Go8 Research Impact
Benefiting society
Group of Eight
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The Group of Eight (Go8) member universities are characterised by the excellence, breadth and depth of their research that extends from the curiosity-based, investigator-led basic research to much more applied research and the developmental work usually funded by business.

Research that can save lives, boost economic development, create wealth, invigorate manufacturing and lead to better lives for all Australians.

Performing across the whole range of the research spectrum enables universities to link to the shorter-term needs of business, government and society as a whole. University researchers aim at the huge leap forward in understanding, rather than the incremental advance; at creating opportunities rather than exploiting them; and at exploring and understanding the human condition. Because they account for a high proportion of the higher education research effort, the research intensive universities play a particularly important role in this area.

Some university research which advances knowledge can quickly provide direct and indirect opportunities to support business innovation, create completely new commercial opportunities, inform government policy, and provide information that supports community well-being. However, the research that has the greatest impact frequently turns out to be that which was conducted without any direct intention of being useful. In many cases the advances made by fundamental research are essential to advances across a wide range of different technologies but this impact can take many years to become apparent. Any hindsight study attempting to trace back the origins of important technologies or economic developments quickly finds dependencies on research, the performers of which could never have forecast how their research might find practical application.

Presented here are examples of research outcomes generated by Go8 member universities which demonstrate the potential impact research can have on both Australian society and the world.

Some of these outcomes are the result of applied research targeted at particular problems, but most of them are the result of long term curiosity-driven research.
From

The University of Queensland

you’ve heard about…

Gardasil

Research conducted by Professor Ian Frazer and Dr Jian Zhou on virus-like particles led to the development of the HPV vaccines, Gardasil and Cervarix, for the prevention of cervical cancer and other HPV related cancers. Cervical cancer is the second most common cancer in women globally and kills 275,000 women annually.

The vaccines are now available in 120 countries and more than 100 million doses of Gardasil and Cervarix have been distributed worldwide.

In addition to developed countries, the vaccine has been made available at low cost to developing nations where cervical cancer has the greatest mortality rate. It is estimated that the vaccines have the potential to save 250,000 lives annually (Alliance for Cervical Cancer Prevention).

But, did you know about

Magnetic Resonance Imaging

MRI has been an important clinical diagnostic tool since the 1980s, with the current global market estimated to be around US$4.5 billion p.a. from the sale of around 3500 systems annually. Technology that improves the clarity of images from Magnetic Resonance Imaging machines resulted from a project led by Professor Stuart Crozier.

The electromagnetic noise compensation technology is now incorporated into two-thirds of the world’s high field MRI systems sold since 1996 and facilitates vastly improved diagnostics. An estimated 8 billion patients worldwide have benefited from this improved technology.
Spinifex

Spinifex is a breakthrough pain management product which is on the verge of going global. The innovative pain treatment research is being led by Professor Maree Smith.

This potential first-in-class oral treatment for chronic pain and related symptoms has now progressed to human clinical trials in Europe with the successful filing of an Investigational New Drug (IND) application with the US Food and Drug Administration.

Spinifex has been globally recognised for its world-class drug development capabilities and its potential to help solve a significant and growing unmet medical need that exists in the treatment of patients with chronic pain.
But, did you know about...

The creation of the Glycemic Index

Principal Researcher, Professor Jennie Brand-Miller’s ground breaking work into human nutrition has led to the development of the University of Sydney Glycemic Index Research Service (SUGiRS).

SUGiRS was established in 1995 to provide a reliable commercial GI testing laboratory for the local and international food industry.

Foods that meet nutrition guidelines and have been GI tested can carry the GI symbol, which is administered by the Glycemic Index Foundation, supported by the University of Sydney and JDRF (Australia).

The GI ranks carbohydrates on a scale from 0 to 100 according to the extent to which they raise blood sugar levels after eating. Research on the nutritional aspects of food carbohydrates has been internationally recognised. Both the World Health Organisation (WHO) and Food and Agriculture Organisation (FAO) refer to the GI in making nutrition recommendations.

Resmed

When ResMed was formed in 1989, its primary purpose was to commercialise a device for treating obstructive sleep apnea (OSA), a major subset of Sleep-Disorder Breathing (SDB). Developed in 1981 by Professor Colin Sullivan and colleagues at the University of Sydney, nasal continuous positive airway pressure (CPAP) provided the first successful noninvasive treatment of OSA.

Since 1989, SDB affects around 20% of the adult population, making it as widespread as diabetes or asthma, and due to an increasing understanding of the morbidity and mortality caused by SDB, is one of the fastest growing segments of the respiratory industry. Widely accepted across the globe, positive airway pressure treatment is a highly effective, proven and popular way to treat OSA.

The treatment involves wearing a mask or nasal pillows system connected to a small portable airflow generator that delivers air at positive pressure. The air pressure acts like an “air splint” to keep the airway open. ResMed has an annual revenue of $348 million and a team of over 4,300 people in over 100 countries.

From

The University of Sydney

you’ve heard about...
Research carried out at the University of Sydney by Professor Anthony Weiss and his Elastin Laboratory over the past twenty years on the human protein Elastin has the potential to revolutionize treatment for burn and chronic wounds. Elastagen is pioneering Elastatherapy™ technology using a synthetic version of the human protein Elastin to naturally repair and augment the skin.

Elastin can be stretched to over eight times its original length and snaps back without any deformation. The biological dressing creates a physiological interface between the wound surface and the environment, which is impermeable to bacteria.

By restoring the elasticity of the regenerated skin, the technology reduces scarring and can generate significant impacts in the quality of life of recovered patients.

The research has led to the creation of the company Elastagen, which has progressed the technology to human clinical trials for the treatment of burns and chronic wounds.

Elastagen
But, did you know about…

Breakthrough for IVF treatment

A pioneering IVF technology developed in Adelaide is helping couples with a history of miscarriage to start a family.

EmbryoGen®, which improves embryo implantation rates for some women by up to 40 per cent, was developed through a partnership between the University of Adelaide, Adelaide Research & Innovation and Danish fertility company ORIGIO, a world leader in assisted reproductive technology solutions.

It contains a signalling protein called GM-CSF found naturally in the mother’s tissues that protects the embryo from stress, making it stronger and more robust in the early implantation period and improving the success of IVF treatment. ORIGIO licensed the IP for the culture medium, and undertook the world's largest fertility media study to verify Professor Robertson's findings, and develop the world's first natural growth factor medium with proven effect.

Now available in over 40 countries, EmbryoGen® is making a difference to the lives of families all around the world.

Solving security problems is a SNAP!

Sophisticated network surveillance technology developed at the University of Adelaide will help solve a security dilemma currently facing airports, casinos, shopping malls and large sporting venues around the world. Security personnel at these sites are struggling against a huge information overload, trying to spot events in video walls displaying hundreds or thousands of cameras and trying to follow the action as it moves from camera to camera.

Snap software automatically integrates data from thousands of security cameras in a video surveillance network into a single sensor, eliminating existing problems with huge information overloads. The patented technology allows a single operator to follow people throughout the whole network, in real time, and is scalable to many thousands of cameras.

Developed at the University’s Australian Centre for Visual Technologies (ACVT), the software is being commercialised by Snap Network Video Surveillance Pty Ltd, a University spin-out company.

During a trial at a major international airport, Snap’s software was able to demonstrate a multi-million dollar benefit, and the company has now partnered with Pacific Communications to market the product in Australia and New Zealand.

Now employing seven full-time staff in Adelaide, Snap is a prominent Australian example of early commercialisation and technology transfer success.
An $8 million algal biofuel demonstration project in Whyalla, spearheaded by Adelaide-based research company Muradel, has the potential to bring a thriving new fuel industry to the region.

Muradel Pty Ltd has established a commercial scale demonstration plant in Whyalla which showcases their state-of-the-art technology that produces sustainable biofuels from marine microalgae. Muradel is a joint venture between the University of Adelaide, Murdoch University and SQC.

Since 2010 the company has gained international recognition through the development of sustainable biofuel processing technology at their pilot plant in Karratha, Western Australia.

The secret to Muradel’s technology is the exploitation of a tiny non-invasive, naturally occurring and highly productive marine organism that can be readily concentrated and turned into crude oil.

By using a robust saline-tolerant strain of microalgae, Muradel’s technique requires only sun, air and sea water.

The technology has the potential to produce sustainable “green crude” for the existing petroleum industry and to provide fuel for aviation and the mining sector.
But, did you know about…

Consumers save over $1 billion annually with dental discovery – Recaldent™ products have revolutionised dental practice

A leading figure in oral health science with more than 30 years’ experience in dental research, management, and commercialisation of innovations, Professor Eric Reynolds was one of the first to identify the molecular processes enabling the repair of early tooth decay without the need for invasive treatment.

This was followed by the discovery of a milk compound called Recaldent™ that repairs the effect of acid on teeth and reduces the risk of disease. Hailed as a major global breakthrough in the prevention and treatment of early tooth decay, Recaldent™ enhances the uptake and incorporation of fluoride into tooth enamel and the repair of early stages of disease.

“Regular use of Recaldent™ products has the potential to significantly repair early stages of tooth decay,” Professor Reynolds says.

Recaldent™ is now in products that have generated over $2 billion in sales since 2003, while its use is estimated to save consumers over $1 billion in dental treatment costs per year.

Photo: Chris Owen
Managing large-scale irrigation water systems: breakthrough technology improves efficiency of water distribution around the world

A revolutionary irrigation management system developed by engineers at the University of Melbourne and Rubicon Water is now being used across Australia, in the USA, China and Europe.

The water-saving technology, known as Total Channel Control® (TCC) will annually save in rural Victoria a volume of fresh water equal to what is available to Melbourne.

Produced in partnership with Rubicon Water, TCC consists of hardware and software that modernises irrigation infrastructure, measuring, modeling and managing water flow. About 70% of all water the world uses is transported through open channels, with a typical transport efficiency of less than 50% (i.e. more than twice the water delivered at the final destination has to be extracted from the environment).

In the Australian context, TCC runs open channel distribution systems at near 90% water efficiency. TCC forms the back bone of the $2B Victoria Northern Irrigation Renewal Project and has also been implemented elsewhere in NSW and Victoria.

Photo: Michael Kai
But, did you know about

**Mandatory addition of folic acid to flour to prevent serious birth defects**

Neural tube defects are serious birth defects resulting in early death or lifelong disability. These defects affected two in every 1000 births recorded from the commencement of record keeping to the mid 1990’s.

UWA research, led by Professor Carol Bower starting in the 1980’s and continuing in the 1990’s established the importance of taking vitamin supplements before conception and into early pregnancy, and especially to have sufficient folate levels from the time of conception.

These findings contributed to the confirmation that 70% of neural tube defects were preventable by sufficient maternal folic acid intake during that early period. Starting supplements once pregnancy is confirmed may be too late to provide the necessary protection.

Having folic acid added to a staple food through fortification means that all women consuming that food would have a reliable source of folic acid, regardless of whether their pregnancy was planned.

This research made a major contribution to the decision of State Food Ministers in June 2007 to introduce, by September 2009, mandatory fortification of flour in Australia with the vitamin folic acid to prevent neural tube defects.
FerriScan® is a patented and commercialised MRI-based technology which accurately measures the concentration of iron in the liver without the need for invasive, risky and painful liver biopsy.

Measurement of liver iron concentration is essential for effective management of iron overload in patients receiving regular blood transfusions.

This non-invasive procedure developed through research at UWA led by Professor Tim St Pierre, is associated with almost no risk to the patient. Currently FerriScan® is being used in approximately 194 hospitals in 32 countries around the world and more than 23,000 patient measurements have been made using FerriScan®.

The new method has been incorporated into clinical guidelines for the management of diseases such as thalassaemia. It was recently recognised by the National Health and Medical Research Council as a Development Grant success story.
Preventing vision loss

Glaucoma is a common form of eye disease that is the world’s leading cause of irreversible blindness, with over 60 million sufferers worldwide. Currently, there is no cure for the disease, and while early detection allows treatment to slow or stop further vision loss, glaucoma exhibits few early symptoms making detection difficult.

To combat this challenge The Australian National University’s (ANU) Professor Ted Maddess applied research derived from examining how invertebrates squeeze real-time visual information into brains of limited information capacity to help create early detection testing devices that are at the core of the Humphrey FDT® Perimeter and Humphrey Matrix® which are sold by Carl Zeiss Meditech.

The small, automated and non-invasive peripheral vision testing devices can be operated by healthcare workers with little or no speciality training in ophthalmology, requiring patients to simply press a response button whenever they see a test stimulus.

The instruments have been on the market since 2006. Their simple operating requirements, coupled with clinically proven effectiveness in detecting visual field loss from eye diseases, including glaucoma, diabetic retinopathy and macular degeneration, put them in a suite of perimeter diagnostics that are used by more eye care providers worldwide than any other.

But, did you know about

Providing support for mental health

Around one in five Australians suffer from some form of mental disorder each year. They account for 13 per cent of the total disease burden in Australia, at a cost to workplace productivity of $5.9 billion each year.

While pervasive, many people fail to seek the treatment they need for mental illness for varied reasons, including cost of treatment, difficulty of access and stigma. Research from the ANU National Institute for Mental Health Research was the first of its kind to demonstrate that brief internet-based interventions for depression are not only immediately effective, but have a significant positive long-term benefit on mental health.

The Institute applied these findings to develop MoodGYM, the world’s first free internet-based therapy program to help prevent depression in young people.

The interactive program incorporating cognitive-behaviour therapy for depression has been accessed by over 750,000 registrants from more than 203 countries around the world since its launch in 2001. Use of MoodGYM has been shown to provide a significant, immediate drop in symptoms of depression, reduction in hazardous alcohol use, and increase in quality of life, which persists following the initial intervention.
Until sustainable green energy sources overtake fossil fuel usage our daily power production will rely on this increasingly valuable hydrocarbon resource.

An Australian innovation in digital rock analysis has created a company at the forefront of the efficient recovery of hydrocarbon resources. Digitalcore’s technology fuses new generation micro-CT scanner technology, advanced analysis and simulators run on the National Computational Infrastructure supercomputer to provide high-fidelity 3D imaging of porous materials at a microscopic level.

Digitalcore is a consequence of joint ANU and UNSW research and was recognised as an emerging leader in 2012 with the award of the Rio Tinto Eureka Prize for Commercialisation of Innovation.

Digitalcore recently merged with Numerical Rocks, expert leaders in multiphase flow modelling, to become Lithicon which found a niche market modeling fluid flow through reservoir rocks, improving resource management and informing technologies such as carbon sequestration. In February 2014, Lithicon was sold to American company FEI for $76 m.
Managing Urban Water Challenges

Effective water management shapes our ability to survive and thrive in response to challenges such as urban expansion and climate change.

At Monash University Professor Ana Deletic has led an interdisciplinary team of researchers in developing green storm water treatment and harvesting technologies to make better use of urban run-off for stream protection and human consumption.

In Melbourne alone, over 10,000 rain gardens have been constructed to protect the Yarra River catchment using unique biofiltration techniques pioneered by Professor Deletic.

This technology not only protects waterways and provides essential water for urban use, but also contributes to the greening and cooling of cities.

It has been adopted across Australia, and at trial sites in Singapore, Israel, New Zealand and the United Kingdom.

Saving Lives at Birth

The delivery of an old drug in new ways has the potential to save the lives of thousands of mothers in the developing world at risk of bleeding to death after childbirth.

Monash Institute of Pharmaceutical Science (MIPS) researchers led by Dr Michelle McIntosh are developing oxytocin as an inhaled, acute use medicine for the treatment of post-partum haemorrhage which kills 150,000 women annually in resource poor countries.

The inhaled form of oxytocin is stable at room temperature and readily administered, in contrast to the current need for refrigerated storage of the injected liquid formulation, which is problematic in resource poor countries. Inhaled oxytocin can be administered by non-medically trained staff.

The technology has now cleared a number of the critical pre-clinical hurdles that are required prior to progression into the clinic.

The project has been supported by funding agencies including the Bill and Melinda Gates Foundation, Saving Lives at Birth, the McCall MacBain Foundation, the Planet Wheeler Foundation and the Helen McPherson Smith Trust.
Researchers at Monash University led by Professor Peter Gibson and Dr Jane Muir have developed a diet and related smartphone application to help manage gastrointestinal symptoms associated with Irritable bowel syndrome (IBS).

The Monash University Low FODMAP diet works by restricting foods that are high in certain carbohydrates called FODMAPs.

The research team within the Department of Gastroenterology have released a smartphone application which provides users with accurate information about which foods may trigger IBS reactions, helping sufferers to manage their symptoms.

It is now widely recognised that the best way to alleviate IBS symptoms is to avoid foods that contain a family of carbohydrates known as FODMAPs (fermentable, oligosaccharides, disaccharides, monosaccharides and polyols), which are poorly absorbed by the gastrointestinal tract.

The Smartphone application was first launched in December 2012 in response to an increasing number of requests about the FODMAP content of foods. The app, which is now available on both iPhone and Android, has been purchased by over 30,000 people worldwide since its launch.

It has been downloaded in 60 different countries, reaching no. 1 in the Medical category in 20 countries.
UNSW engineers hold the world record for conversion efficiency for silicon solar cells at 25%. The impact of the pioneering research extends globally across the entire solar power industry.

Around the world, billions of solar photovoltaic (PV) panels are powering homes, buildings, infrastructure and remote communities by converting sunlight directly into usable electricity.

In 1974, Martin Green began working at UNSW. One year later Green and his team produced its first silicon photovoltaic solar cell, which converted sunlight directly into electricity. In 1985 they became the first group to reach the 20% efficiency milestone.

With the addition of Dr Stuart Wenham, the UNSW solar research group has continued setting world records for module and cell efficiency, including the current record of 25% set in 2008 with their PERL cell.

The commercial variant is known as PLUTO and up to US$1 billion of product has been delivered annually. International solar companies including Samsung, Suntech Power and BP have all used UNSW technologies.

AustLII

In the legal sector, getting your hands on key information is essential to access to justice, democracy and the rule of law. AustLII – the Australasian Legal Information Institute – has revolutionised access to justice and the rule of law by making a wealth of legal material freely available to anyone with an internet connection.

AustLII receives upward of 700,000 hits each day, making it the most popular online free legal resource in the world.

Launched in 1995 by UNSW’s Professor Graham Greenleaf and Professor Andrew Mowbray, from the University of Technology, Sydney, AustLII sources legal information from all nine Australian jurisdictions, including decisions of almost all Courts and tribunals, legislation and all treaties to which Australia is a party.

There are also more than 55,000 items of scholarship, primarily from 80 Australasian law journals.

Actually more than 500 databases, AustLII’s innovation includes an open source search engine, massive automation of legal texts, and data mining to produce an automated citator. Today, AustLII’s know-how is fostering free access to legal information internationally, inspiring similar systems in the Pacific Islands, parts of Africa and also in the UK, Hong Kong and New Zealand.
UNSW scientists were the first in the world to use a single atom in silicon to create a working quantum bit, a fundamental building block of a universal quantum computer.

The breakthrough reported in Nature in 2012, by teams led by Professor Andrew Dzurak and Associate Professor Andrea Morello, showed it was possible to both read and write information using the spin, or magnetic orientation, of an electron bound to a single phosphorus atom embedded in a solid-state silicon chip.

In 2013, another Nature paper by the same team reported encoding quantum information on the nucleus of the atom. In a parallel effort, another UNSW team, led by Professor Michelle Simmons, created the world’s smallest working transistor, a crucial component of any future quantum computer and a technological achievement 10 years ahead of industry predictions.

More recently her team and that of Professor Sven Rogge demonstrated they could couple phosphorus donors and measure the interactions between spins on adjacent atoms.

Now the teams, all members of the ARC Centre for Quantum Computation and Communication Technology (CQC2T), have extended the accuracy of their quantum bits to over 99%, setting a new benchmark for quantum bits in solid-state devices.

Building the world’s first quantum computer