



A snapshot of science, technology and innovation Melbourne, Victoria

Victoria's reputation as a hub for world-leading science, technology and innovation has been steadily growing over the past decade.

It is underpinned by a vibrant and growing economy, an enviable lifestyle, a broad range of industry capabilities and a strong network of world-class universities and research clusters, and stimulated by a diverse pool of highly skilled workers who have created a fusion of energy, creativity and ability.

Victorians' expertise spans a range of science and technological capabilities, including:

- Biotechnology;
- Information technologies;
- Advanced manufacturing technologies;
- Energy and environmental technologies;
- Nanotechnology; and
- Design.

These capabilities are used in a diverse range of businesses, from pharmaceuticals to mining, photonics to financial services, automotive to aviation, and aquaculture to architecture.

The Victorian Government is proactive in growing the State's science and technology sector, with policy initiatives aimed at helping Victoria maintain its leading edge. These include:

- Ongoing investment of more than \$1.8 billion in science, technology and innovation since 1999;
- An elaborate infrastructure built around R&D clusters and precincts, all aimed at pooling expertise, developing commercial products and encouraging networking in Australia and global collaborations;
- Building the Australian Synchrotron, opened in Melbourne in 2007;

- Putting in place a legal environment that supports scientific research and a legislative framework that encourages competition;
- The establishment of the Victoria Israel Science and Technology (VISTECH) research and development fund to facilitate and support joint market-orientated research and development projects between Victorian and Israeli companies;
- The recent establishment of a \$30 million Medical Research Commercialisation Fund aimed at filling the gap between funding provided by the National Health and Medical Research Council and early stage start-up investment grants; and
- A technology commercialisation program to assist companies take ideas to the market.

Victoria at a glance

- Victoria has enjoyed consistent economic growth of around 4% for the last 10 years;
- Victoria has an open economy with low barriers to entry and a AAA credit rating from both Standard and Poor's and Moody's Investor Services;
- The London-based Economist Intelligence Unit has consistently rated Victoria's capital city, Melbourne as one of the most liveable cities in the world;



- Last year, Melbourne joined London and Boston as one of only three cities in the world with two universities (University of Melbourne and Monash University) in the global top 20 biomedical rankings;
- Located in the Asia Pacific time zone in southeastern Australia, Victoria is ideally placed to bridge the gap between American and European business hours;
- Four of the top five public companies in Australia are headquartered in Melbourne;
- Some of the world's top companies already tapping into Melbourne's research excellence and business opportunities are Amgen, Celgene, Computershare, Genentech, GlaxoSmithKline, NEC, Pfizer Animal Health, SPC Ardmona and Siemens;
- The 2006 survey by Swiss-based IMD World Competitiveness Yearbook (WCY) ranked Australia as the world's sixth most competitive country and globally the most resilient to economic cycles;
- Australia is ranked sixth in the world in the Information Economy Index, which measures global connectedness through online participation, take-up rates by business and government and investment in online resources.
- Stem cell research - in May 2007, Victoria became the first Australian State to pass legislation allowing somatic cell nuclear transfer (SCNT) or 'therapeutic cloning', providing a world's best practice regulatory framework for advances in the field.
- ICT – Victorian ICT companies spent A\$264 million on R&D in 2005, almost 50% of Australia's total ICT R&D spend. Victoria has more skilled professionals working in specialist fields such as open source technology, microelectronics, photonics and radio frequency identification.
- Industrial and advanced manufacturing technologies – traditional strengths include automotive, with three of the world's biggest car companies based in Victoria (GM Holden, Ford and Toyota) designing and developing cars for export worldwide; and aerospace with significant R&D involvement in the creation of the Joint Strike Fighter and Hawker de Havilland designing and developing specialised parts for the new Boeing 787;
- Environmental and energy technologies – Victoria's R&D focus is on renewable energy production, geosequestration, low emission brown coal electricity, water desalination and recycling.

Research and Development in Victoria

Australia has a long tradition of world-class R&D, with Victoria leading the way. The State's research strengths are:

- Internationally recognised capabilities in many sciences including life sciences, polymer chemistry, light metals, astronomy and sports sciences.
- Biotechnology, medical research and pharmaceutical technologies – about 40% of Australia's biotech companies and biotech R&D spend is in Victoria. R&D expenditure on biotech increased by 8% over 2006 to \$457 million. Emerging biotechs contributed to 61% of this spending.
- Agricultural and food technologies – with 56% of Victoria's land used for agricultural production, Primary Industries Research Victoria spent AU\$117 million on R&D in 2005. Victoria also hosted the Agricultural Biotechnology International Conference 2006, recognising its global status in the field.

World-class infrastructure

Victoria's capabilities in science, technology and innovation have been built upon world-class research infrastructure.

The infrastructure is made up of private R & D companies as well as some of Australia's most important public and private sector research establishments. These establishments are founded around clusters, precincts and networking collaborations, creating a strong sense of vibrancy and momentum. Their scope is extensive. Each institution is a vital contributor to innovation in many fields.

The Victorian Government has invested significant funds into these establishments, enabling them to focus on commercial and collaborative R&D projects.

The establishments include:

- 13 world-renowned institutes including Walter and Eliza Hall Institute of Medical Research, Florey Neuroscience Institutes, the Ludwig Institute for Cancer Research and the Monash Institute of Medical Research;



- 4 agricultural research centres of expertise across 19 locations including the Horsham Grains Innovation Park, the Joint Centre for Crop Improvement, the Victorian Centre for Plant Functional Genomics and the Victorian AgriBiosciences Centre;
- The Commonwealth Scientific and Industrial Research Organisation (CSIRO) which incorporates the Divisions of Molecular and Health Technologies, Manufacturing and Materials Technology, Textile and Fibre Technology and Food Science Australia;
- Cooperative Research Centres for Polymers, Advanced Automotive Technology, Advanced Composite Structures, Wood Innovations, Oral Health Science, Molecular Plant Breeding, Vision and Bushfires.

The Government has also invested in a number of other high profile infrastructure projects.

These include:

- **The Dairy Innovation Centre**, pulling together several existing groups working on husbandry and food products;
- **Bio21**, a biomedical, biotechnology research cluster;
- **Nanotechnology Victoria Ltd**, the State's leading organisation supporting the commercialisation of nanomaterials and bionanotechnology products from Victoria's strong research base whilst also driving public education and policy initiatives in this emerging field;
- **The Centre for Health Innovation**, a world-class research and education facility providing a test-bed for the development, demonstration and evaluation of innovative health care technologies and patient safety products. The Centre provides a single point of linkage for industry, health care providers and technology developers and provides advanced teaching, training and testing services through its simulation facility;
- **The Victorian Centre for Advanced Materials Manufacturing Ltd**, a portal through which technology businesses can access the State's considerable research expertise in advanced materials and advanced manufacturing technologies. Victoria's centres of research excellence in these disciplines are spread across a number of research and technology precincts throughout Melbourne.

The Australian Synchrotron

Located in Melbourne, the Australian Synchrotron opened in 2007 and is a \$220 million facility that will transform Australia's scientific and industrial research capacity.

Synchrotrons have been used in research as diverse as making better chocolate, developing more absorbent nappies, designing new medicines such as anti-flu drugs and anti-inflammatories, helping jet engines last longer and even solving the mystery of Beethoven's death and deafness.

The State Government of Victoria has contributed \$157 million for the Australian Synchrotron building and machine. A consortium of project partners is funding the 'beamlines' – tubes that capture the light created by the Synchrotron and where experiments are conducted.

The Australian Synchrotron has links with other major facilities throughout the world, including those housing the most powerful synchrotrons in Europe, Asia and the USA.

The Australian Synchrotron will be used across a broad range of sciences and industries, including agriculture, food technology, environment, minerals and energy, biotechnology, new materials, manufacturing, medical technology and biological sciences, microtechnology and nanotechnology, information and communications technology (ICT), defence and forensics and archaeology and conservation.

Victoria's Achievements

Victorian scientists' track record of breakthroughs stretches across decades. They include:

- **The Cochlear implant** – the bionic ear was invented in Melbourne by a team at Melbourne University led by Professor Graeme Clark in 1978. It now provides hearing to 20,000 profoundly or totally deaf people in 55 countries around the world.
- **Biota's Relenza** – an anti-flu vaccine using 3D structure-based design technology. The product is now approved in over 50 countries for therapeutic use and in eight countries for prevention;
- **The Black Box** – Dr David Warren developed the world's first Flight Memory Recorder. Australia became the first country to make flight recorders mandatory in aircrafts. Every airline in the world now flies with a black box.



- **Optiscan endo-microscope** – This Melbourne innovation allows surgeons to view cell detail at a magnification of 1,000 with potential applications in fields such as dermatology and oncology;
- **Recaldent™** – Prof Eric Reynolds' groundbreaking research into oral diseases and the prevention of tooth decay led to the discovery of a milk compound, Recaldent™, that repairs the effect of acid on teeth and reduces the risk of disease. Recaldent is now used in gels, chewing gum, pastes and rinses around the world.
- **Monash IVF** – Since the early 1970s Monash in Melbourne has been a world leader in the development of IVF. Twelve of the first 15 IVF babies born in the world were Monash IVF babies and more than 18,000 children have been born as a result of successful treatments in these programs.
- **Polymer bank notes** – Developed by Professor David Solomon at the CSIRO in conjunction with the Reserve Bank of Australia, the world's first long-lasting and counterfeit resistant polymer (plastic) bank notes were first released in Australia in 1988. The technology has now been exported to more than 20 countries world-wide. They last ten times longer than paper notes.
- **Colony stimulating factors** – CSFs are now in worldwide use for protecting cancer patients from bone marrow damage caused by high-dose chemotherapy. G-CSF and GM-CSF were discovered by Professor Donald Metcalf and his team at Melbourne's Walter and Eliza Hall Institute of Medical Research. In Australia, Melbourne company AMRAD Pharmaceuticals Pty Ltd market their G-CSF products as Granocyte™.

Skilled workforce

Victoria's strengths in science, technology and innovation are a result of a highly skilled workforce combined with a strong and supportive infrastructure, a world-class education and training system that provides specialised programs customised for the needs of the sector.

Victoria is home to 9 universities, 13 internationally recognised medical research institutes, 15 tertiary training institutes, 14 agricultural research centres, dedicated clusters and precincts, and a range of world-class research facilities.

These higher educational institutions provide industry with a constant stream of highly skilled graduates.

Melbourne's universities are internationally recognised. For instance, in 2006, the Times Higher Education Supplement ranked the University of Melbourne overall at Number 22 in the world, 7 for biomedicine, 16 for technology (engineering and IT), and 27 for science. These rankings place the university ahead of global players Yale, Harvard, MIT, Princeton, University College London and UCLA.

Workforce at a glance

- Victoria has the highest rate of university attendance and graduations in the Asia-Pacific;
- Over 25% of Melburnians have a Bachelors degree and the State boasts Australia's highest proportion of post-graduate degrees per capita surpassing the United States, Canada and Japan;
- Victoria has the highest international student uptake of all states with over 75,000 international students;
- 46% of Melbourne's workforce is under 35 years old.

For further information