Australian Government

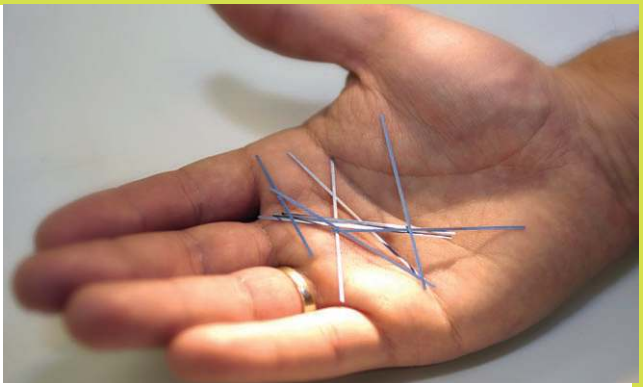
TRANSFORMING LIVES AND ECONOMIES TOGETHER

The United States is the world's undisputed innovation leader, but Australian ingenuity is helping to meet America's biggest challenges and improve the lives of its citizens every day. This is an introduction to a series of factsheets showcasing some of the successes of past and present US-Australian collaboration in science, and signaling future collaboration. **It's not a comprehensive account—just some of the people and transformational projects spanning a breadth of research areas.**

Australian Government

INNOVATION TODAY MEANS JOBS AND PROSPERITY TOMORROW

A factory in Boise, Idaho, is re-opening to make a new kind of solar cell invented at the Australian National University (ANU). In Pittsburgh, they're already making an 'ultra-battery' for storage of renewable energy, developed at Australia's national science agency, CSIRO. The technology will also be used in hybrid cars. **Texan cotton farmers are growing crops that use less water, less pesticide and produce better cotton, with the help of CSIRO-derived plant varieties.** In Nebraska, Cold War technology, adapted by Australian mining company BHP Billiton, is being used to find rare earth mineral deposits from the air. **In Hawaii, one of the world's largest optical telescopes uses an instrument built at ANU to analyze infrared light.** Across America, deaf children are hearing for the first time thanks to a cochlear implant or bionic ear invented and manufactured in Australia. **Young women have access to vaccines that prevent cervical cancer, because of the work of an Australian medical researcher at the University of Queensland.** And millions of people are connecting to the internet wirelessly, thanks to discoveries by CSIRO astronomer-engineers. **These are just a few examples of the way Australian and US science and innovation are working together to build a healthier, sustainable and more connected future for the people of both nations.**



Shared perspective, shared gains

With a population of 22.5 million, Australia has only about one-fourteenth the population of the US—but in the science and innovation sphere, Australia punches above its weight. With only 0.3 per cent of the world's population, Australia publishes about 3 per cent of the world's scientific papers. It spends 2.21 per cent of its GDP on research and development.

Australia and the 48 contiguous states of the US are about the same size, face similar environmental challenges, and have similar societies and perspectives on the world. Their respective national science programs are focused on many of the same areas—energy, resources, defense, health, climate change, materials, the environment. Given this, and the sheer scale of science and technology investment in the US, it's not surprising that the US is Australia's number one collaborator in science. In 2009, nearly one in six Australian papers listed a US co-author, and that level of cooperation is increasing.

The benefits to Australian science are obvious: being able to tap into and collaborate with the broad, top-level expertise and gain access to facilities in America; raising the profile outside Australia of its research capabilities and sophistication; and gaining access to a huge potential market for its research-based products.

But the US gains too, which is why Australia ranks eighth as a source of international co-authors for American journal articles in science and engineering. Collaboration provides a different perspective on areas of mutual interest, and access to a unique environment and facilities in the southern hemisphere and to world-class expertise in certain strategic areas such as Antarctic, climate and marine research, clinical medicine, astronomy and space science.

Solving practical problems

Australia's research scene features two large government science and technology bodies. CSIRO (Commonwealth Scientific and Industrial Research Organisation), established in 1926 as a scientific response to Australia's unique environment and place in the world, has an annual budget approaching AU$1.4 billion.

The Defence Science and Technology Organisation (DSTO), created in 1974 from a series of pre-existing defense laboratories, receives a budget appropriation of about AU$440 million. Other Government agencies include the Australian Nuclear Science and Technology Organisation, ANSTO (AU$369 million in 2010-11), the Australian Institute of Marine Science (AU$66.2 million in 2010-11), Geoscience Australia (AU$156 million in 2010-11) and the Bureau of Meteorology (AU$345.3 million in 2010-11).

The Government's annual budget for research and research training at the country's 41 universities is currently around AU$2.5 billion. Business sector expenditure on research and development in Australia has grown rapidly in the past 25 years, rising from 30 per cent of the country's total research expenditure to just over 60 per cent today.

One of the ways in which private enterprise has become more fully integrated in research is through the Cooperative Research Centres (CRCs) Program. The program supports end user driven research collaborations to address clearly articulated, major challenges facing Australia, many of which are global. CRC activities include research, utilization and commercialization, education and engagement with small and medium enterprises.

AUSTRALIA AND AMERICA'S SHARED VISION OF GROWTH THROUGH INNOVATION HAS IN THE PAST LED TO DEVELOPMENTS FROM THE NULKA HOVERING DECOY ROCKET WHICH PROTECTS SHIPS AGAINST INCOMING MISSILES, TO IMPROVEMENTS IN IVF TECHNOLOGY. IT CAN GENERATE NOT ONLY JOBS, BUT A BETTER FUTURE FOR BOTH COUNTRIES.

There are 42 active CRCs that operate across four broad industry categories: agriculture, forestry and fishing (11 CRCs), manufacturing (5), mining (4) and services (22). Since 1991, the Australian Government has committed more than AU$3.4 billion in CRC Program funding. Participants in CRCs have committed a further AU$11 billion in cash and in-kind contributions.

Creating jobs in technology

In Boise, Idaho, a high-tech manufacturing facility, shut down by Micron Corporation, is reopening. A joint venture between Micron and Australia's Origin Energy will make a new type of solar cell there, known as sliver cells. Developed at the Australian National University in Canberra, sliver cells provide significantly more power for the same price as conventional silicon cells.

In Pittsburgh, East Penn Manufacturing has secured a license and funding to make a new kind of battery for electric cars—the UltraBattery—which charges rapidly, lasts four to five times longer and slashes production costs by about two-thirds. It was developed by CSIRO.

Astronomy protects and connects America

Australian-developed technologies for astronomy are equipping US telescopes, and finding other applications such as earthquake monitoring.

The Canberra-based company Electro Optic Systems has developed instruments and sensors to detect, track, classify and characterize objects in space; makes remotely controlled weapon systems; and is involved in a strategic alliance with US-based global defense company Northrop Grumman.

And Australian technologies first developed for radio astronomy are now used to deliver fast, reliable Wi-Fi access to the internet.

Improving quality of life

While some of the areas of mutual interest where Australia is particularly strong are obvious, others may surprise some Americans.

Deaf people across America now hear using Australian-developed bionic ears, and hundreds of thousands of people with sleep apnea can rest more easily with devices invented in Sydney. New technologies are in the pipeline—from the bionic eye to home-fitted hearing aids for a fraction of the cost of traditional hearing aids.

Young women across America have the choice of two vaccines that work to prevent infection with a virus responsible for many cervical cancers, both based on work at the University of Queensland.

And Trident chewing gum can now actively repair tooth decay thanks to Recaldent, a product derived from casein harvested from milk in Australia, and also found in a range of dental products.

Other Australian achievements include: the world's first medicine for mental health—lithium to treat bipolar disorder; a major contribution to the development of the first widely available antibiotic, penicillin; and the Nobel Prize-winning discovery that stomach ulcers are caused by bacteria, not by stress.

Sustainable cotton and environmental protection

As in the US, there is also huge interest in Australia in agriculture and food security.

More than 35 per cent of the cotton grown in America is now provided by plants derived from varieties developed by CSIRO. The plants are high yielding, water efficient, disease resistant and produce high-quality fiber. In Australia these plant varieties have resulted in an 85 per cent reduction in pesticide use.

Other similar developments may well be in the pipeline if agreements signed by a Melbourne biotech company, Hexima, with the three largest agrichemical businesses in the US—Dow, Monsanto and DuPont—come to fruition. Hexima scientists have uncovered two families of genes which can protect plants against fungal and insect attack, and a mechanism for delivering their products to where the plant needs them.

US fisheries environments from California on the west coast to the Georges Bank and Chesapeake Bay on the east coast are now being managed using ecosystem models put together by researchers from the National Oceanic and Atmospheric Administration, US universities and CSIRO.

Australian, New Zealand and US researchers and fire fighters are collaborating to develop and employ the latest remote sensing technology to fight forest fires. The collaborations have been strengthened following the major wild fires in Victoria, Australia, and in California in recent years.

Finding tomorrow's mines

Australian mining giant BHP Billiton has redeployed US Navy technology that detects minute changes in gravity. Now known as Falcon, it is an airborne detector which can be used to scan the landscape for deep ore bodies. In Nebraska, it is being used to search for rare earth mineral deposits.

Meanwhile, CSIRO has just sold its LANDTEM system to Crone Geophysics in North America. The system detects ore bodies by sensing tiny differences in magnetism. It has already found new nickel sulfide and silver deposits worth billions of dollars.

THIS IS AN INTRODUCTION TO A SERIES OF EIGHT FACTSHEETS EXPLORING US-AUSTRALIAN COLLABORATION AND OUTLINING SOME OF THE WAYS THAT AUSTRALIAN SCIENCE IS CONTRIBUTING TO AMERICA'S SOCIETY AND ECONOMY.

IMAGE CREDITS: COCHLEAR IMPLANT PIONEER PROFESSOR GRAEME CLARK WITH RECIPIENT, COCHLEAR LIMITED; ASTRONOMER NAOMI MCCLURE GRIFFITHS AT PARKES, CSIRO; TROPICAL CYCLONE YASI, NASA GSFC/JEFF SCHMALTZ; SLIVER SOLAR CELLS, AUSTRALIAN NATIONAL UNIVERSITY; COTTON HARVESTER AT WORK, CSIRO; US NAVY OHIO-CLASS SUBMARINE, US NAVY/LT REBECCA REBARICH; MONTANA COPPER MINE, ISTOCKPHOTO; GARDASIL PROMOTION, CSL; SILVER JACK SHOAL, ISTOCKPHOTO.

For further information visit **www.innovation.gov.au**

Australian Government
Department of Innovation
Industry, Science and Research