons between 2007 and 2015. The company achieved zero fossil fuel usage in 2018 and has been maintaining zero industrial waste since 2008. (Prepared based on the image provided by Smileyearth)



BNCT treatment and boron drugs (Provided by the Research Center for BNCT, Osaka Prefecture University)



BNCT's element technologies are gathered in Osaka. (Prepared based on the image provided by the Research Center for BNCT, Osaka Prefecture University)

Blessed with "harmony of people" more than anything else

In addition to this, BNCT research institutes are concentrated in the Kansai region in various fields such as medicine, pharmacology, and physics, including the Institute for Integrated Radiation and Nuclear Science, Kyoto University, which has led the world's BNCT research. This rare environment greatly supported development of BNCT.

The second issue was the neutron irradiation equipment. Transporting patients from the hospital to the research reactor was not practical. Sumitomo Heavy Industries, Ltd. solved this problem by developing a compact neutron generator to be installed in hospitals.

Looking back on the development to date, Kirihata says that he has been blessed with "heavenly timing, a local advantage and harmony of people." As for the local advantage mentioned earlier, BNCT's element technologies gathered in the Kansai region was a significant factor. In regard to the opportunities 'heavenly timing,' the trend of promoting industry-academia-government collaboration was important. Stella Pharma's commercialization development was supported by JST from 2008 to 2014 and the Japan Agency for Medical Research and Development (AMED) from 2015 to 2019. The base of this industry-academia-government collaboration was the Research Center for BNCT, which started in 2014 on the Nakamozu Campus of Osaka Prefecture University.

Kirihata says that he was blessed with the "harmony of people" more than anything. "Mr. Asano, who established Stella Pharma to deliver this technology to patients, and the doctors who cooperated in the clinical trials — the thoughts of the people involved was a major driving force."

Dr. Kirihata explaining about BNCT

1 The whole picture of the BNCT treatment system: Proton accelerator, proton beam transporter, and neutron irradiation device stand in a line.
2 Cyclotron: extracts proton beams and converts them into neutrons.
3 Treatment section of the BNCT irradiation room.

(1 2: Provided by Sumitomo Heavy Industries, 3: Provided by Kansai BNCT Medical Center, Osaka Medical and Pharmaceutical University)

Kirihata also expresses his enthusiasm to focus on nurturing specialized human resources in the future. "First of all, we need to continue fundamental research to expand the range of cancer applications. On the other hand, it is also essential to look at medicine from the larger perspective of the global environment surrounding us, rather than just chasing technology. What thought system can we build for sustainable development, and how can we use our expertise? It overlaps with the idea of the Expo, and I would like to value human resource development as well."

Kansai companies that stand out on a global scale

Many other companies in Kansai have developed their unique ways of doing business while carrying on their traditional industries. METI selects "100 Global Niche Top Companies" that have established a leading position in the world market in a specific product or service field. The list has been put together twice in the past, in 2013 and 2020, and 113 companies were selected in 2020, of which Kansai companies did remarkably well, with 21 selected from Kyoto, Osaka, and Hyogo prefectures.

On the other hand, in the World Economic Forum's "Global 100 Most Sustainable Corporations in the World (Global 100 Index)," which annually ranks the world's 100 most sustainable companies, five Japanese companies ranked in 2021. Companies from Kansai also made their presence felt here. Takeda Pharmaceutical Company Limited, selected for the sixth consecutive year, was founded in Osaka City, and Sekisui Chemical Co., Ltd., ranked four years in a row, is also headquartered in Osaka City.

Kansai has the power to lead the world in achieving the SDGs. The actions of every one of us are also essential to realize the theme of Expo 2025 Osaka, Kansai, "Designing Future Society for Our Lives." Now is the time for us to think about the future of science, technology and humanity — what kind of planet will we pass on to the next generation?

PROFILE

OKU Tatsumasa

President of Smileyearth Corporation

He was appointed as the official coordinator of friendly exchange between Japan and the Republic of Uganda in 2017, received the METI Minister's Prize at the 7th Monozukuri Nippon Grand Awards in 2018, and was presented the first Ambassador's Commendation at the Embassy of Japan in Uganda in 2019.

KIRIHATA Mitsunori

The Director of the Research Center for BNCT, Osaka Prefecture University, and project professor of Organization for Research Promotion at the same university

Ph.D. (Agriculture). Having retired after working as a professor at the Graduate School of Agriculture and Biological Sciences / Life and Environmental Sciences, Osaka Prefecture University, he assumed his current position as a project professor of Research Center for the 21st Century and Organization for Research Promotion at the same university.

“TEAM EXPO 2025” Program / Co-Creation Partners

“TEAM EXPO 2025” is a participatory program in which diverse people form teams and engage in various activities to challenge Expo 2025 and the future beyond that.

Yumeshima Shinsangyo Toshi Sozo Kikou (Yumeshima Kikou), Japan Finance Corporation Osaka Branch, Japan International Cooperation Agency (JICA), Japan External Trade Organization (JETRO), TAKARA BELMONT CORPORATION, OSG Corporation Co., Ltd., Ritou Sogo Kenkyujo (Shimasouken), Japan Federation of Kaigo Business Providers (KAIZIREN), Shinrai Shihon Zaidan, Japan Convention Services, Inc., International Association for Universal Design (IAUD), Kobe University, Osaka University, Japan Greenery Project, Kougei Sanchi Kyokai, Resona Bank, Ltd., Neworld, Inc., Venture Café Tokyo, Banpaku Mirai Kenkyukai, Ooen Festival, Ritsumeikan University, Dai Nippon Printing Co. Ltd., Saraya Co. Ltd., Kansai University, The Institute of Professional Engineers Japan Kinki hdqrs., Eco-Business Suishiin Kyokai, and Beyond Company, Asia and Pacific Trade Center Co., Ltd., Sumitomo Mitsui Banking Corporation, Undiscovered Gems of Japan, DENTSU INC., The Senshu Ikeda Bank, URBAN RESEARCH Co., Ltd., MERRY PROJECT, Ningen Inc., Keihanna de Osaka/Kansai Bampaku wo Kangaeru Kai (Kangaeru Kai), MUIC Kansai, Osaka wo Kaeru 100nin Kaigi, Osaka University Social Solutions Initiative (SSI), Parallel Career Promotion Committee, JTB Communication Design Inc., Izumiotsu City, Kansai SDGs Platform, Osaka Prefectural Federation of Small Business Associations, WAVERIDGE inc, The Future Laboratory, The Osaka Chamber of Commerce and Industry, morning after cutting my hair, Inc., The Yomiuri Shimbun, The Graduate School of Project Design, Kyoto Seika University, Television Osaka Inc, Ministry of Economy Trade and Industry Kansai Bureau, Link and Motivation Inc., Music Securities Inc., Macquake, Inc., Borderless Japan Corporation, Next Commons Lab, Platform for Sustainable Education and Community As of the end of March 2021

ScienceWindow 2021 Spring Issue

April–June 2021 vol. 15 No.E11
(Published in November 2021)
ISSN 1881-7807 ISBN 978-4-88890-756-9

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