

# CONNECT

KYUSHU UNIVERSITY



Issue 5



# New frontiers in knowledge

Universities are the repositories of the wisdom that has been passed down throughout human history and tradition.

We are a part of this great legacy. However, the problems the world faces today are complex and we must be unified to tackle them.

When Kyushu University became a Designated National University Corporation in 2021, we launched VISION 2030 with the goal of becoming a university that “drives social change with integrative knowledge.” The notion of “integrative knowledge” is knowledge that synthesizes the entire spectrum of research—from the natural sciences, to the humanities and social sciences, and even design—to create the new insights and ways of thinking needed to solve the complex social issues facing humankind.

One new challenge of integrative knowledge we have launched, is the expansion of digital technology and data science. Advances in our digital age have opened up new ways of using data in education, research, and medicine that were unthinkable even a decade ago. With the Data-Driven Innovation Initiative we started in April 2022, we hope to use data-driven approaches to discover and create new value across disciplinary boundaries to enhance our innovation ecosystem.

Integrative knowledge demonstrates its true value in humanity’s endeavor into outer space. Our access to the new frontiers of space is only possible thanks to the combined knowledge and efforts of diverse people from multiple disciplines. Kyushu U alumnus



and JAXA astronaut Dr. Koichi Wakata himself said: “Thanks to international cooperation, especially in the ISS [International Space Station] program, I was able to join the team of human space flight. The international team of space exploration demonstrates what humanity can achieve if we work together.”

I look forward to exploring these new frontiers of knowledge with our students and fellow colleagues to carve out a better and brighter future.

**Tatsuro Ishibashi**  
President, Kyushu University

## Fast Facts



**164<sup>th</sup>**

QS World University Rankings 2024

**6<sup>th</sup>**

THE World University Rankings, Japan University Rankings 2023  
(out of over 200 ranked universities)



## Largest single campus in Japan

272 hectares (672 acres)

FUKUOKA



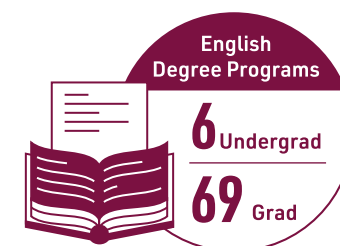
Located in the

**#1**

most desirable city to live in Japan

**75**

programs offered in English



**31<sup>st</sup>**

QS Asian University Rankings 2023



**1:9**

Faculty to student ratio

## Contents

### On the Cutting Edge

- 06 How neurons compete to lose their link
- 07 How old is that microplastic in the ocean?
- 08 Pictograms with universal design for equity and inclusion
- 09 The subnational shape of sustainable development in Africa

### Features

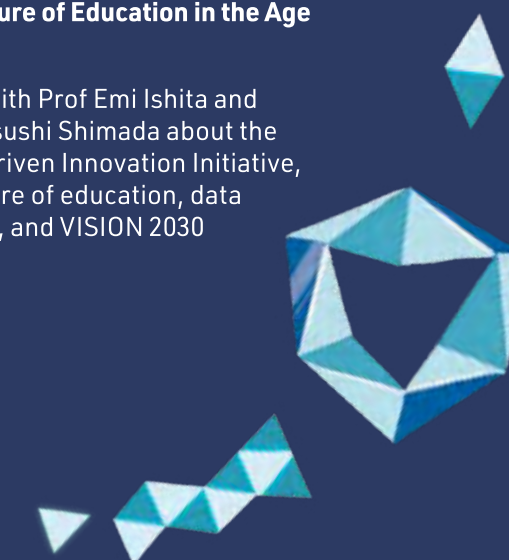
- 10 **Alumni Spotlight: Koichi Wakata**  
JAXA astronaut speaks at Kyushu University on his latest mission into space
- 12 **Alumni Spotlight: Babak Hodjat**  
Developer of the Natural Language Interface behind Apple’s Siri
- 14 **Japan in Today’s World**  
Celebrating 30 years of immersive and international student exchange
- 16 **Cultivating Tomorrow’s Leaders**  
SENTAN-Q paves the way for a diverse global future

### Cover Story

**02**

#### The Future of Education in the Age of Data

A talk with Prof Emi Ishita and Prof Atsushi Shimada about the Data-Driven Innovation Initiative, the future of education, data science, and VISION 2030





# THE FUTURE OF EDUCATION IN THE AGE OF DATA

## How data expands the future of learning and drives the mission of integrative knowledge

We are in the midst of an extraordinary digital age, with new technology and devices being introduced to various facets of our lives including education, research, and medicine. At the same time, an astronomical amount of data is being produced from these applications. Recognizing that the use of this data will be paramount in the future of education and academia, Kyushu University launched the “Data-Driven Innovation Initiative” in April 2022.

This initiative hopes to use data-driven approaches to discover and expand new disciplines, and to enhance the University's innovation ecosystem.



### Professor Atsushi Shimada

*Department of Advanced Information Technology,  
Faculty of Information Science and Electrical Engineering*

Division head of the Learning Analytics Division. Specializes in media processing, learning analytics, and pattern recognition. Until recently, managed the system operations of Kyushu University's learning support systems. Currently investigating how AI will affect education and learning in the future.



### Professor Emi Ishita

*Department of Library Science,  
Graduate School of Integrated Frontier Sciences*

Appointed to the Data-Driven Innovation Initiative's Research Data Service Division in January 2023. Specializing in the fields of Library and Information Science, Research Data Management, Text Classification, and Computational Social Science.

In this interview, two professors of the Data-Driven Innovation Initiative, Professor Emi Ishita from the Department of Library Science and Professor Atsushi Shimada from the Faculty of Information Science and Electrical Engineering, sit down to talk about the new initiative, the changing educational landscape with the advent of generative artificial intelligence (AI), and the future of research and academia in the data-driven age.

#### Q How can data be used to improve education?

**Ishita ▶** In Japan, research data management and support are paramount services, but lack any comprehensive systems or experts. Our current mission is to provide these services at Kyushu U in cooperation with the University libraries. I think it's good that we're now able to be more deeply involved in studies related to data management for education, including in learning analytics.

**Shimada ▶** Learning analytics has certainly grown due to the COVID-19 pandemic shifting education online. The amount of data about an individual's educational progress has also increased considerably. There's been a movement to support learning in a more data-driven way, so I'm interested in researching both the data we collect, and the learning data provided by students. Perhaps with the right data, we can begin to explore “data-driven education” where we can see what works and what doesn't for each student, and improve their experiences accordingly.

**Ishita ▶** Of course, we have to strictly adhere to privacy and confidentiality. A student's educational data is their personal information. Even if it's to be used in research, it needs to be anonymized. On top of that, you need to follow institutional policies and get proper consent from study participants. Even then, it's still difficult to decide on the scope of data use and disclosure.

For example, Dr. Shimada has collected significant amounts of educational data himself. Our division assists him in making that data available to the public. If you don't manage data properly from its point of creation, you can't release it to the public.



## Q How will generative AI change education?

**Shimada** ▶ I've heard from many people—experts and educators alike—who expressed various concerns and hopes for generative AIs like ChatGPT. I think all of them are valid, and it's in my nature to give these tools a try. In fact, I'm incorporating ChatGPT into my own lectures. I tell my students that they should use it as though they are talking to a person, and that the AI's answers could be wrong. It's dangerous to just take them all at face value.

We can then see which students are using the AI well, and which ones are struggling. We have them record things like what kind of interactions they had with ChatGPT, what they thought about its answers, and their follow-up questions. We've found that students who have acquired knowledge correctly and confidently are able to use the AI more skilfully.

I think we are starting to see some proper applications of these AI tools in the classroom. ChatGPT has been useful in educating students about critical thinking.

**Ishita** ▶ We can call this a form of information literacy. With how much generative AIs have exploded into our world, it is vital that we develop the right skills to use them properly and identify mistakes and errors.

There are some unique experiments with ChatGPT in my field of research. We are trying to automatically identify texts from archives and databases. Our team tried using ChatGPT for the task, and it was better than other language models we've used in the past. But the fact that its systems are a black box makes it difficult to write a comparison paper about.

**Shimada** ▶ I wonder if it's a good idea to look at the results and determine if they were good or bad, when their underlying principles are completely unclear.

**Ishita** ▶ Yes, I feel that it's not the same as academic research. Other researchers say that since they didn't create the other language models, in principle, it's the same thing. That may be true, but I am concerned about the fact that the sources involved remain unknown.

**Shimada** ▶ At this point, I think ChatGPT is more of a good tool to test out. For example, a research project I'm working on is about its applications in the automatic generation of questions. However, its accuracy is not that high; only about one in every ten questions it produces is actually useful.

**Ishita** ▶ What types of questions are you trying to generate?



**Shimada** ▶ For me, they would be about the field of data science. For example, you could use generative AI to create questions for a test or discussion topic on different models used in the field.

The system can be improved by feeding the model the materials used during class and then asking it to craft a question where the answer is based on that study material. While it's great to see the results, the model itself is a black box. If we had the model itself on hand, we would be able to do a lot more analysis.

Another avenue I've seen its usefulness for is in data analysis. For example, if you have a lot of anonymized data that needs to be combed through, a generative AI can interpret the data, put it in readable tables, and even develop sample code from it.

What will AI's role in the future be? I think a day will come where people are able to leave the analysis to AI, as long as they can communicate well with it. I think it's similar to how people use the web today. Many people don't understand how the web works, or the search algorithms that control how we see web content. Generative AI could be used in the same way: as a tool. Even on the web, it's necessary to pay attention to the reliability of information and educate people about information literacy.

**Ishita** ▶ I think it's good that AI is convenient to use and that everyone can use it, but I think we should still be cautious. However, as you said earlier, I don't fully understand how the web works. People don't understand the mechanics of a car, but as long as it can drive and move around, that's all that matters. That much is true, and I wonder if that is where research and education should be focused on.

**Shimada** ▶ Not much time has passed in the current generative AI boom. I can see great possibilities for it five or ten years from now. By then, it could have changed into something different.

**Ishita** ▶ As I mentioned earlier, it's important that you have the right type of thinking. You have to think critically about the results AI generates. How we use Wikipedia is a good example: the information it contains might be good, but you need to scrutinize that information.

**Shimada** ▶ Right now, we assume AI will make mistakes. Ten years from now, we may be in a position to be corrected.

**Ishita** ▶ It is indeed a paradigm shift.

## Q What is the future of education and academia in the data-driven age?

**Ishita** ▶ An immediate goal we should have is to update research data management. It's a little bit behind in Japan. Data-driven research is growing, and with the move towards open data, the way we do research may change drastically. Therefore, we will need a comprehensive system to manage and distribute research data.

We then need to consider how to manage that data 10 to 20 years from now. It's important to look at the long term. While most institutions have policies of storing research data for 10 years, I have a feeling that the way we do research will have changed by that time, so it would be wise to look into the future of research data management. I think it will be possible to link this to the university's information governance.

**Shimada** ▶ Now that we have so much data in regards to education and learning, I think that in the future, learners will be able to keep their own learning history as data for the rest of their lives. Like when you get transcripts from your university, you may be able to trace both your grades and how you studied and learned. In a society where so much data is being accumulated, perhaps the day will come where we always have such information in our pockets. But for that to happen we must create reliable technology. 〰

**"Not much time has passed in the current generative AI boom. I can see great possibilities for it five or ten years from now."**

— Professor Atsushi Shimada





◀ *Growing, competing, strengthening, and pruning.* In early development, neurons called mitral cells grow multiple branches, which are strengthened or pruned as development progresses. Researchers found that neuron branches that received the neurotransmitter glutamate were protected from degradation during the pruning process. (Kyushu University/Imai Lab)

## HOW NEURONS COMPETE TO LOSE THEIR LINK

A new look at cellular mechanisms reveals how synapses compete, and how weak ones are eliminated during brain development.

Researchers at Kyushu University have uncovered the mechanisms of a fundamental yet critically-overlooked phase in brain development: synaptic pruning.

Neurons are specialized cells that help transmit messages throughout our bodies. Unlike other cell types, a neuron has a unique structure: long branches known as dendrites extend from its body towards other neurons. These form connections, or synapses, through which neurotransmitters can pass from cell to cell.

Using mouse mitral cells—a type of neuron in the olfactory system, which governs our sense of smell—the team found that when a neuron receives a neurotransmitter signal, the receiving dendrite is protected

through a series of chemical pathways. At the same time, depolarization triggers the same cell's other dendrites to go through a different pathway that promotes their own pruning.

“Two common phrases in neural remodeling are ‘fire together, wire together’ and ‘out of sync, lose your link.’ They describe how neurons that signal each other strengthen their connections, whereas without said signaling, those connections diminish,” explains Professor Takeshi Imai of the Faculty of Medical Sciences, who led the study. “Both these processes are key to proper brain maturation.”

The elimination of connections happens throughout the nervous system, such as in

neuromuscular junctions, where neurons signal your muscles to move.

“While researchers have explored how neurons strengthen their connections, how they were being eliminated was critically understudied,” says Assistant Professor Satoshi Fujimoto, the first author of the paper. “In adults, mitral cells have a single connection to a signaling waystation, but in early development, those cells send out many branches. As time progresses, these branches are pruned to leave a single connection.”

In their study, published in the journal *Developmental Cell*, the team reported that spontaneous waves of the neurotransmitter glutamate facilitate dendrite pruning. By focusing on the mitral cell's inner signaling pathways, the team found a unique protection/punishment mechanism behind the selective strengthening and pruning of connections.

“We found that when neuron depolarization happened, glutamate acted as a ‘save-me’ signal that protected the branch it attached to from degradation, unlike the branches that lacked the same signal,” Fujimoto adds.

“Pruning neuronal connections properly is just as important as strengthening the network. Its dysfunction has been linked to various neurophysiological disorders: for example, having too few connections has been linked to schizophrenia, whereas having too many has been observed in people with autism spectrum disorder,” says Imai. “To understand these sorts of pathologies, we need to look carefully at every step of brain development.” 🐙

## HOW OLD IS THAT MICROPLASTIC IN THE OCEAN?

Researchers find offshore microplastics can range from 1–3 years old while nearshore microplastics can range from 0–5 years old.

We have a plastic problem in our planet's waters. Besides being the most abundant form of debris found in lakes and oceans today, plastics fragment over time into microplastics: pieces less than 5 mm in size that can be found drifting in both shallow and deep waters.

“Microplastic pollution is a major global issue,” explains Professor Atsuhiko Isobe of the Research Institute for Applied Mechanics. “However, not only do we lack information on the health effects of microplastics, we have little information on how long they remain in the ocean.”

In a study published in the journal *Marine Pollution Bulletin*, Isobe led a team of researchers from Kyushu University and Asahi Kasei Corporation to develop a new

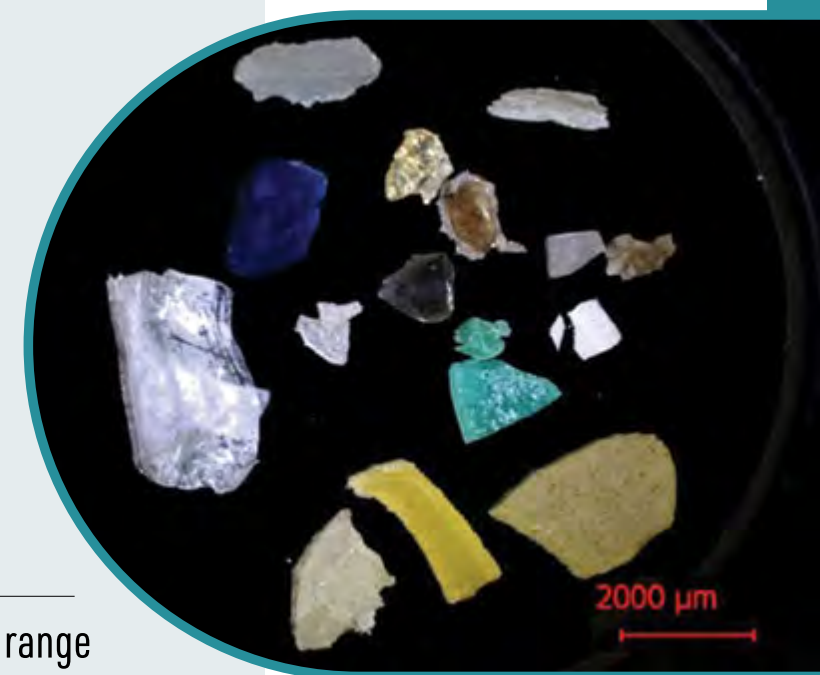
way of estimating the age of microplastics from the upper oceans.

The team began by investigating what metrics could be used to measure microplastic age in the first place.

“The most common material in plastic is polyethylene, which oxidizes as it is exposed to the elements,” explains first author Rie Okubo from Asahi Kasei Corporation. “One metric we can use is called the carbonyl index. When polyethylene degrades, its carbonyl index increases.”

Since microplastics are exposed to the elements, the team standardized their model to find out how temperature and UV radiation affects the carbonyl index.

“We then applied this data to microplastics we collected from Japan's nearshore regions—



▲ *Samples of oceanic microplastics.* Plastic fragments less than 5 mm in length are categorized as microplastics. (Kyushu University/Asahi Kasei Corporation)

ranging from 10 to 80 km off the coast—as well as microplastics from its offshore regions, specifically between the North Pacific Ocean and Philippine Sea,” Okubo adds.

Analyzing their samples, the team found that microplastics in nearshore regions ranged from 0–5 years old, whereas those from offshore regions ranged from 1–3 years old.

“We hypothesize that nearshore microplastics were in this age range because they are frequently washed ashore and ‘survive’ longer,” explains Okubo. “Offshore microplastics, on the other hand, take longer to reach that part of the ocean, and are also more likely to sink into the waters over time.”

The researchers hope that their new method will give them better insights into how microplastics are generated and spread into the environment.

“Our research and understanding of microplastics is still very new, and thanks to this data we've gained a little more understanding on the fundamental science behind them,” says Isobe. 🐙



◀ *Collecting microplastics.* Professor Atsuhiko Isobe and crew sample microplastics from the upper oceans off Japan's coast. (Kyushu University/Isobe Lab)



# PICTOGRAMS WITH UNIVERSAL DESIGN FOR EQUITY AND INCLUSION

Standardization in pictogram designs could make public spaces more accessible to all.

In our daily lives, signs and noticeboards help to inform us about where we might go and what we should do. They might direct us to a bus stop; tell us where to queue for a train; or warn us about fire or electrical hazards.

However, signs written in words aren't always accessible for everyone. People with intellectual disabilities can struggle to read or understand textual information. Instead, they rely on pictograms in public spaces to circumvent these difficulties, but variations in pictogram designs can affect their clarity.

While there have been efforts to standardize these designs, more research is needed to make them more effective.

In a study published in *Visible Language*, Associate Professor Mao Kudo of Kyushu University's Faculty of Design worked with 19 adults with intellectual disabilities to clarify graphic design elements that made pictographic information more accessible for them.

In practice, elements like the addition of motion lines were effective in increasing the understanding of objects like emergency buttons, but not for signifiers like "please stand on the right or left."

Interestingly, motion lines had similar effects on pictogram comprehension for both people with and without intellectual

## Five design elements for clearer pictograms

1 Adding a person to symbolize a location



2 Adding location-specific elements



3 Orienting items as per real-life use



4 Adding lines for motion or sound



5 Adjusting arrow dimensions



(Kyushu University/Mao Kudo. No unauthorized reproduction permitted)

disabilities. The study also found that regardless of a person's disability status, lengthening an arrow's axis made it easier to understand.

When Kudo began working on this issue during her doctoral program, she was asked, "Why are you researching pictograms when they are already complete?" However, as her research progressed, she found that people with and without disabilities both found commonly-used standardized pictograms difficult to comprehend. Thankfully, the addition of graphic elements that provided context helped them decipher the same pictograms.

Kudo hopes her continued work in the field of pictograms will facilitate progress in their design and provide better insight into how they are perceived by people who use them. 🌱

▲ An example of Kudo's pictograms in use during the 2023 World Aquatics Championships in Fukuoka. The added "location element", a bus stop pole, helps people identify its meaning more easily. (Kyushu University/Mao Kudo)

▲ A close-up of the venue map for the 2023 World Aquatics Championships held in Fukuoka, which used pictograms designed by Kudo. (Kyushu University/Mao Kudo)



# THE SUBNATIONAL SHAPE OF SUSTAINABLE DEVELOPMENT IN AFRICA

New analysis of Africa's economic growth reveals insights from provincial disparities.

In a paper published in *Environmental Development*, Thierry Yerema Coulibaly and Shunsuke Managi of Kyushu University's Urban Institute elucidate sustainability-related spatial inequities in African provinces and the factors that explain them.

Using the Inclusive Wealth Index (IWI) as a framework for analysis, Coulibaly and Managi's study describes the effects of government presence—informed by the national capital city in each province, and transnational borders—and short-term income growth tradeoffs on long-term wealth management.

The IWI is a sustainable development and economic progress metric that transcends the conventional means of measuring a nation's prosperity. Proposed by the United Nations Environmental Program (UNEP), this innovative metric reshapes the global economic narrative and hopes to redefine the benchmarks of progress.

Aiming to offer a holistic portrayal of a country's affluence and welfare, the IWI considers three fundamental elements: natural, human, and produced capital. By synthesizing these factors,

the index presents a unified and accessible assessment of the United Nations' multifaceted Sustainable Development Goals (SDGs).

The study found that between 2012 and 2018, provincial inclusive wealth per capita rose modestly by 1%, signaling a weak sustainability performance due to a concurrent 1% yearly depletion of natural capital.

While half of the provinces analyzed demonstrated a synergy between income and wealth, the tradeoffs between these factors—rooted in a failure to align income and natural capital growth—highlighted the difficulties in reconciling short-term growth with long-term development.

The study's findings also revealed that national borders can significantly delineate spatial disparities in wealth levels, variations, and compositions, with sustainability achievements extending beyond mere capital cities. Ultimately, the data underscored the importance of harmonizing national and subnational needs-based interventions to foster a form of sustainable development that yields nationwide benefits.

Coulibaly hopes that through similar studies, people "can learn the concept of sustainability and how a sole focus on economic growth can be detrimental to future development." 🌱

▼ Capital stocks as measured by the Inclusive Wealth Index. (Thierry Yerema Coulibaly)





## Alumni Spotlight

## KOICHI WAKATA

## JAXA astronaut speaks at Kyushu University on his latest mission into space

At twilight, on days with clear skies, you might sometimes glimpse a bright, star-like object flying overhead. That object is the most remote place that humans have ever called home: the International Space Station, or ISS, which orbits the Earth about 400 kilometers above sea level, traveling at an astounding speed of around 28,000 kilometers per hour.

From October 2022 to March 2023, the ISS was home to Koichi Wakata, an astronaut affiliated with the Japan Aerospace Exploration Agency (JAXA) and a graduate of Kyushu University. The stay marked Wakata's fifth space flight and his third long-duration mission, lasting 157 days.

Wakata was selected as an astronaut candidate in 1992 and has broken numerous records during his career. In 2014, on his first long-duration mission, Wakata became the first Japanese astronaut to serve as commander of the ISS. As of 2023, he has been in active service for over 30 years, making him the longest-serving astronaut in the world. In total, he has clocked 504 days, 18 hours, and 35 minutes in space, setting a new record for the most time spent in space by a Japanese astronaut.

Wakata attended Kyushu University for all three of his higher education degrees. Before beginning his career as an astronaut, Wakata completed a Bachelor of Science degree in Aeronautical Engineering in 1987, followed by a Master of Science degree in Applied Mechanics in 1987. He later earned his doctorate in Aerospace Engineering in 2004.

On Saturday, October 14, Wakata returned to his alma mater for a debrief on his fifth space flight as both a SpaceX Crew 5 Mission Specialist and an ISS Expedition 68 Flight Engineer.



◀ Koichi Wakata donates an official JAXA flight souvenir to the University. (Kyushu University)

▶ Koichi Wakata on a spacewalk outside the ISS. (JAXA/NASA)

▶ Official portrait of Koichi Wakata. (JAXA/ NASA/Josh Valcarcel)

Wakata began his visit to Kyushu University's Ito Campus by meeting President Tatsuro Ishibashi. He donated an official JAXA flight souvenir of autographs and photos that commemorated his long stay on the ISS. He also returned a Kyushu University flag that the University had entrusted to him to take on his trip, as well as a NASA flight certificate.

Wakata then gave a talk at Shiiki Hall to around 900 students, researchers, and staff from Kyushu University, where he showed video footage from the mission, beginning with the initial take-off to his final splashdown off the coast of Florida.

For this trip, Wakata flew on the SpaceX Crew Dragon spacecraft, along with two astronauts from the United States and one from Russia. During their five months onboard the ISS, the four crew members carried out important and multidisciplinary scientific research. These involved some experiments

◀ Koichi Wakata tends to tomato plants grown without soil onboard the ISS. (JAXA/NASA)

crucial for future exploration by humans deeper into space—including to the moon and Mars—such as monitoring radiation levels, growing plants without soil, and improving technology for recycling urine and sweat into drinking water, Wakata explained.

The crew also conducted research that could ultimately benefit society back on Earth, such as experimenting with nematodes to help elucidate the process of aging, and growing protein crystals to support the development of pharmaceutical drugs.

To help inspire the next generation of scientists, Wakata carried out educational programs onboard the ISS for students from the Asia Pacific region, such as the Kibo Robot Programming Challenge and a series of simple microgravity physics experiments suggested by students.

Another important mission for the crew was to install foundations for a new type of solar array designed to generate a larger, more stable power supply for the ISS. To achieve this, Wakata made two spacewalks—totaling 14 hours and 2 minutes—outside the space station, relying on nothing but a spacesuit to protect him from the environment.

Wakata recounted that during the first of those spacewalks, he ran into problems attaching the solar array's base, but by brainstorming solutions with the ISS crew and the ground control station, he was able to successfully complete his mission.

Wakata also captivated the audience by showcasing innovations that helped the ISS crew live a comfortable life in space, including products like no-rinse shampoo, tablet toothpaste, and wipes that can clean clothes without water.

After the mission report, a Q&A session took place between Wakata and current Kyushu University students. One asked if he experienced fear when carrying out spacewalks. Wakata replied that since he had undergone rigorous training to deal with these risks, he had no fear; he added that the view of Earth through an astronaut's helmet was very beautiful.

To a student who wanted to become an astronaut, Wakata gave the advice that integrative knowledge was important, and that the student should deepen his studies to become a leading expert in his field. He encouraged all students in the audience to not fear failure, as adversity is needed to fuel personal growth.

At the end of talk, Astronaut Wakata also received an Honorary Doctorate, conferred by President Ishibashi, in recognition of his achievements and significant contributions to education and research at Kyushu University. ▶





◀ Babak Hodjat (right) practices calligraphy at Kyushu University. (Photo provided by Babak Hodjat)

Hodjat is known as the primary inventor of the natural language technology behind Apple's voice-controlled assistant, Siri. His unique approach to natural language interfaces enabled AIs to "listen" to commands without needing to understand the entire language.

In 1997, under the guidance of Professor Emeritus Makoto Amamiya, Hodjat began publishing his groundbreaking works on a key aspect of that technology, called Adaptive Agent Oriented Software Architecture (AAOSA). This pivotal work laid the foundation for his startup, Dejima, which Hodjat founded with friends from Kyushu U. In 2012, he began a new venture with Sentient Investment Management, where he introduced the world's first AI-run hedge fund: a pioneering project utilizing the world's largest evolutionary AI.

Today, Hodjat conducts AI research and development at Cognizant. He focuses on exploring the potential of artificial life to address pressing global challenges such as countermeasures for the climate crisis. Through his work at Cognizant, he endeavors to find innovative solutions to the world's problems and contribute to the advancement of AI technology.

#### Q How did your research enable Siri's development?

Dejima played a vital role in the CALO project that ultimately led to the development of Apple's Siri. CALO stands for "Cognitive Assistant that Learns and Organizes" and it was a project that attempted to integrate numerous AI technologies into a cognitive assistant.

In our work, we developed an AAOSA system, of which I was the primary inventor. This system involved mapping text converted from speech waveforms to functions and user interactions. In this approach, an "agent" represented a specific function, like managing volume controls on your radio, controlling TV channels, or playing back programs. These agents "listened" to language commands from the user and staked claims on how they could assist, which ultimately resulted in a coherent response to the user's intention.

What set this approach apart from prior methods was that the system didn't require a complete understanding of an entire language. The AAOSA system was employed in the original Siri as its natural language understanding component, effectively mapping natural language commands to Siri's functionality.

#### Q What were some memorable moments for you at Kyushu University?

I arrived at Kyushu University in April 1997, and it was a remarkable experience. Initially, I was enrolled in a Japanese language course for six months and commuted to the main campus on a bicycle. The course not only taught me Japanese but also provided valuable insights into the life and culture of Japan through exceptional instructors.



◀ Babak Hodjat, CTO of AI at Cognizant. (Photo provided by Babak Hodjat)

#### Q Was it difficult to learn Japanese and adjust to a new country?

The Japanese people are known for their remarkable kindness and generosity, but for a newcomer, it can be a bit challenging to decipher subtle cultural cues. Language can be learned, but understanding the intricacies of cultural signals can be elusive at times, leading to comical misunderstandings. Nonetheless, I had a supportive network of friends and instructors, and Professor Makoto Amamiya, who guided me through this journey.

#### Q Could you tell us more about your work with Professor Amamiya?

Even before coming to Japan, I had been corresponding with Professor Amamiya, a leading expert in distributed AI. He graciously invited me to start working at his laboratory, despite myself still learning the Japanese language.

I had a clear vision of scaling up AI technology to make it accessible to more people, and Amamiya encouraged me to try challenging and novel methods. Without his support, I might have been a lot more conservative. I had always been a more practical scientist, but Amamiya's insistence on the soundness of the math and proof enabled the strong foundation for my work.

#### Q After your involvement with Siri, what other projects have you pioneered?

After Siri, I felt a desire to explore new avenues beyond natural language processing. A colleague proposed the idea of using AI for stock trading, which intrigued me. Between 2007 and 2008 we established Genetic Finance, where we built the world's largest evolutionary AI system. We utilized spare computing resources from internet cafes and game centers around the world to run simulations and develop algorithmic approaches.

By 2009, we started trading with real money and later launched a successful hedge fund. However, we decided to remain a technology-driven entity and spun off Sentient Investment Management. Another notable spin-off, Evolv AI, focuses on website optimization and is widely utilized today.

#### Q How important is integrative knowledge to you?

Integrative knowledge is crucial, as it lets us bridge different disciplines and leverage diverse perspectives. I had the opportunity to lead a workshop organized by the World Economic Forum that brought together AI scientists and neurologists. These small, interdisciplinary interactions have proven to be immensely fruitful, as they facilitate the exchange of ideas and generate innovative collaborations.

Combining expertise from various fields provides valuable insights and helps us navigate AI's complexities responsibly. 🌱

### Alumni Spotlight

# BABAK HODJAT

## Developer of the Natural Language Interface behind Apple's Siri

Babak Hodjat attended Kyushu University between 1997 and 2003, where he received his PhD degree in machine intelligence from the Department of Intelligent Systems at the Graduate School of Information Science and Electrical Engineering. Today, he is the Chief Technical Officer (CTO) of Artificial Intelligence (AI) at Cognizant, a global consultancy for information technology services.



## Japan in Today's World

# CELEBRATING 30 YEARS OF IMMERSIVE AND INTERNATIONAL STUDENT EXCHANGE

In October 2023, Japan in Today's World (JTW)—Kyushu University's flagship international study program—celebrated its 30-year anniversary as it welcomed its new cohort. JTW's main participants are exchange students from the university's partner institutions around the world. As a year-long study program, JTW offers those students a unique opportunity to come to Fukuoka and deepen their knowledge of Japanese culture, society, history, and language through a mixture of English-taught subject courses, Japanese language courses, and various immersive extracurricular activities.

When JTW launched in 1994, it was a small educational program with 14 participants, primarily from the United States. Over the last 30 years, it has continued expanding; today, JTW welcomes around 60 to 70 undergraduate and postgraduate students from about 20 countries and regions to Kyushu University's Ito Campus.

"Our students are not just diverse in their nationality, but also academically," says Masa Higo, Head Faculty Coordinator of JTW. "This makes our job more challenging, but it is very rewarding to see so many students across a range of academic fields taking an interest in Japan."

Higo, a professor in sociology, first joined the program in 2014 as a faculty coordinator before rising to Head Faculty Coordinator two years later. He attributes JTW's broad appeal and success primarily to the quality of academic learning and the level of cultural immersion that it gives the students.

"Our students come for only one year, or sometimes even only one semester, but during their time, they gain a window into the day-to-day family life and culture of Japanese people," says Higo.

◀ Professor Masa Higo interviewed on the occasion of JTW's 30<sup>th</sup> anniversary. (Kyushu University)

▼ The 30<sup>th</sup> cohort of JTW students at Daikanbou, Aso-Kuju National Park. (Kyushu University)

◀ The 1994 cohort of students from the JTW program with then-United States Ambassador to Japan, Walter Mondale (center). (Kyushu University)



"Their classroom learning aside, they also spend quite a bit of time with their host families and local schoolchildren, and are matched with personal student tutors from Kyushu University. The JTW program also gives students the opportunity to experience traditional activities such as the Yamakasa festival, and to connect deeply with Japan's history and nature."

One activity that the students participated in was a kimono-wearing workshop held at Ito Campus on July 10, 2023. The kimono is one of Japan's most iconic traditional garments and is still worn today, particularly for festivals and important ceremonies.

The students received a short introduction on kimonos from Hosui Yamauchi, a professional instructor in the art of kimono dressing. Then, the students were dressed in kimonos—many for the first time—by Yamauchi's volunteers. Some JTW students also got the rare opportunity to try on "uchikake", a formal and expensive wedding kimono worn by brides.

During the workshop, Anna Müller, a master's student from Germany, reflected on her first few months with JTW. "I study biotechnology, so it's not Japan-related at all," she laughs. "But Japan has some very advanced research institutions and companies in the biotechnology sector, so this program is a great way to keep my options open for job opportunities and broaden my horizons."

Müller adds, "While here, I've really focused on the culture, language, and authentic experiences. The JTW program has been perfect for that—I feel like I'm seeing Japan for how it really is."

Later that week, JTW students also grappled with a difficult and impactful exchange at Kyushu



▲ Anna Müller at Hosui Yamauchi's kimono workshop. (Kyushu University)



University's Global Peace Symposium, where they heard first-hand testimony from Michiaki Ikeda, a survivor of the Nagasaki atomic bombing. Ikeda gave a powerful and harrowing account of how he endured, at just six years old, one of Japan's most traumatic moments in history.

"It was very interesting to hear his testimony; the details were so specific and vivid," says Griffin Fitch, a newly-joined JTW student from the United States. "In America, we learn about the atomic bombings, but this was the first time I've heard a Japanese person's perspective. I feel like I might be from one of the last generations able to talk to someone who survived the bombing, so I was thankful for that experience."

For Higo, the Global Peace Symposium is one of the most important events for JTW students to participate in. "Being able to talk directly to a first-hand survivor [of Nagasaki] is incredibly meaningful, and crucially, it symbolizes the act of cross-cultural exchange, which is what JTW is all about," says Higo.

When asked what he imagines the next 30 years of JTW might bring, Higo offers a surprising vision: "In the long term, while it sounds counter-intuitive, I hope that the program makes itself obsolete. JTW is a model for how I envision higher education at Kyushu University should be: international and inclusive."

"While it's still a long way off, ultimately, I hope that there will be so many options for exchange and English-taught courses offered across the University's different departments that JTW as a standalone program will no longer be necessary," Higo adds. 🌸

▲ JTW students listen to Michiaki Ikeda's experience of the Nagasaki atomic bombing. (Kyushu University)

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— Professor Masa Higo



## Cultivating Tomorrow's Leaders

# SENTAN-Q PAVES THE WAY FOR A DIVERSE GLOBAL FUTURE

As a Designated National University Cooperation, Kyushu University is tasked with the mission to become a global leader in education and research. To this end, Kyushu University envisions an academic environment that is diverse, inclusive, and truly international; guided by talented, world-class faculty members irrespective of age, nationality, or gender.

However, in Japan, both young researchers and female researchers generally remain underrepresented in senior positions. One initiative Kyushu University is taking to tackle this is SENTAN-Q, a “Diversity and Super Global Training Program for Female and Young Faculty.”

Launched in 2019, SENTAN-Q identifies and empowers exceptional young or female faculty to become globally competitive in their academic field. Around 10 researchers are selected annually for training under elite overseas mentors. Upon completion, successful trainees earn promotions or tenure.

In this feature, we speak to Huixin Liu, a recent SENTAN-Q graduate and newly-promoted Professor in the Department of Earth and Planetary Sciences, Faculty of Sciences, to find out more about her research and experience on the program.



## Q What is your area of research?

My research field is space physics; I currently focus on space weather, which is the weather that occurs in outer space, about 100 km to 20,000 km above Earth. In this region, a weakly ionized plasma exists and changes from day to day.

Space weather is mainly influenced by explosive events on the sun, such as solar flares, but is also impacted by meteorological activity on Earth, like typhoons, volcanic eruptions, and earthquakes. In my lab, we are using satellite observations and numerical models to understand the physics underlying space weather so we can make more accurate predictions about it.

## Q Why is it important to understand and predict space weather?

Historically, space weather had little impact on human society. It would only have been perceived due to auroras: light displays that occur when high energy particles from solar winds hit the Earth's atmosphere. But with our growing dependence on technology, we have become increasingly vulnerable to space weather's effects. It can interfere with radio communications, GPS signals, and spacecraft; extreme solar storms can even knock out our power grids or cause satellites to fall from the sky.

We are about to enter solar maximum—a period of the solar cycle with the most intense solar activity—so there is a real need for space weather monitoring and prediction if we are to minimize and mitigate its destructive impacts on our society's techno-infrastructure.

## Q Can you tell us about your training with SENTAN-Q?

I was nominated for SENTAN-Q two years ago, as the first participant from the Faculty of Sciences. The program required me to complete six steps over two years, which included on-campus training on university governance and the importance of diversity and inclusion; as well as workshops on the latest teaching methodologies, which prioritize interactive over traditional lecture-style learning.

During the program, we also provided research guidance to and co-authored papers with international students, both on-campus and through placements overseas. I taught at both the University of Oslo, Norway, and the University of Rostock, Germany. My lab here in Kyushu is very international and I already had experience teaching abroad in Germany and the U.S., so this was not new to me; but for many colleagues, this opportunity was incredibly valuable.

▼ A view of Earth at night, showing an aurora: a light display caused by space weather. (NASA/Johnson Space Center)



▲ Huixin Liu, Professor in the Department of Earth and Planetary Sciences, Faculty of Sciences. (Kyushu University)

## Q What was the most valuable SENTAN-Q experience for you?

For me, learning about university governance was very unique. It expanded my professional capacity from just caring about research and education in my own lab to considering it at a university-wide scale. It was also eye-opening to realize that there is more student representation in governance at overseas universities, something that Kyushu University could consider implementing in the future.

The recurrent education was also very beneficial, as it allowed me to forge connections with other faculty members from different fields. In the area of humanities, I learned about multicultural communication, which helps me to better understand and instruct foreign students in classes and my lab. In the sciences, I learned about satellite orbit control and design, which is the engineering side of space science and exploration.

## Q Why do you think SENTAN-Q is important?

Like many other universities in Japan, the system here can be very traditional. It can be a little difficult and slow for female or young faculty to progress in their career. Through this program, Kyushu University has been able to speed up career development for faculty members that it thinks have the most potential.

In addition, I think that SENTAN-Q's focus on providing those faculty members the opportunity for international exchange is a key step toward giving Kyushu University a more global attitude. This could ultimately lead to a world-class excellence in research and education that attracts the best minds, both domestically and internationally. 🌱





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