AUSTRALIA

Balancing act

Australian politicians are embracing innovation as the wellspring for future wealth, but will it come at the expense of basic and fundamental research?

BY BIANCA NOGRADY

If there is one buzzword dominating the political airwaves in Australia at the moment, it's 'innovation'.

Since the launch of the government's National Innovation and Science Agenda in December 2015, the idea that Australia needs innovation to drive the economy has been hammered into the public consciousness with all the subtlety of a piledriver. The message was further reinforced in the run-up to the general election in July, which saw the ruling coalition barely retain power.

This fervour for translating science into economic benefit comes amid a renewed focus on the disparity between Australia's proud track record in world-class research, and its less impressive background in taking that research through to the end-user.

But it also comes after a sequence of damaging funding cuts to basic and fundamental science. In 2014, the government cut the budgets of several major scientific research institutions. Hit hardest were the Australian Research Council, one of the country's main science funders; the Commonwealth Scientific and Industrial Research Organisation (CSIRO), its federal research agency; and the

Cooperative Research Centres programme, which links academic researchers with industry and government. CSIRO, which has lost around 1,200 positions since 2013 because of government-imposed spending cuts and restructuring, is in the throes of yet another round of job losses, many coming from its world-leading climate-research groups.

CSIRO chief executive Larry Marshall, a former venture capitalist, has shared a vision of the national science agency becoming an "innovation catalyst". In March 2016, he was recorded telling a meeting of CSIRO scientists that Australia's research priorities are shifting from "curiosity-led research" towards impact.

All of which raises a question: is Australia plundering the already-shrunk purse of basic and fundamental research to invest in the other end of the innovation pipeline?

A CORRECTION TOO FAR

Tony Peacock, head of the Cooperative Research Centres Association in Canberra, warns that Australia has become used to the refrain that it's good at basic research, but not as proficient at translating that research, and there is now a danger of overcorrecting. He argues that the narrative is overstated. "We're not nearly as bad at translation as is often depicted,

and we sometimes are over-promoting ourselves on basic research," he says.

Over-compensation is already happening. In 2013, as part of broader cuts to the Australian Research Council, Aus\$61 million (US\$46 million) was taken from the council's Discovery Programme, which funds basic and applied research. Money is so tight that excellent research no longer guarantees scientists a grant, Peacock says.

Not only are researchers feeling the pinch, but the country's investment in science is also slipping behind the average for members of the Organisation for Economic Co-operation and Development (OECD). In 2013–14, Australia's gross expenditure on research and development dropped to 2.12% of its gross domestic product, down from 2.25% in 2008–09; the OECD average for 2013–14 was 2.37%.

Economist Glenn Withers of the Australian National University in Canberra says that the country is a little bit behind the OECD average on funding fundamental research and way behind on investment in applied work. But he cautions against shifting resources from fundamental to applied research. "The more you run down the fundamental base, the weaker, sometimes, the applied can be, because you don't truly

DAVID PARKINS

understand what you're doing," he says.

"So the answer for Australia's future is increase both, but especially the applied; don't take it away from the fundamental."

The new national innovation and science agenda sent a clear signal that the government was prepared to financially back innovation in Australia. The announcement included a Aus\$200-million CSIRO Innovation Fund — made up of Aus\$70 million of new funding, with the rest drawn from CSIRO licensing income and private-sector investment — and a Aus\$250-million Biomedical Translation Fund to "invest in promising biomedical innovation and commercialisation". It also offered tax breaks to "incentivise investors to support innovative, high-growth potential start ups."

Funding was guaranteed for some of Australia's key scientific infrastructure, the future of which had been uncertain for some time. But much less money has been offered for basic and fundamental research: around Aus\$127 million was promised in additional block grant funding for universities, with the proviso that the money acts as "an incentive for industry and end-user engagement". A change to the structure of university funding, replacing block grants with more "flexible" research training and support programmes, was pitched as providing the opportunity for more researchers to form meaningful collaborations with industry, pursue entrepreneurial opportunities and help to transform the economy.

But while the government has its eyes fixed

on research with clear end-users, who will fund the crucial blue sky research?

Caroline McMillen, vice-chancellor at Australia's University of Newcastle, argues that it's time for the country's industry to step up and support basic science — financially and otherwise. Of the world's top 2,500 companies investing in research and development (R&D), fewer than 20 are based in Australia. McMillen argues that a cultural shift is needed in business and industry. Science might be industry-ready, but there is a question as to whether industry is science-ready, she says.

"Industry does invest in R&D but it doesn't tend to invest outside a lot, in universities, for example," McMillen says. "It's getting the system joined up." She points to initiatives such as doctoral training centres in the United Kingdom, which enable industry partners to work with PhD students and their supervisors.

"Many of us do this, but we don't do it in quite as systematic a way and I think it's time for Australia to really branch there," she says.

GIVE AND TAKE

McMillen is also enthusiastic about the idea of regional research hotspots that take advantage of dominant — and even declining — industries in those regions to help fund related basic and fundamental research.

Newcastle, on Australia's east coast, has a strong history of coal and steel production. Companies there are already partnering with the town's main university, which has research strengths in energy, land use and environmental remediation.

"If you've got a very strong research-intensive university with a differentiated suite of STEM performance and skills and you're in an area in which there's been an

economic decline but with strong manufacturing skills at the base," says McMillen, "if you can get the parts to connect, you can move that forward."

In the United States, industry has historically made significant investment in basic science, says Andrew Holmes, head of the Australian Academy of Science. He cites research centres such as the privately owned Bell Laboratories in Murray Hill, New Jersey — birthplace of pivotal innovations such as the transistor, the laser and the photovoltaic cell.

"The argument was that Bell Laboratories was effectively a national laboratory, because it was a monopoly that set a fraction of its income aside to fund basic science, and look what came out of it," says Holmes.

It's true that industry-led research can deliver spectacular innovation outcomes. But how might such collaborations work for an area of science that promises no multimillion dollar gadgets at the end?

Australian climate science has been under sustained assault for several years. A previous prime minister was once quoted as saying that the science of climate change was "crap". And although current Prime Minister Malcolm Turnbull accepts human-induced climate change, he has not intervened in CSIRO's climate-science staff cuts, initiated by Marshall. Marshall wants to shift CSIRO away from measurement and modelling climate science towards climate mitigation, "because that's where we believe we can have the most impact". The government recently signalled a renewed interest in climate research, instructing CSIRO to make climate science a "bedrock function" of the organization and committing Aus\$3.7 million a year to make it happen.

Holmes says that the cuts are a great concern. "Most of us believe there are things that only public funding can make possible, and they're essential."

There has been talk of other institutions, such as the Bureau of Meteorology, picking up some of the basic climate research no longer supported by CSIRO. But the shift shows how Australia risks losing its long-cherished capacity for pure research in its rush to boost innovation.

Holmes warns that Australia mustn't abandon the engine room of discovery. "If we don't create the new knowledge and ideas through discovery then we won't have things to exploit," he says. But more than that, Holmes believes that acquiring knowledge is part of being a civilized country.

"We as a nation really need to return to this notion of science for public good, and ask ourselves the question, do we want that to be something that continues?" ■

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