TOPPAN

CONVEX
–International–

vol.115

Special Feature
The Buds of New
TOPPAN Businesses

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–International–

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Notice from the Public Relations Division

CONVEX International is an internal magazine for the TOPPAN Group. The title, *CONVEX*, is based on the meaning of the Chinese character "凸", which is pronounced *totsu* in Japanese and is the first character in the word *toppan*. In the same way that a convex lens focuses light at a single point, the name of the magazine expresses the TOPPAN Group bringing together its "vibrant knowledge and technology."

Cover Photo

(from back left)

Takumi Goto
Technical Research Institute, Business Development Division, TOPPAN Holdings Inc.

Rikako Funabashi
Technical Research Institute, Business Development Division, TOPPAN Holdings Inc.

Chiharu Takubo
Technical Research Institute, Business Development Division, TOPPAN Holdings Inc.

(from front left)

Rubani Firly
Technical Research Institute, Business Development Division, TOPPAN Holdings Inc.

Mayu Suzuki
Technical Research Institute, Business Development Division, TOPPAN Holdings Inc.

Takuji Kobayashi
Technical Research Institute, Business Development Division, TOPPAN Holdings Inc.

Contents

A Challenging Spirit Will Open the Way to the Future

New Value Created by Technology and People

"Staying ahead of change and creating the value of the future." This attitude, one which we have long pursued, is something we must demonstrate at an even higher level than ever before. In a rapidly changing society, it is not enough to simply anticipate the future. We ourselves must be the initiators of change and actively create the future. The R&D conducted at the Technical Research Institute is a driving force in this.

The Technical Research Institute is a veritable fountain of knowledge that will open the way to the future. From the cutting-edge research to the research aimed at strengthening our existing businesses, everything conducted here serves as an important milestone in creating the businesses of the future. And each of us plays a part in the process of delivering that value to society. 3D cell culture technology in the healthcare field and components for hydrogen energy in the field of sustainable transformation (SX) are just two examples of the results of the endless inquisitiveness of our researchers. However, the true value lies not only in the technologies themselves but also in the "challenging spirit" that led to their creation. I believe that a culture that takes failure as a source of success is what truly results in the development and growth of both people and technologies, and opens up new frontiers.

Speed is also essential for a challenging spirit. With technologies rapidly becoming obsolete like we see in our world today, we must identify changing market needs ahead of competitors, leverage internal and external collaboration, and agilely engage in repeated testing of hypotheses. Such speed serves as a driving force to deliver, in the shortest time possible, ideas to society in the form of the real value that it needs.

The TOPPAN Group will work together to take the seeds of new businesses born from the fount that is the Technical Research Institute and nurture them into solutions to social issues from a market-oriented perspective. I am confident that we can solve challenges faced by society and create a future that enriches people's hearts and minds by resolutely following this path of value created by technology and people.

The greatest force for opening the way to the future comes from the challenging spirit of each individual. Let's work together as the TOPPAN Group to pave the way to new value.

Jin Endo
Managing Executive Officer
R&D Strategy Office and Business Development Division
Overseeing Intellectual Property Division
TOPPAN Holdings Inc.

Endo's Proactivity

Appearance on TV Tokyo's Nikkei Special "Breakthrough: Indomitable Pioneers"

In April 2025, TOPPAN's Technical Research Institute was featured for two weeks on TV Tokyo's Nikkei Special "Breakthrough: Indomitable Pioneers," with Mr. Endo appearing in the program. Recorded inside the Institute, the program focused on the R&D of our latest ToF sensor and 3D cell culture technologies. In the program, TOPPAN's innovative research and its enthusiasm for the future were presented through interviews.

Television Program

Special Feature

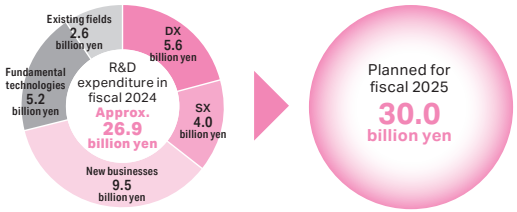
The Buds of New TOPPAN Businesses

Seeds for the future discovered through R&D

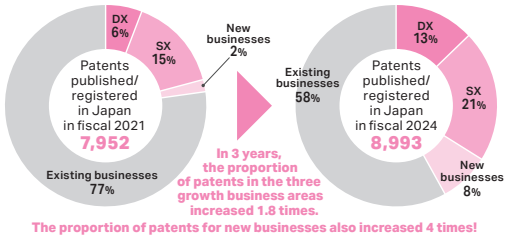
R&D supports the TOPPAN Group's competitiveness and its ability to lead the way toward solving social issues. In this special feature, we take an in-depth look at the R&D that can lead to the "buds of new businesses" and the technological capabilities that are rooted in this R&D with some help from young employees working at the Technical Research Institute.

TOPPAN's R&D in Numbers

TOPPAN's priority investment areas and R&D expenditure



Patent portfolio transformation



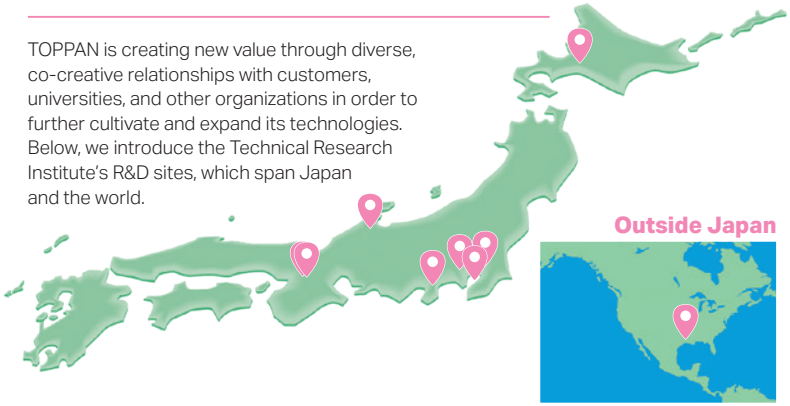
The proportion of patents for new businesses also increased 4 times!

Business Model / Field	Main R&D Objectives
DX	AI/IoT businesses, solutions for local government administration, digital marketing, digital platform business, BPO, smart city initiatives & community planning, etc.
SX	Mono-material compositions, switch to paper materials, recycling/upcycling operations, biomass business, biodegradable materials, etc.
New businesses	Metaverse-related business, healthcare business, 3D cell cultures, fuel cell components, quantum dots, energy business, genome editing, robotics, agribusiness, etc.
Fundamental technologies	Materials/analysis, converting, AI business, microfabrication, foundation for service quality improvement, etching, intellectual property, security business, etc.

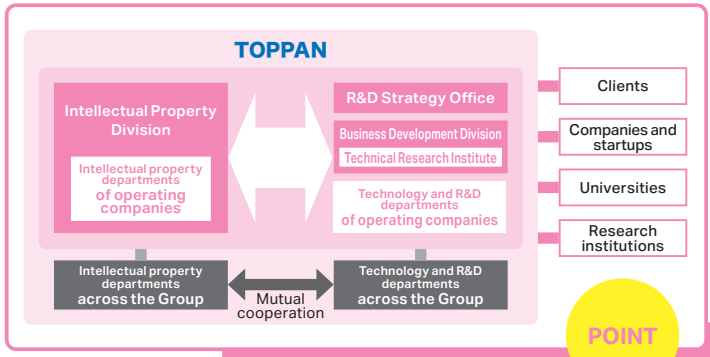
In response to social issues and technological trends, TOPPAN has established priority investment areas and is strengthening R&D. In our patent portfolio, which shows the percentage of patents by area, the percentage of patents held in growth businesses such as DX, SX, and new businesses has increased considerably over the past few years. Our R&D departments work to improve our technological capabilities and create new businesses by steadily and diligently taking on challenges such as building fundamental technologies that could lead to the seeds and buds of new businesses, developing competitive products, and providing technical support to aid these efforts.

An expansive network
Our R&D Centers

TOPPAN is creating new value through diverse, co-creative relationships with customers, universities, and other organizations in order to further cultivate and expand its technologies. Below, we introduce the Technical Research Institute's R&D sites, which span Japan and the world.



R&D framework



POINT

An R&D structure rooted in diverse co-creation

Through collaboration among its departments, the TOPPAN Group is promoting market-conscious R&D centered on its core technologies. We are also creating value that meets the needs of a rapidly changing society by leveraging our intellectual property, Group synergies, and joint development with external research institutions and customers.

Explore the Technical Research Institute!

Get to Know the **Technical Research Institute**, the Heart of TOPPAN's R&D!

TOPPAN Holdings Technical Research Institute

The Technical Research Institute plays a central role in R&D for new product development and the establishment of next-generation technologies for the TOPPAN Group. The institute works to solve social issues based on "printing technologies."

Address: 4-2-3 Takanodaiminami, Sugito-machi, Kitakatsushika-gun, Saitama Prefecture
Site area: 49,321 m²
Established: July 30, 1986

Overview

With the aim of developing next-generation technologies, we have established an environment at the Technical Research Institute which makes it possible to tackle the individual processes involved in R&D, including **basic experiments** to develop fundamental technologies; **applied experiments** to create competitive products from the results of the former; and **mass production technology testing**, including in such areas as cost and quality, to establish technologies to be deployed in factories.

1 Experiment center

Provides an environment for conducting experiments related to establishing technologies to be deployed in factories, and for biotechnology (biosafety level 2 facility).

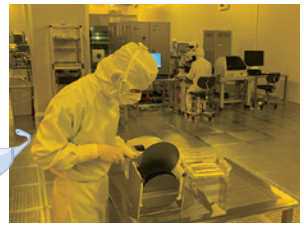
2 Experiment building

The experiment building is equipped with large experimental equipment for conducting applied experiments to develop commercial products.

3 Dedicated clean room building

(TSCR building)

The dedicated clean room building (TSCR building) is equipped with a clean room providing the highest cleanliness level (class 1).



4 Experiment center B building

This building is equipped with large coating facilities more than 70 meters in length—the same size as a factory—and can be used for small-quantity trial manufacturing.

5 Research building

(lab area)

Equipped with a wide variety of experimental equipment for basic research in a diverse range of fields. Basic experiments, synthesis, analyses, and simulations are conducted here.

6 Research building

(office area)

Remodeled in 2022. Incorporates activity-based working (ABW), which allows employees to choose their location according to the nature of their work. Hot desking enables interactions and discussions across team boundaries.

We're the Ones Building the Future!

Mono-material packaging R&D

Cross-organizational communication promotes ideas and co-creation

Takumi Goto

Technical Research Institute (Sugito)
Business Development Division
TOPPAN Holdings Inc.

Research

Since joining the company, has engaged in work related to food packaging development. Responsible for GL BARRIER and mono-material packaging R&D.

In response to the recent trend toward a circular economy,* the transition to mono-material packaging with high recyclability has become an important issue in the industry. Conventionally, good barrier performance and strength in packaging were achieved by laminating multiple materials together, but this made recycling difficult. To address this issue, my team is studying optimal packaging formulation design and process conditions to achieve the same functionality in mono-materials as in composite materials.

The containers and packaging I am in charge of play an important role in resource recycling, so I am paying particular attention to this circular economy trend. I try to understand overall societal trends and changes, and think about how I can incorporate these into my own R&D activities.

I keep running into challenges, but also to maintain my own intellectual curiosity, I want to pursue what interests me, even if it means investing time and money.

* Circular economy: An economic system that minimizes the use and consumption of new resources and maximizes the value of existing resources.

Quantum dot ink development

Taking on the challenge by avoiding preconceived ideas and launching a research group on a new theme

Chiharu Takubo

Technical Research Institute (Sugito)
Business Development Division
TOPPAN Holdings Inc.

Research

Responsible for quantum dot ink development for displays. Also working on a nano-dispersion research project launched under the front runner program.

I am in charge of the development of quantum dot inks for displays. Quantum dots, manufactured by the Electronics Division, are ultra-nano-sized semiconductor particles which luminesce with extremely high color purity. To be used in displays, quantum dots must be mixed with other materials to form an ink and then patterned, and we are pursuing suitable formulations for this purpose.

Quantum dots are a developing technology. We believe that in order to commercialize new technologies ahead of our competitors, it is essential to improve efficiency and speed up our R&D by utilizing materials informatics.* In addition, TOPPAN possesses strengths in both the aspects of the digital and the physical, and I believe that is why we are a company that is able to generate new ideas in-house.

* Materials informatics: A method for discovering new materials and developing new processes using AI.

Thin-film coating technology development

Taking part in the creation of the technologies and products that will be needed in the future

Mayu Suzuki

Technical Research Institute (Sugito)
Business Development Division
TOPPAN Holdings Inc.

Research

Engaged in the development of coating technology for functional films such as CO_2 separation membranes in the field of wet coating technology.

In the field of wet coating technology, I am in charge of developing coating technologies for CO_2 separation membranes and other products. Wet coating technology is a technology that coats materials such as films, paper, and nonwoven fabrics with resin to produce a film and add functionality. Examples of applications TOPPAN makes use of include anti-reflective films and adhesives for packaging. The CO_2 separation membranes we are currently developing need to be both uniform for gas separation purposes, and thin to be properly permeable. TOPPAN has already cultivated uniform thin-film coating technologies in its electronics business, and, by combining these with our technologies for designing processes that match the materials being used, we hope to develop new technologies that address environmental issues.

Wet coating technology generally involves the use of organic solvents, and in this respect, it has a large environmental impact. However, if we can commercialize membranes for separating CO_2, it will enable major contributions to society in the fields of energy and the environment. I hope that even 10 years from now I will still be involved in this kind of work to create products that meet the needs of the times.

Personalized cancer treatment project

Opening the door to a new treatment by transcending specializations to gain perspectives and knowledge

Rikako Funabashi

Technical Research Institute
(Cancer Institute)
Business Development Division
TOPPAN Holdings Inc.

Research

In charge of research to commercialize a testing system that can predict the therapeutic effects of anticancer drugs for individual cancer patients using our invivoid™ 3D cell culture technology.

At the Cancer Institute Hospital TOPPAN Lab, I engage in R&D for our personalized cancer treatment project utilizing the invivoid™* 3D cell culture technology. The project aims to commercialize a testing system that can predict the effects of anticancer drugs for individual cancer patients, and I am mainly in charge of selecting and procuring the optimal cells for project use.

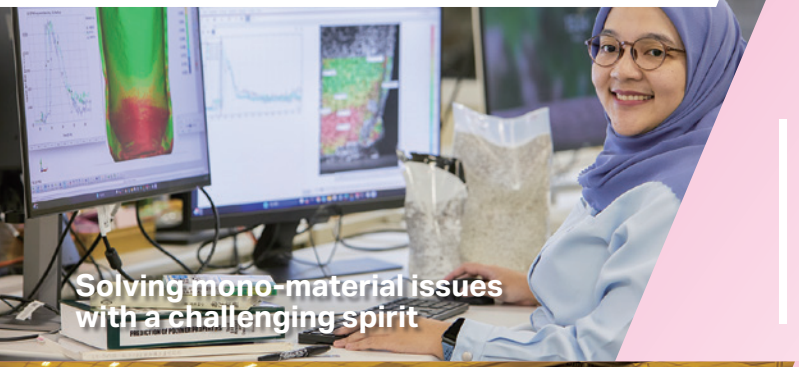
Our team is working with the University of Texas MD Anderson Cancer Center in the U.S. and other institutions toward the commercialization of personalized cancer care. We are also part of a consortium with other companies aiming to bring cultured meat to society.

Taking part in these efforts, every day it makes me realize that one of TOPPAN's strengths is its proactive collaboration with various academic and other institutions.

I will continue to actively engage with people in a wide range of fields, both inside and outside TOPPAN, to broaden my perspective and one day take on the challenges of reducing the side effects of cancer treatment as well as developing testing methods for genes known as variants of uncertain significance (VUS) that cannot be determined to be cancer-causing at this time.

* invivoid™ 3D cell culture technology: invivoid™ technology, developed in collaboration with Professor Michiya Matsusaki of the Graduate School of Engineering at Osaka University, is a new three-dimensional cell culture technology that enables the controlled co-culture of a wide variety of cells through a unique method. The technology makes it possible to create artificial tissues that closely resemble those in living organisms, and a wide range of potential applications are expected, such as regenerative medicine and drug discovery research, including drug efficacy and toxicity testing.

Physical property evaluation and structural simulation



Solving mono-material issues with a challenging spirit

Rubani Firly

Technical Research Institute
(Sugito)
Business Development Division
TOPPAN Holdings Inc.

Research

Engaged in the development of mechanical property evaluation technology in the analysis and measuring technology product property evaluation team. Responsible for material property simulation using material modeling.

I have had a strong interest in mono-materials development from the time I interned at the Technical Research Institute for a month and a half before joining TOPPAN. The materials TOPPAN works with include not only polymers but also such diverse materials as paper and cardboard, which is very satisfying to me. While polymer materials can be designed by human beings, I used to feel that they were difficult to recycle. After joining TOPPAN and talking to many people here, however, I have come to believe that we can achieve a sustainable future with polymer materials.

Taking on new challenges and solving social problems are important qualities for a researcher. It is said that younger people are better learners, but based on the experiences I have had with ambitious individuals, I now realize that it is not age that matters but rather that it is important to be young at heart. There are many people at the institute that I respect who are young at heart, regardless of their actual age.

Like them, I will continue to take on the challenge of solving problems with mono-materials and be involved in solving related issues as a researcher. I believe in the potential of TOPPAN to acquire advanced technologies and be a leader in society.

Equipment development and engineering

Accelerating R&D to solve social issues through engineering

Takuji Kobayashi

Technical Research Institute
(Ishikawa Plant)
Business Development Division
TOPPAN Holdings Inc.

Research

As an engineer, is engaged in new equipment development and equipment manufacturing. Currently working on line relocation and improvement in support of MEA development at the Ishikawa Plant.

My current main work is the relocation of the membrane electrode assembly (MEA)* line at the Ishikawa Plant and making improvements in areas where we are experiencing difficulties. When working on new equipment development or making improvements, there are many issues to be resolved, and it is important to be persistent. In part it is because I am currently working with it, but MEA is an interesting technology. An MEA consists of an ion-conductive membrane (electrolyte membrane) with catalyst layers on both sides. MEAs make up the heart of a fuel cell and can efficiently generate electricity through a chemical reaction between hydrogen and oxygen. As a means of generating clean energy that does not emit CO_2, it could help solve environmental issues once it becomes more widespread, so I hope it will become established as a business.

I believe that one of TOPPAN's strengths is its variety of business fields, and I would like to see it become a company that can approach the social issues of the day from multiple angles by utilizing this and other strengths. To do so will require the ideas that the Technical Research Institute produces. Accordingly, it will also be important to promote the creation of an environment that enables the automation of experiments in order to establish a system that will help researchers to efficiently engage in R&D.

* Membrane electrode assembly (MEA): A key component determining the performance of a fuel cell. MEAs are a core component of water electrolyzers that produce hydrogen, electrolytic cells used as part of hydrogen storage and transportation, and hydrogen-using fuel cells. These energy conversion devices are indispensable for enabling a future hydrogen society.

Seeds Sprout in the Soil of Challenge


Creating harmonious, collaborative relationships is the starting point for improving productivity
The Plant and Me
HYOGO

Supporting the manufacture of a diverse range of products in the Kansai region

The Takino plant complex is located in the city of Kato, Hyogo Prefecture, which offers convenient access to highways and main roads. As TOPPAN's manufacturing base in the Kansai region, it employs over 700 people and manufactures a wide range of products in the Information & Communication and Living & Industry segments.

The Takino Securities Plant is located in a corner of the complex. Construction of its phase 1 building was completed in 1996, and phase 2 in 1999. Currently, the facility prints and processes New Year's postcards, passbooks for financial institutions, marksheets, and important forms; engages in the manufacture and issuing of various types of cards (including the management and writing of card information) such as cash cards, smart cards, and ETC cards; and provides enclosure and shipping services. The Takino Securities Plant is the only facility in the TOPPAN Group that is responsible for the production of New Year's postcards and passbooks. As a manufacturing base requiring high security and advanced printing technology, the plant is committed to employing all necessary safety measures and security systems, and to quality assurance.

Creating a work environment in which each individual can flourish

Yuya Murakami has been a member of the passbook processing team since the year after he joined the company in 2009. After operating a binding machine and a passbook cover pasting machine, he is now responsible for supervising the entire passbook production process. "I serve as a bridge between my subordinates and superiors. While respecting the opinions of each section member, we actively exchange opinions within the team so that we can achieve overall optimization and meet our production targets," says Murakami. Because he is shy himself, he is always aware of the importance of communication.

When he was in charge of the cover pasting machine, he felt encouraged when the current plant manager praised him for exceeding production targets. "This factory has helped me to grow. Back then I would ask the machine to not give me any problems during my shift so efficiency would not drop," he says with a smile. Talking of his ambitions, Murakami stated, "Going forward, I would like to make this an even more comfortable work environment and bring out the best in everyone working here."

Interview

Yuya Murakami

Takino Securities Plant
TOPPAN Communication Products Inc.

INFORMATION

Takino Securities Plant

Established: 1996
Location: 355-17 Kotaka, Kato-shi, Hyogo Prefecture
Major products:

- Securities (passbooks, New Year's postcards, certificate forms, etc.)
- Cards (magnetic cards, contact smart cards)
- Card issuance, DM services, BPO services

TOPPAN's Purpose & Values

TOPPAN Holdings established TOPPAN's Purpose & Values, the philosophy for the TOPPAN Group, in May 2023. It is composed of the Purpose—Breathing life into culture, with technology and heart—and the Group's shared Values of "Integrity," "Passion," "Proactivity," and "Creativity." In this section, we present information that will help you better understand our Group philosophy.

Interview

Interview with Chiaki Mukai, External Director

We spoke with Chiaki Mukai, newly appointed as an external director in June 2025, about TOPPAN's image and its Purpose & Values.

Chiaki Mukai

Born in Gunma Prefecture in 1952. M.D. and former astronaut. Selected as an astronaut in 1985. Served on the space shuttles Columbia and Discovery in 1994 and 1998, respectively. In 2015, she was appointed Vice President of the Tokyo University of Science, and has served there as Specially Appointed Vice President since 2016.

A "culture of creation" that never ceases advancing

When I first spoke with everyone at TOPPAN, what I felt most strongly was that TOPPAN's creation of its culture was an ongoing process. As the word "Breathing" in TOPPAN's Purpose indicates, the culture that TOPPAN creates is one that is truly alive and breathing.

The term "culture" often refers to something that has formed in a particular region, but TOPPAN's culture is different. Everyone at TOPPAN is a part of a culture that continues to be created. Being unafraid of change and constantly moving forward is what makes up TOPPAN's DNA, and is proof of the venture spirit that has existed since the company's founding.

Of the four Values, I personally feel that "Passion" is the most important. You cannot reach people's hearts if you do not possess the passion to do or convey something. I believe that it is this kind of passion which gives rise to your skills and ideas. This "Passion" is the driving force that makes technologies useful to society.

Passion alone, however, is not enough. As the "technology and heart" in TOPPAN's Purpose indicates, technology and heart are the two halves of the whole. Left-brained logic and calculation, and right-brained sensitivity and intuition. By putting both of them to work, we can create value that goes beyond mere technology to reach people's hearts.

Achieving a dream requires milestones and a realistic plan. And, above all, the help of colleagues is essential. If you compare yourself to the sails of a ship, the ship cannot proceed without the support of the wind—i.e., the people around you. In order to follow your dreams, you must involve those around you and move forward together with your colleagues.

The roots of all TOPPAN technologies can be traced back to printing. TOPPAN's founders started the company because they saw a new technology and felt a sincere desire to promote and grow it. The passion they held for this is clear. That DNA is still alive and well in each and every one of you here at TOPPAN.

Building on technology has the power to bring happiness to people and to our society. I hope that all of you will continue to value this, the essence of TOPPAN, in the future. I also encourage you to remain eager to accept and incorporate values that are not your own. This attitude has the power to further nurture TOPPAN's culture.

Rid yourself of limitations and step forward

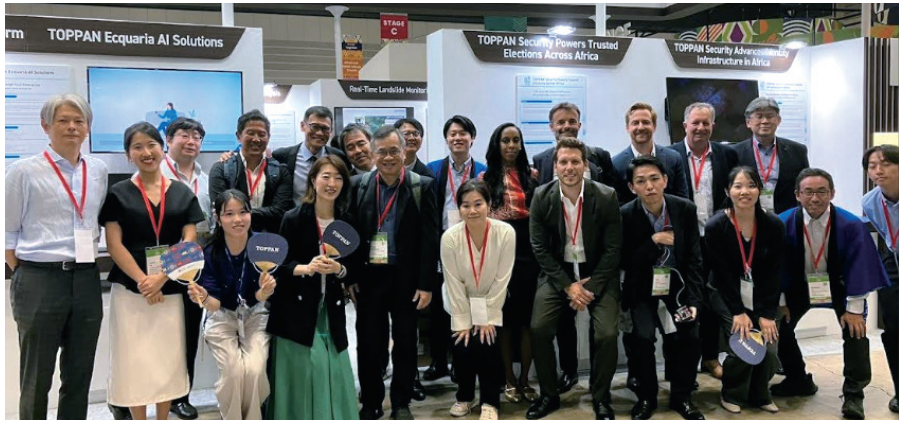
We unconsciously place all sorts of limitations on ourselves. We reduce what is possible for ourselves "because I am a woman" or "because I am Japanese," for example. These limits can feel like a comforting blanket. But if you would seek a new world, you must have the courage to leave your blanket behind and step out into the cold morning.

TOPPAN provides an environment that allows you to challenge yourself. If each day you break down your limits piece by piece, it will eventually lead to huge changes. Challenge yourself to do something where you are right now; push yourself to overcome something. That is how TOPPAN's culture is created.

It remains to be seen what kind of growth this company will achieve. But I am sure it will grow in interesting ways. I encourage everyone to continue to break through limits.

Japan/Tokyo

TOPPAN Group Participates in TICAD 9



The Ninth Tokyo International Conference on African Development (TICAD 9) was held in Yokohama, Japan from August 20 to 22 this year. This important international event was led by the Japanese government to promote co-creation for African growth. The TOPPAN Group exhibited at a side event of TICAD 9.

The event was an excellent opportunity for the TOPPAN Group to reassert its presence, as leaders of various countries visited our booth and held discussions with us. By having several Group companies, including overseas companies, jointly exhibit, we were able to showcase the breadth of the TOPPAN Group's businesses.

We will continue to create new value with our technology and passion on the world stage.

China/Shanghai

Event Held to Strengthen Employee and Company Engagement at TOPPAN (Shanghai) Management

In July this year, an event for employees and their families was held at TOPPAN (Shanghai) Management Co., Ltd., with approximately 30 participating.

The day began with an explanation of TOPPAN's business areas and global expansion, as well as an overview of TOPPAN (Shanghai) Management. A leather craft workshop for children was also held.

The office was filled with a warm atmosphere as parents and children enjoyed working together to create craft items. At the end of the event, everyone enjoyed lunch together, and the venue was filled with smiling faces.

We will continue to hold employee family participation events to strengthen employee and company engagement.

Japan/Iwate

TOPPAN Sumo Club Takes Second at Sumo Tournament

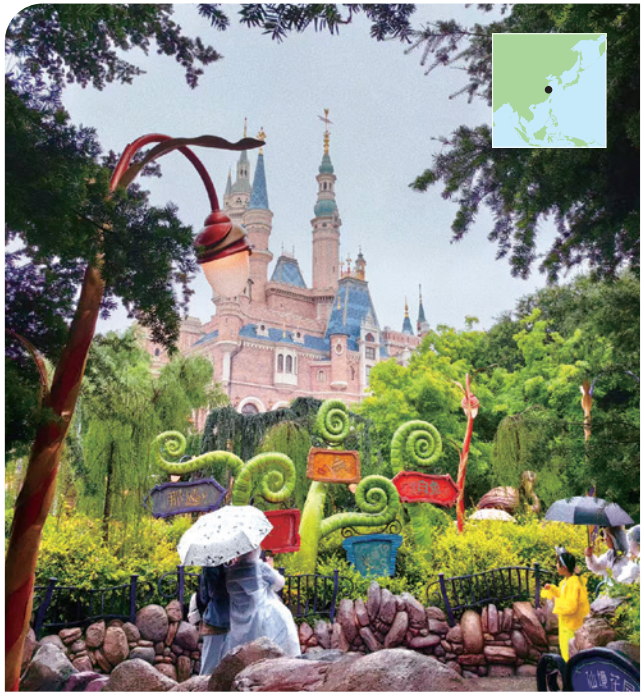
The TOPPAN sumo club won second place in the team competition of the 63rd East Japan Corporate Sumo Tournament held at the Sumo Ground in Hachimantai, Iwate Prefecture. In the individual competition, Yoshiki Kajisako (TOPPAN Colorer), who won in the light weight class last year, won the championship for the second year in a row, and Hayato Kamei (TOPPAN Communication Products) placed third in the middleweight class.

TOPPAN World SEEDS

In this section, we introduce you to employees working at TOPPAN Group companies around the world.

File15 China

About China:
- Area: 9.6 million km²
- Population: 1.4 billion
- Major language: Chinese



My favorite spot in Shanghai is Disneyland. People of all ages can enjoy various attractions and the beautiful fireworks show, spending a fun and unforgettable day. It is easy to get to from the city center and perfect for visiting with family and friends.

REPORT

I work in production management at the Secure Business Promotion Group of TOPPAN (Shanghai) Management Co., Ltd. I handle the entire process from order placement to shipment, ensuring smooth operations through quality and delivery control as well as coordination inside and outside the company.

Sijia Pan
Deputy Supervisor
Planning & Development Dept.
Secure Business Promotion Group

TOPPAN (Shanghai) Management Co., Ltd.

Based in Shanghai, we provide solutions for item and asset management using RFID tags, as well as brand protection and authenticity verification systems. Our technologies are widely adopted for logistics centers, production facilities, and retail products.

- Location: Shanghai, China
- Business: Security, electronics, packaging, décor, and marketing

TOPPAN Holdings Inc. PUBLIC RELATIONS DIVISION