

## FUNDING

# Australian science boost

*Government pushes for long-term investment and more cash.*

BY NICKY PHILLIPS

Research facilities and medicine were among the winners for science in Australia's 2018–19 national budget, which was proposed on 8 May.

Prime Minister Malcolm Turnbull's centre-right Liberal government will push to invest almost Aus\$1.9 billion (US\$1.4 billion) over the next 12 years in shared research infrastructure — such as microscopes, supercomputers, a marine observing system, and telescopes used in myriad disciplines, from nanotechnology to oceanography. The new money is in addition to the \$2.2 billion-plus that the government has already committed to spend on research facilities and programmes over 10 years, as announced in December 2015.

"We're pretty excited about that," says Kylie Walker, chief executive of Science & Technology Australia in Canberra, an umbrella organization of scientific societies. The final budget will require the Senate's approval.

Medical research will receive an increase of \$1.3 billion, to be spent on various programmes and initiatives over 10 years that

aim to improve health and boost the medical industry, including \$500 million for a genomics and precision-medicine initiative. The government currently spends about \$1.2 billion a year on medical research, according to the Australian Academy of Science.

## SPACE CASH

The budget also sets aside \$4.5 million over 4 years to encourage more women to study and work in science, technology, mathematics and engineering, and \$26 million in seed funding to establish a national space agency. Andrew Dempster, director of the Australian Centre for Space Engineer-

ing in Sydney, says that, as well as money, the national space agency needs bipartisan support from both sides of government: "Space programmes are longer than the electoral cycle."

Rosalind Dubs, board director of the Australian Academy of Technology and Engineering in Melbourne, told *Nature* that a

**"Space programmes are longer than the electoral cycle."**

national space agency will ensure Australia has clout when interacting with other countries' space agencies, and will guarantee Australia's continued access to Earth-observation and global-positioning satellites.

Researchers have been lobbying for several years for long-term investment in Australia's shared research facilities, under the National Collaborative Research Infrastructure Strategy (NCRIS). "Research infrastructure has been funded on a year-to-year basis for a long time, which made it very vulnerable," Walker says. A political stalemate in 2015 between the centre-right Liberal government of then-Prime Minister Tony Abbott and the opposition Labor Party meant that many NCRIS facilities nearly ran out of money to keep their sites open and pay staff.

Beyond specifying cash for new supercomputers and the Australian Animal Health Laboratory in Geelong, the budget did not state which infrastructure projects will receive funding. But Walker says that the extra money will allow facilities to attract and retain a skilled workforce, and invest in capital works to maintain and upgrade equipment.

The government has also allocated almost \$500 million to help heal the ailing Great Barrier Reef. That funding, announced on 29 April, includes \$444 million for the Great Barrier Reef Foundation in 2017–18. Although some researchers welcomed the proposal, others say that it will not address the biggest threat to the reef's health — global warming. ■

## ECOLOGY

# Dam removal restores rivers

*Huge European demolition projects offer hope for fragmented ecosystems.*

BY QUIRIN SCHIERMEIER

The Yecla de Yeltes Dam in western Spain supplied drinking water to local communities for half a century, until newer projects rendered it obsolete. Its demolition this month is the biggest dam-removal project in the European Union so far — and is being hailed by ecologists as a milestone for river-restoration efforts on the continent.

Such efforts are ramping up in many European countries — although others, notably those in the Balkan Peninsula, are on a dam-building spree. An initiative has begun to take the first continent-wide census of all dams. And although dam removal is generally welcomed by most scientists, some call for more research into potential ill effects.

Hundreds of thousands of dams and weirs, most small and many no longer in use, fragment Europe's rivers. The structures, some of

them thousands of years old, have provided irrigation, energy and other benefits. But their presence also threatens the habitats of endemic fish and wildlife.

"Dams alter the natural characteristics of a river system," says Jeroen van Herk, a project manager for Dam Removal Europe, a group that promotes river restoration. "Long stretches of rivers, which once flowed freely from source to outlet, become a series of pools, hindering migrating fish from reaching spawning grounds in the upper reaches."

The Yecla de Yeltes is on the Huebra River, a 122-kilometre-long tributary of the Duero, which is one of the Iberian Peninsula's main rivers. Ecologists suspect that the 22-metre-tall dam, built in 1958, is partly responsible for the observed decline of a small freshwater fish called the sarda (*Achondrostoma salmantinum*), along with that of other endemic species, including otters

and black storks (*Ciconia nigra*), which were once abundant in the area. Scientists in Spain are set to monitor whether the animals come back after the dam is removed.

Across much of Europe, rivers unfettered by artificial barriers are exceedingly rare. However, over the past 20–25 years, at least 5,000 small dams, weirs and culverts have been removed from rivers in France, Sweden, Finland, Spain and the United Kingdom, according to Dam Removal Europe. (There are few reliable records from other European countries.)

Dam removal gained momentum after the EU adopted the Water Framework Directive in 2000, legislation that requires member states to improve the ecological protection of rivers and lakes. But as yet, only about half of rivers in the EU meet its environmental objectives, says Wouter van de Bund, an aquatic ecologist at the European Commission's Joint Research



The Yecla de Yeltes Dam in Spain is being demolished in the largest project of its kind ever in Europe.

Centre (JRC) in Ispra, Italy.

In the United States, about 1,200 barriers have been dismantled in recent decades, with generally positive effects on local ecosystems, says Laura Wildman, a fisheries engineer at eco-consultants Princeton Hydro in South Glastonbury, Connecticut.

But restoration projects need to be monitored for negative effects, too, experts say. Decommissioning existing river barriers might mobilize toxic sediment, or affect buildings or bridges downstream. And existing dams could help to prevent the spread of invasive species such as the North American signal crayfish (*Pacifastacus leniusculus*) or the Asian topmouth gudgeon (*Pseudorasbora parva*). There are also historic dams, such as the Roman-built, 22-metre-high Prosperina Dam near Mérida in Spain,

which need to be preserved as cultural heritage.

Dams were built with little regard for the impacts they might have on ecosystems, says Carlos Garcia de Leaniz, an ecologist at Swansea University, UK, who coordinates the US\$6.2-million, EU-funded Adaptive Management of Barriers in European Rivers (AMBER) project. “We must not make the same mistake when dams are being removed.”

In collaboration with the JRC, AMBER is managing an exercise to map the location of all registered dams and weirs in 38 countries across the continent, including some that aren't EU members. The project database currently holds information on 230,000 river barriers in 13 EU countries. Drawing from nine case studies, the project also aims to develop tools to help water authorities assess the costs,

benefits and damage potential of dam-removal projects.

Inventories are important for planners and policymakers to understand the scale of issues caused by river fragmentation, says Wildman.

A number of small dams in the Netherlands, Denmark and Spain are scheduled for removal later this year. And starting in 2019, French scientists plan to systematically monitor the impacts of a removal project even larger than Yecla de Yeltes: the demolition of two hydropower dams in the Sélune Valley in Normandy, one 35 metres tall and the other 15 metres.

But while old barriers are being removed, new dams are built elsewhere. Some 2,800 hydropower plants are currently being planned across the Balkans — a threat, says van de Bund, to many of the continent's last untouched rivers. ■

## BIBLIOMETRICS

# Wikipedia's top-cited scholarly articles — revealed

*Gene studies dominate lists of DOI publications referenced highly in the encyclopaedia.*

BY GIORGIA GUGLIELMI

The most-cited journal articles on Wikipedia include papers on the names of lunar craters and the DNA sequences of genes — and many of these works are referenced more times in the online encyclopaedia

than they are in the scientific literature.

“It is pretty incredible that almost all the highly cited articles are science articles,” says Matt Miller, a data scientist and librarian based in New York City. Miller analysed citation data released in March by the Wikimedia Foundation, the non-profit organization in San

Francisco, California, that runs Wikipedia. The data set — which contains some 15.7 million records — shows how many times sources with formal identifiers such as ISBNs (international standard book numbers) and DOIs (digital object identifiers) are referenced across all of Wikipedia's nearly 300 language editions. ▶