One clue to the importance of climate: Bumblebee ranges began shrinking "even before the neonicotinoid pesticides came into play in the 1980s," says ecologist and coauthor Alana Pindar, a postdoctoral fellow at the University of Guelph in Canada. She says the retreat from southern territories is "a huge loss for bumblebee distributions" and happened surprisingly quickly. The researchers believe the retreat—and the move to higher elevations—may reflect the fact that bumblebees evolved in cooler climates than many other insects that haven't yet lost ground, and so are especially sensitive to warming temperatures.

More mysterious is their failure to push north. "What we can infer is that temperature in the northern latitudes is not what's limiting their spread," says Ignasi Bartomeus, a researcher at Spain's Estación Biológica de Doñana in Seville, who was not involved in the study. Differences in daylight or food could hamper a march north, or bumblebee populations may simply be too slow-growing to quickly expand. Many bumblebees form small colonies, Kerr explains, limiting their ability to spread quickly. In contrast, species with high population growth rates are "more likely to be able to establish a new colony that represents a measurable difference in geographic range." He notes that one outlier in the study, the buff-tailed bumblebee (*Bombus terrestris*), one of Europe's most common species, is known for its reproductive success and has moved north. The species "is kind of like the dandelion of the bumblebee world," he says.

So far, says Bartomeus, the most common bumblebee species seem to be the most resilient. But "we have a lot of losers," he cautions, including species that have specialized habitat requirements. And climate change could further strain species already struggling with dwindling habitat and other pressures, Kerr says. "We're hitting these animals with everything," he says. "There's no way you can nail a bee with neonicotinoids, invasive pathogens, and climate change and come out with a happy bee."

The loss of bee species could carry consequences for ecosystems and people. For instance, "plants that like their pollinators to be pretty loyal" could see declines in reproduction, says ecologist Laura Burkle of Montana State University, Bozeman. And given that wild bees help pollinate many crops, "we play with these things at our peril," Kerr says. "The human enterprise is the top floor in a really big scaffold. What we're doing is reaching out and knocking out the supports." ■

Cally Carswell is a freelance journalist in Santa Fe.

WOMEN IN SCIENCE

Plan to drop goals for women roils Japanese science

Change stirs debate about how to remedy underrepresentation of women

By **Dennis Normile**, *in Tokyo*

Japan Prime Minister Shinzō Abe repeatedly has said he intends "to create a society in which women shine." Now, female researchers are wondering if they are included in his vision. Japan's top science advisory panel has issued a draft 5-year national research plan that drops longstanding numerical targets for boosting the number of women in scientific fields, sparking concerns about the nation's commitment to reshaping the male-dominated sector.

The draft, unveiled on 28 May by Japan's Council for Science, Technology and Innovation (CSTI), has prompted debate over whether the targets—which have been in place for nearly a decade—are the best way to foster change. "Previous targets have not had as much impact as we would like," says Yuko Harayama, a political scientist and executive member of CSTI. "We need to analyze why." But dropping the targets is not the right response, says Hisako Ohtsubo, a molecular biologist at Nihon University, Funabashi, near Tokyo. "Without numerical targets we're afraid progress could stall," she says. Last week, Ohtsubo and several colleagues started lobbying CSTI and other government officials to add targets and additional supportive measures to the final plan, which is due by the end of the year and takes effect next April.

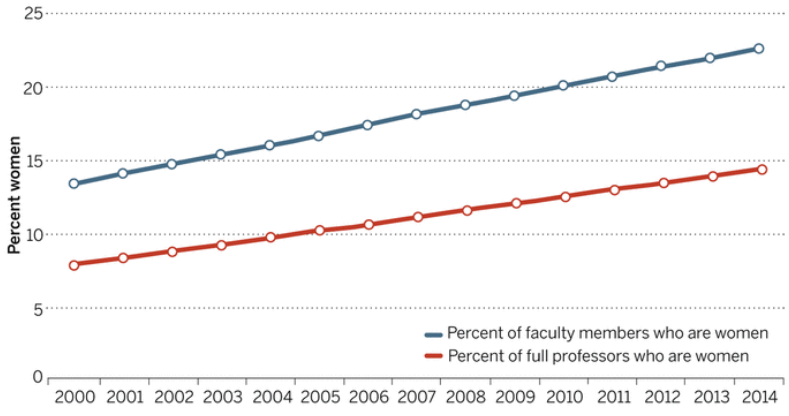
> ***"Targets have not had as much impact as we would like."***
>
> **Yuko Harayama**, Council for Science, Technology and Innovation

Japan continues to lag in recruiting women into its academic and scientific workforce, especially at top research universities. Nagoya University leads the way, with women holding 14.5% of all faculty positions as of May 2013. Tokyo and Kyoto universities, considered Japan's top schools, were at 11% and 10.6%, respectively. The average for Japan's 86 national universities is 14.1%, excluding teaching assistants, according to the Japan Association of National Universities (the student body is about 30% female).

Those numbers are "are very low" compared with other developed countries, says cancer biologist Michinari Hamaguchi, Nagoya University president from

Stuck on the first rung

In Japan, women have made up a growing percentage of total faculty members but a smaller proportion is being promoted to full professorships.



DATA SOURCE: MINISTRY OF EDUCATION, CULTURE, SPORTS, SCIENCE AND TECHNOLOGY

2009 until this past March. Women are 36% of total faculty in the United States, 44% in the United Kingdom, 36% in Germany, and 33% in France, according to a study by science policy experts Sotaro Shibayama of the University of Tokyo, and Aldo Geuna of the University of Turin in Italy.

To help close the gap, since 2006 Japan's 5-year plans for science and technology have included numerical goals for female recruitment. The plan adopted in 2006, for instance, called for women to make up 25% of the researchers recruited into the overall scientific workforce by 2011. It also set goals for specific fields, including 30% in health, 30% in agriculture, 20% in the natural sciences, and 15% in engineering. The current plan, adopted in 2011, upped the overall recruitment goal to 30%. And in 2013, the government's Gender Equality Bureau urged that the 30% goal apply to university presidencies and other leadership positions, not just the rank and file. The target date is 2020, but so far, Japan is not on track to meet these goals.

The new draft plan, for the years 2016 through 2020, drops gender targets in favor of so-far unspecified strategies to advance women. That approach alarms some advocates. Ohtsubo, for one, says "numerical targets are definitely necessary" for advancing women. She and a number of colleagues are also pushing to expand other supportive measures. For example, earlier plans have encouraged funding agencies to create grants for women who rejoin the workforce after raising children and to relax age limits for young investigator grants, so as not to disadvantage women who take time out for maternity leave.

> ***"Without numerical targets we're afraid progress could stall."***
> **Hisako Ohtsubo**, Nihon University

Advocates point to some institutions as a model. At Nagoya University, Hamaguchi created a scheme to recruit one or two promising female principal investigators each year without regard to their specialty, putting them on track to fill faculty positions as older professors retire. A mentoring program encourages senior female faculty to share tips with newcomers, and the university organizes leadership seminars to prepare women for higher positions. It also keeps its day care center open for particularly long hours, and helps provide care for sick kids. The center even sends taxis to pick up children from nearby schools.

Supporting women "had a snowball effect," Hamaguchi says. In 2006, for example, Nagoya's graduate biology department had just one female professor and one female teaching assistant. Now, 18 of the department's 75 faculty members are women. "The university's affirmative actions led to a natural increase in women faculty," says Narie Sasaki, a molecular cell biologist who helped craft some of the initiatives.

Hamaguchi and others worry that a lack of similar support elsewhere is contributing to a female brain drain. Women make up close to 60% of the Japanese citizens working in Western countries as students, teachers, and researchers, according to a Ministry of Foreign Affairs survey. And anecdotes suggest that the overseas female Japanese scientists are among the cream of the crop. Over the past decade, for instance, the Howard Hughes Medical Institute (HHMI) has awarded its prestigious grants to just three Japanese scientists working in the United States, and all are women.

That might be a statistical fluke, says one of the HHMI scholars, plant biologist Keiko Torii of the University of Washington in Seattle. But she thinks Japan does need "some strong government initiative ... to promote women in science as well as help them and their husbands balance families and careers."

CSTI's Harayama, who spent a decade on the faculty of Tohoku University in Sendai, shares those concerns. But she worries that overemphasizing numerical targets might lead to institutions simply filling slots with women without addressing the many other issues that can hold them back.

Harayama notes that CSTI is sponsoring studies examining how and why women choose certain career paths. One preliminary result is that young women who excel in science are gravitating toward fields such as health care and teaching, which provide credentials—such as teaching certificates or medical licenses—that offer a passport back into the workforce after time off raising children. "Young women are being very pragmatic in choosing career paths," she says.

Harayama also suspects many women avoid leadership positions because they don't find the prospect of working within Japan's male-dominated, opaque decision-making hierarchies very attractive. "We need changes in the establishment," she says.

How the final plan might encourage those changes won't be clear until later this year. But Harayama predicts it will include "more concrete actions" to create an academic community in which more women scientists can shine. ■

BIOMEDICINE

Targeting copper to treat breast cancer

Business obstacles threaten to delay the phase III trial of a copper-depleting drug

By **Ken Garber**

In 2007, a woman facing an almost certain death sentence took a chance on a drug that needed a second chance itself. The woman had stage IV breast cancer that had spread to her liver. Chemotherapy had eliminated her primary tumor, and surgeons had removed the liver metastases, leaving her in a status called "no evidence of disease" (NED). But oncologists cannot eliminate microscopic distant metastases—and this woman had the "triple negative" subclass of breast cancer, which is particularly aggressive and prone to bouncing back. Patients like her usually relapse within a year, with death following swiftly.

So, as part of a 2-year clinical trial of advanced breast cancer patients, the woman began taking a drug that mops up copper, thought to play a role in tumor growth (*Science*, 15 January 2010, p. 331). The drug, tetrathiomolybdate (TM), had already failed a series of previous cancer clinical trials, but this new trial has since been extended several times and there is still no sign of cancer in the woman after 8 years.

The full trial results are equally striking, as Weill Cornell Medical College (WCMC) oncology fellow Eleni Nackos reported last month at the annual meeting of the American Society of Clinical Oncology (ASCO). At a median follow-up of nearly 5 years, 62 other women in the 75-patient TM trial also had no detectable cancer. Among them were 12 of the 15 other women with stage IV triple negative breast cancer, whose typical median survival is months, with NED status only a temporary reprieve.

Though these are extremely small numbers and the study had no placebo arm, University of Chicago oncologist Olufunmilayo Olopade says she was "blown away" by the data presented at ASCO. "What was so compelling about this study was that they were looking [at] women who were at high risk of recurrence," she adds.