News explainer

Italy, and the Swiss Federal Institute of Technology in Zurich — found that submarines could become more difficult to detect using sonar in the North Atlantic Ocean as water temperature rises (see go.nature.com/4awx29k).

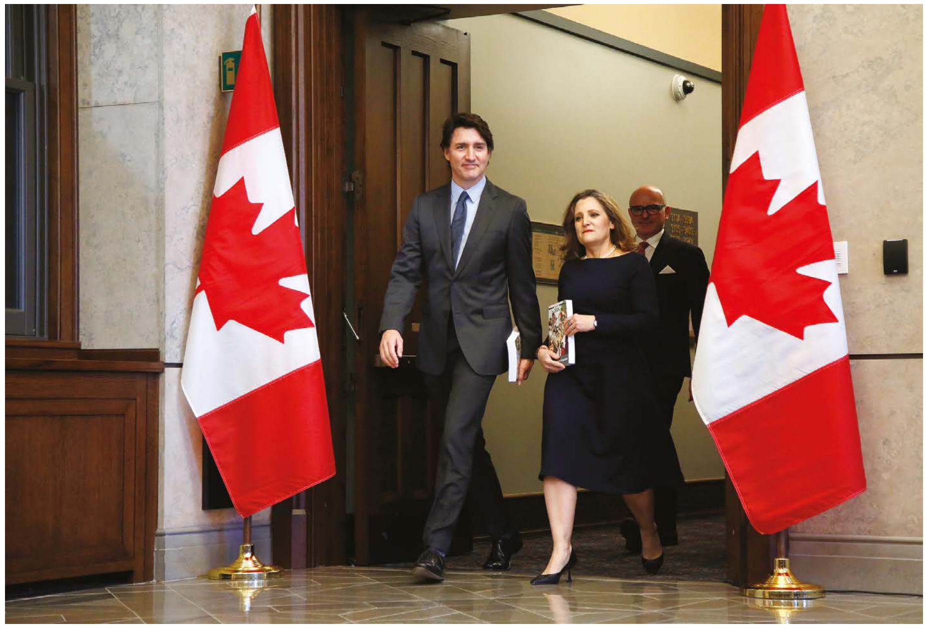
In another study, presented at last month's conference of the European Geosciences Union in Vienna, CMRE researchers working with scientists at the universities of Princeton in New Jersey and Central Florida in Orlando assessed how extreme weather might affect 91 NATO military bases and installations (see go.nature.com/4ara06t). The researchers found that multiple bases and installations are likely to become susceptible to climate change as emissions continue to rise.

What about a role for science in diplomacy?
In 1958, NATO established research fellowships and projects in what later became its SPS programme, to boost collaboration between nations including the United States and the Soviet Union. "Science provided a path for superpower adversaries to cooperate," says Paul Arthur Berkman, founder of the Science Diplomacy Center in Falmouth, Massachusetts.

The fellowships and collaborative projects continued to provide a point of contact between NATO and Russia until 2014, when Russia invaded Crimea. That year, Russia, Romania and the United States were jointly developing a system to connect telemedicine capabilities across all three countries to provide medical care in remote and emergency situations. However, the invasion prompted NATO to freeze cooperation with Russia.

In 2010, Berkman co-organized and chaired the first dialogue between NATO and Russia regarding environmental security in the Arctic. Now, he is concerned at the alliance's shift away from using science as a "safety valve" in its relations with Russia. He warns that cutting off this scientific dialogue undermines democracy and nations' ability to tackle global challenges such as climate change. "Open science is akin to freedom of speech. If we turn off open science, in a sense we're undermining democracy," says Berkman.

By Natasha Gilbert



DAVID KAWAI/BLOOMBERG VIA GETTY

Canada's finance minister Chrystia Freeland (right) presented the federal budget on 16 April.

CANADIAN BUDGET BRINGS BOOST TO PHD AND POSTDOC PAY

Government announces biggest increase to postgraduate stipends in 20 years.

By Brian Owens

Researchers in Canada got most of what they were hoping for in the country's 2024 federal budget, with a big boost in postgraduate pay and more funding for research and infrastructure.

"We are investing over Can$5 billion in Canadian brainpower," said finance minister Chrystia Freeland in her budget speech on 16 April. "More funding for research and scholarships will help Canada attract the next generation of game-changing thinkers."

Postgraduate students and postdoctoral researchers have been advocating for higher pay for the past two years through a campaign called Support Our Science. They requested an increase in the value, and number, of federal government scholarships, and got more than they asked for. Stipends for master's students will rise from Can$17,500 (US$12,700) to Can$27,000 per year, PhDs stipends that ranged from Can$20,000 to Can$35,000 will be set to a uniform annual Can$40,000 and most postdoctoral-fellowship salaries will increase from Can$45,000 to Can$70,000 per annum. The number of scholarships and fellowships provided will also rise over time, building to around 1,720 more per year after five years.

"We're very thrilled with this significant new investment, the largest investment in graduate students and postdocs in over 21 years," says Kaitlin Kharas, a PhD student at the University of Toronto, Canada, and executive director of Support Our Science. "It will directly support the next generation of researchers."

Although only a small proportion of students and postdoctoral fellows receive these federal scholarships, other funders tend to use them as a guide for their own stipends.

Many postgraduates said that low pay was forcing them to consider leaving Canada to pursue their scientific career, says Kharas, so this funding should help to retain talent in the country.

"This is going to move us from a searing brain drain to a brain gain, and position us to compete on the world stage," says Chad Gaffield, chief executive of the U15 Group of Canadian Research Universities, based in Ottowa, which supported the campaign.

'Determined to thrive'

The budget also includes marked boosts for basic research. There is an extra Can$1.8 billion over five years in core funding for the three federal grant-awarding research councils, as well as Can$400 million for upgrades to the

TRIUMF particle accelerator in Vancouver, and more cash for several other large facilities and institutes across the country. There will also be more than Can$2 billion for the artificial-intelligence sector in Canada.

This budget "really emphasizes that Canada is determined to thrive in the twenty-first century based on science", says Gaffield.

Others have pointed out that the vast majority of the money in the budget for the research councils is backloaded, with just Can$228 million coming in the next two years. This means that the gains will be slow, and could be vulnerable to changes in the political climate, says Alex Usher, president of Higher Education Strategy Associates, a consultancy in Toronto. "Do not count on this money being there after an election," he posted on X (formerly Twitter).

The budget also makes some changes to how science funding is organized. Instead of ten different programmes for scholarships and fellowships, with differing levels of support, there will now be a single programme with just three levels – master's degrees, PhDs and postdoctoral fellowships.

The government will also create a new "capstone" research-funding organization to better coordinate the work of the three grant-awarding councils and "advance internationally collaborative, multi-disciplinary and mission-driven research", the budget says. It will also create an advisory Council on Science and Innovation, which will develop a national science-and-innovation strategy to guide priority setting and increase the impact of federal investments. "This should help move us towards a more efficient, well-coordinated and nimble way of supporting research in Canada," says Gaffield. "I look forward to working with the government to optimize it."

HOW TO FREEZE A MEMORY: WORMS PUT ON ICE STOP FORGETTING

The model organism *Caenorhabditis elegans* quickly forgets a notable odour – unless it is chilled.

By Julian Nowogrodzki

Roundworms have short memories, forgetting new information just two to three hours after learning it. But put them on ice and they don't forget – until they are returned to room temperature, a study finds (D. L. Landschaft Berliner *et al*. Preprint at bioRxiv https://doi.org/msww; 2024).

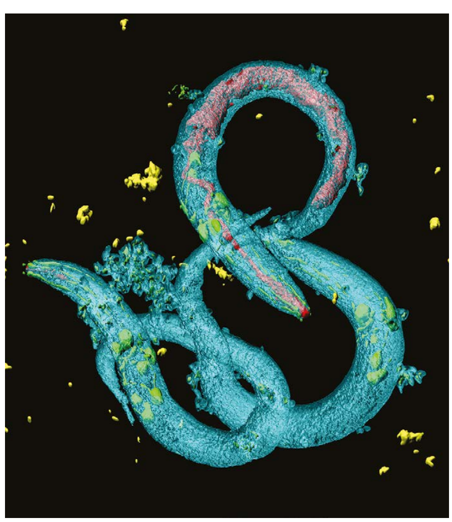
The worms, the laboratory workhorse *Caenorhabditis elegans*, retain their memories only if they're cooled quickly. If they are allowed to acclimatize to the cold by spending the night in cool conditions before they are trained and placed on ice, they forget the information as fast as usual. If they are given the drug lithium, they also hang onto their memories for longer than normal, even at room temperature.

The work speaks to the mysteries of how memories are made and discarded. It also raises questions about why the keenness of a worm's memories changes under different environmental conditions.

The research is "terrific", says molecular biologist Ilya Ruvinsky at Northwestern University in Evanston, Illinois, who was not involved in the work. "Forming memories is an intrinsically interesting problem. But it doesn't happen in isolation."

The research was led by geneticist Oded Rechavi at Tel Aviv University in Israel and posted on the preprint server bioRxiv on 3 April. It has not yet been peer reviewed.

You can't just ask a worm if it remembers something. To get around this, scientists train a worm to dislike a smell it would normally like by exposing the worm to that smell as it endures a short period of starvation. Two hours after learning to dislike the odour, the worm has forgotten the negative association and is once again attracted to the smell.



Putting the research stalwart *Caenorhabditis elegans* on ice boosts the worm's memory.

HEITI PAVES/SPL

To study memory formation, Rechavi's then-graduate student Dana Landschaft Berliner put worms on ice and found that the animals retained their smell-related memories while chilled for at least 16 hours. As soon as the creatures were taken off the ice, however, their memory 'clock' seemed to restart; after three hours, they had forgotten their aversion to the smell.

Berliner identified several ways to affect worm memory. When the worms were cooled overnight before the memory training, they quickly forgot the odour, as usual. Worms given lithium and then put on ice held onto their memories just like counterparts that hadn't received lithium. But worms given lithium also retained their memories at room temperature, whereas unmedicated animals did not.

Forgetting switch

The key to these responses might be a signalling molecule called diacylglycerol. In *C. elegans*, it is known to regulate cellular processes related to memory and learning, and to be essential for smell-related learning.

In both the ice and lithium treatments, memory preservation was linked to reduced levels of diacylglycerol, the authors found. The team dubbed the diacylglycerol circuit the "forgetting switch" because of its involvement in delaying memory loss.

The connection between low diacylglycerol levels and lithium makes sense: lithium is known to inhibit an enzyme that makes a precursor to diacylglycerol. This is considered to underlie lithium's effect in people with bipolar disorder, Rechavi says.

The scientists also found that memory retention is related to cell-membrane rigidity, which increases in the cold. Two strains of mutant worm that have unusually rigid membranes were slower than normal worms to forget, even at room temperature. Physical hardening of the membrane seems to delay forgetting, the experiments showed.

Why forget?

As for the future, this research raises interesting questions on many levels: molecular, biochemical, genetic and evolutionary, says Rechavi. "Why do they forget, when the worms are perfectly capable of maintaining the memories longer?" He asks. "Is it because they're optimizing for something? Perhaps there's a reason for holding memories for the particular duration that they do."

Rechavi's lab is currently investigating whether similar memory phenomena happen in other organisms that can survive cold temperatures, such as certain turtle species. "It will keep us busy for a long time," he says.