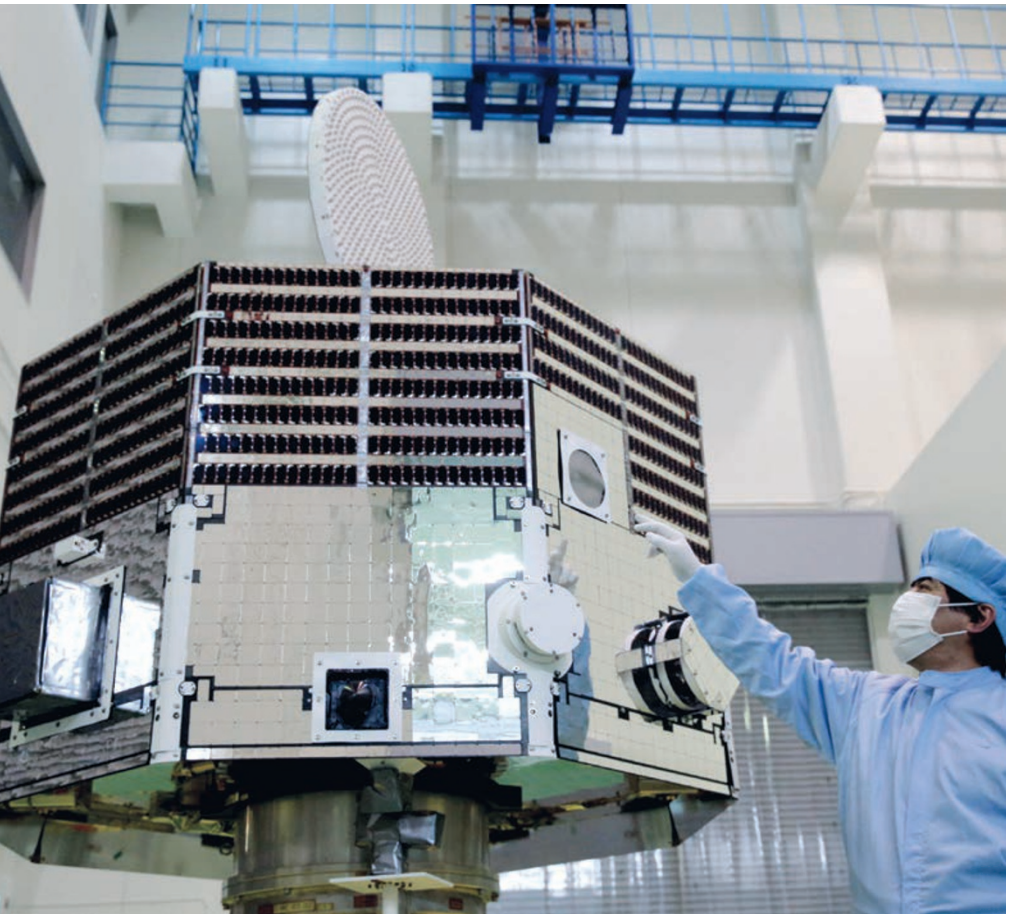


THE ASAHI SHIMBUN/GETTY

The Mercury Magnetospheric Orbiter will study the planet's atmosphere and magnetic field.

JAPAN

The government is stepping up efforts to attract international scientists, as the country invests record sums in research.

SMRITI MALLAPATY

Cevayir Coban has witnessed a major cultural shift in Japanese universities since arriving in the country in 2003. Coban, her husband and their one-year-old son had left the United States so that she could join the laboratory of immunologist Shizuo Akira at Osaka University.

At first, Coban, a malaria immunologist from Turkey, kept herself to herself because she couldn't understand what her colleagues were saying. "The attitude back then was: 'If you don't speak Japanese, you should learn it'," she says.

That sense of isolation has eased, partly because she learned the language, but also because universities have changed their approach to non-Japanese speakers: they now seek out top-level international researchers to work in their labs. "In the past ten years, universities and institutions all over Japan have made an active effort to globalize," Coban says. "The attitude today is: 'You don't have to speak Japanese to work here'."

Around the time of Coban's arrival, the Japanese government, mired by a long period of economic stagnation, recognized that the country was ill-equipped to operate in the rapidly globalizing international research environment. In 2007, it set out its World Premier International Research Center Initiative (WPI), a plan to establish centres of excellence that would attract talented international researchers. Coban now heads her own lab at one of these centres: Osaka University's Immunology Frontier Research Center (IFReC), which is led by Akira. The centre is fully bilingual, 25% of its researchers are non-Japanese and it employs a team of staff to help researchers to relocate and deal with the inevitable paperwork involved in PAGE S16 ▶

CAROLINE FERN BENTON
Vice-president at the University of Tsukuba

What kind of researchers do you hire?
The university looks for individuals who are open to cross-disciplinary and cross-border collaboration. Being an open, global university is very much part of our DNA, and it is reflected in our philosophy and history. One of our prominent founding figures was Kanō Jigorō — the creator of modern judo and the first person to bring foreign exchange students to Japan.

In 2014, as part of a national effort to raise the international prominence of Japanese universities, we introduced an initiative to become a trans-border university in every sense of the word. We want to cross national, institutional, disciplinary and academic–industry borders. We are aiming to triple the number of foreign researchers at Tsukuba to more than 300 by 2023.

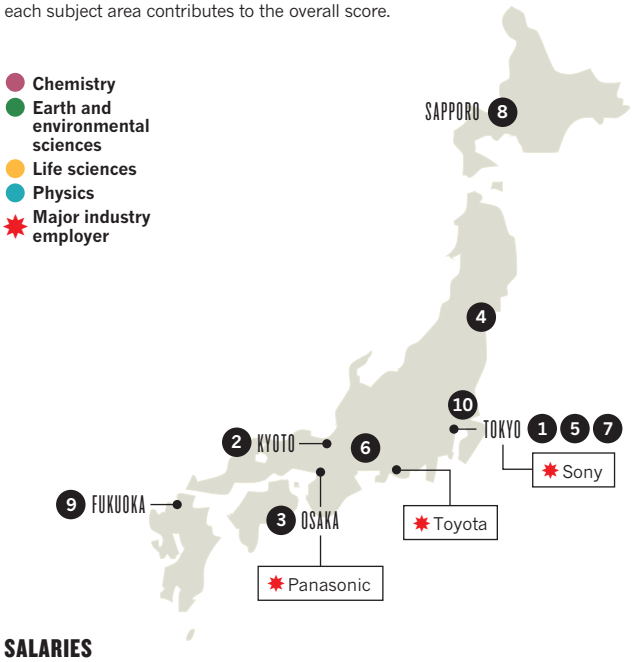
Why are Japanese universities so keen to globalize?
The number of 18-year-olds in Japan, and therefore the number of prospective university students, is declining. This means that we will need to bring in bright, young people to fill the university places and eventually to join the workforce. Research and education have also become much more global. We need to motivate our researchers to go abroad to expand their horizons.

What do you enjoy most about working in Japan?
Japanese culture values harmony and teamwork. This means you feel a sense of belonging to a group. These values are promoted through relationships and a common understanding, so employers tend to take a longer-term view of employment and business. Even research labs at private companies tend to have a much longer-term focus than US companies, for example, which face greater pressure to deliver short-term results. **S.M.**

This interview has been edited for length and clarity.

WHERE TO WORK

The top ten institutions in Japan, based on research output included in the 2015 *Nature Index*, May 1 2015–April 30 2016, shown as weighted fractional count (WFC), a measure of the relative contribution of an author to an article weighted to correct for imbalances between subjects. Bars are divided according to the proportion that each subject area contributes to the overall score.

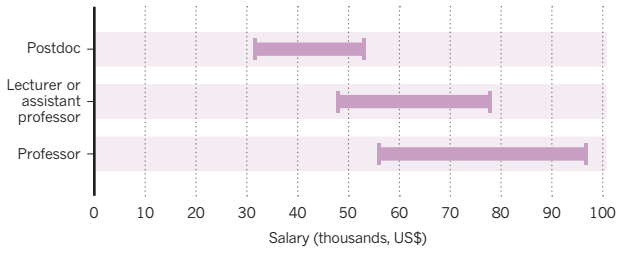


1. **University of Tokyo** / WFC 434.8
2. **Kyoto University** / WFC 259.8
3. **Osaka University** / WFC 180.1
4. **Tohoku University** / WFC 166.8
5. **RIKEN** / WFC 138.6
6. **Nagoya University** / WFC 126.9
7. **Tokyo Institute of Technology** / WFC 114.1
8. **Hokkaido University** / WFC 97.4
9. **Kyushu University** / WFC 83.5
10. **National Institute for Materials Science (NIMS)** / WFC 71.9

Overlaps in subject areas may cause some distortion to relative subject proportions.

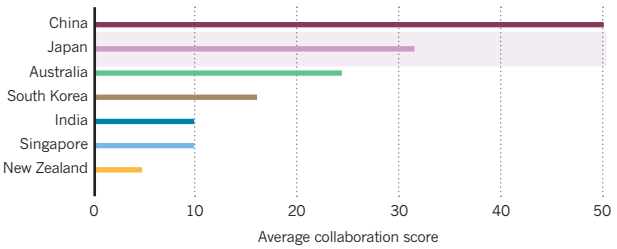
SALARIES

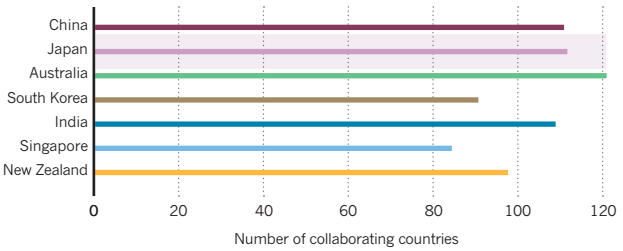
Starting salaries in Japan sit around the middle of the list of Asia-Pacific countries profiled, according to data collected in *Nature*'s interviews.



COLLABORATIONS

Japan's average collaboration score (top) — the sum of *Nature Index*'s fractional count (the relative contribution of authors to an article) for international collaborations divided by the number of countries Japan collaborates with.





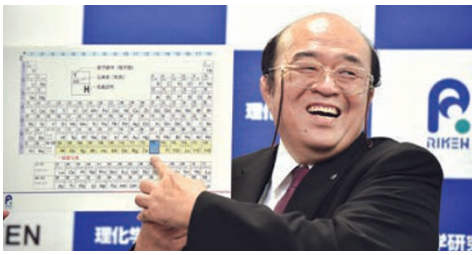
RESEARCH FOCUS

Japan will become the first Asian country to name a chemical element, it was announced in the final hours of 2015. An international committee of chemists had attributed the discovery of element 113 to a team led by chemist Kosuke Morita at the RIKEN Nishina Center for Accelerator-Based Science in Wako.

Elements with more than 92 protons are unstable and decay into lighter, more stable atoms after only a fraction of a second. Proving the existence of these ephemeral elements is therefore very difficult. Morita's team began its search for element 113 in 2003 by bombarding atoms of the heavy metal bismuth with beams of zinc travelling at one-tenth of the speed of light. It took the group 9 years to produce convincing evidence that it had created an isotope of an element with a nucleus of 113 protons and 165 neutrons, and another 3 years for the feat to be formally acknowledged.

The team has proposed the name nihonium, with the symbol Nh, after *Nihon*, Japanese for 'Japan'. The elements place, on the seventh row of the periodic table between copernicium and flerovium, is expected to be confirmed by the International Union of Pure and Applied Chemistry in November, following a five-month public consultation on the name.

In January, the government adopted a five-year plan that identifies robotics, sensor and actuator technologies, biotechnology, human–computer interaction, nanotechnology and quantum technology as areas of existing research strength that should be prioritized for investment. The government is also committed to funding a major cybersecurity project to safeguard crucial transportation, energy and communications infrastructure. ■



Chemist Kosuke Morita led the team that discovered element 113.

KAZUHIRO NOGI/AFP/GETTY

applying for grants and other administration.

In 2014, the Japanese government stepped up its efforts to make the country's higher education more competitive and compatible with the rest of the world by selecting 37 universities to receive funding under its Top Global University Project. The programme aims to increase the proportion of researchers at these institutions who are either foreign-born or Japanese with overseas degrees from 28% to 47%. Moreover, the aim is that by 2023, 22% of classes will be taught in languages other than Japanese — close to triple the current percentage. "We need to capture the power of globalization and openness

"THE ATTITUDE TODAY IS: 'YOU DON'T HAVE TO SPEAK JAPANESE TO WORK HERE'."

to address global and social challenges together," says economist Yuko Harayama, an executive member of the Japanese government's Council for Science, Technology and Innovation.

Despite these efforts, Japan is still falling short of its goals. The number of international researchers in appointments and placements of more than 30 days at Japanese academic and research institutions reached a peak of around 15,100 in 2012 — only a slight increase on the 12,800 researchers in 2003, and a small proportion of the 844,000 researchers in Japan.

"We have been promoting globalization for more than 20 years, but have not yet achieved the status we would like," says Harayama. Universities are under multiple pressures, she adds. They are required to open up to foreign influences, collaborate more with the private sector and focus to a greater degree on science that serves society.

Japan also falters when it comes to women in science. Not only is Coban one of the first international professors in the natural sciences at Osaka University, but she is also the only female principal investigator at IFReC out of almost 30. Nationally, women make up only about 15% of researchers and only 6% of corresponding authors — compared with an Organisation for Economic Co-operation and Development average for female corresponding authors of 26%.

But Harayama is optimistic about the future. In January, the government released a new science and technology plan, which was prepared with greater private-sector involvement than previous strategies — industry accounts for 72% of research and development expenditure in the country. Starting in April, organizations that employ more than 300 people are required to set minimum targets for employment of women and the proportion of women in management roles.

Meanwhile, Japan remains committed to investing in science and technology. In 2014, it spent a record high of 3.6% of its gross domestic product on research and development, making it the third highest investor globally after South Korea and Israel. ■

JAPAN HAS CLOSE TO 30,000 NATURAL HOT SPRINGS, OF WHICH ALMOST 8,000 HAVE BEEN DEVELOPED INTO POPULAR BATHING FACILITIES KNOWN AS ONSENS.

ENTRY REQUIREMENTS

- Researchers must apply for a Highly Skilled Foreign Professionals visa, which grants workers, and, if applicable, their spouse permission to live and work in Japan for up to five years.
- The application process takes between one and three months. Researchers must first obtain a certificate of eligibility from their employer. This is issued through a system that awards points based on criteria such as academic and professional experience. Employees include this certificate when applying for a visa at their Japanese embassy.
- On entering Japan, arrivals receive a residence card that they must carry at all times. Card holders can leave as many times as they wish, but they must re-enter the country within a year.
- Visa-holders can apply for permanent residency after five years.

OPPORTUNITIES & CONTACTS

- The Japan Research Career Information Network (JREC-IN) Portal lists jobs for researchers in academia, industry and the public sector.
- The Japan Aerospace Exploration Agency (JAXA) International Top Young Fellowship offers early-career researchers the opportunity to work at the Institute of Space and Astronautical Sciences for three to five years.
- The RIKEN Special Postdoctoral Researchers Program supports young researchers engaged in an independent project of their choosing for up to three years.
- The Japan Society for the Promotion of Science Postdoctoral Fellowship for Overseas Researchers offers grants to highly qualified researchers to collaborate with Japanese scientists for between one month and two years.

NTT BRL

BILL MUNRO

Group leader of the Theoretical Quantum Physics Research Group at NTT Basic Research Laboratories (BRL) in Atsugi

Are there any cultural differences that researchers coming to work in Japan should be aware of?

No one really says yes or no, so you need to get used to reading between the lines. If someone tells you that something 'will be difficult', then you probably shouldn't do it. But many Japanese people have now learned to be more direct with their non-Japanese co-workers.

How open is the private sector to international researchers?

Many industries are hiring more foreigners. About 15% of NTT BRL employees are non-Japanese and this proportion is slowly increasing. International researchers can apply for two-year postdocs. Older, grey-haired people like myself can apply for five-year research specialist positions.

Is private-sector research in Japan done differently?

Overseas, the trend is for industrial research to become more applied, more product-oriented, but in Japan most of the big companies still carry out fundamental research. Companies here also cover a wider breadth of research fields, and the labs are incredibly well-resourced.

Are there any downsides to working in Japan?

Historically, private-sector research has been a very individual activity in Japan. This is changing, but more slowly than in Western countries, where companies are moving towards larger, collaborative projects. A researcher can only do so much on their own. NTT laboratories are pushing towards more collaboration, both internally and externally. **S.M.**

This interview has been edited for length and clarity.