

STI Infrastructure Grant Program Projects Summary

The STI Infrastructure Grants Program is the biggest State grants investment program in science and technology infrastructure in Australia. The grants support leading-edge biomedical, environmental, agricultural, manufacturing, and information and communication technology projects that are generating economic, environmental and social benefits across metropolitan and regional Victoria. The total value of Round One and Two projects through the STI Competitive Infrastructure Grants Program now amounts to \$742 million, a leverage factor of more than five-to-one on the initial Government STI support of \$120 million. This means the Government has facilitated over \$600 million of new investment in 32 strategic science and technology projects, with these investments continuing to grow.

Commercial Outcomes

Some of the commercial outcomes include:

- The Victorian Partnership for Advanced Computing (VPAC) has developed partnership deals with IBM and Holden and records an annual commercial R&D turnover of over \$2 million.
- Three Murdoch Childrens Research Institute (MCRI) spin-off companies are based at the new precinct and a major philanthropic organisation has so far contributed \$13 million of an expected \$25 million to expand MCRI's facilities.
- The Collaborative Optical Leasing Testbed (COLT) catalysed the development and testing of CEOS's Passive Optical Networks (PON) which has since attracted a \$10 million investment from Hitachi Ltd in Japan.

Collaboration Outcomes

In 2003/04, over 439 different businesses and researchers had accessed STI funded infrastructure.

Examples of collaboration include:

- The Centre for Drug Candidate Optimisation has been used by more than 15 biotechnology companies, the World Health Organisation, and a Gates foundation project in pre-clinical studies.
- REDlab is a test facility for the development of broadband communications and membership has increased from 4 to 126 including SMEs and universities.

Skills Base Outcomes

Results for projects funded under the first and second generation STI Initiative for 2003/04 show 274 PhDs have engaged in STI supported activities. Other key skill base outcomes include:

- Creation of over 70 high value employment positions throughout the Victorian Neuroscience cluster, facilitated by Neurosciences Victoria.
- Attraction and retention of leading scientists to Victoria, including Federation Fellow Professor Ashley Bush (Mental Health Research Institute), Dr Ralph Dringen (Monash), Dr Steve Petrou (Howard Florey Institute) among others.

Scientific Research Outcomes

In 2003/04, STI Initiative funded projects made over 150 discoveries considered to be worthy of intellectual property protection, with 30 of these discoveries filed as US/PCT Patents. Other key achievements include:

- Sustainable Aquaculture Systems successfully demonstrated the viability of the commercial aquaculture production of Murray Cod.
- Peter MacCallum used microarray technology to develop a new and highly accurate diagnostic test for the origin of new cancer cases.

Science Awareness Outcomes

- In 2004, CERES won a Savewater Award® - Community Achievement for outstanding achievement in water conservation and was a finalist on the education program category.
- In 2003-04, 26 public awareness programs and events valued at over \$6.5 million were staged with STI funding assistance. Over 273,000 Victorians participated in activities.

Rounds One and Two Projects - Outcomes

Alfred Medical Research and Education Precinct

This project was awarded an \$8 million grant in Round One that contributed to the major \$93 million Alfred Medical Research and Education Precinct (AMREP) development on The Alfred Hospital campus. The grant enabled participating partners (The Alfred, Monash University, Baker Heart Research Institute and the Macfarlane Burnet Institute for Medical Research and Public Health) to greatly expand research facilities and activities and to attract new research partners to the site. This development, which commenced in 1999 and was completed in 2004, has been an outstanding success in boosting innovation in research and in providing commercialisation opportunities for biotech companies and their health-related products.

- Research institutes/research groups now located in the new AMREP buildings include the Baker Institute, Burnet Institute, National Trauma Research Institute, Australian Centre for Blood Diseases, Clinical Trials Victoria, Centre for Clinical Studies, Monash Department of Epidemiology and Preventive Medicine, laboratories of the Monash Central and Eastern Clinical School, laboratories of The Alfred Department of Infectious Diseases and The Alfred Department of Neurosciences. The new complex also features the Ian Potter Biomedical Research Library, and AMREP conference facilities.
- Several biotechnology companies have taken up tenancies within AMREP providing excellent opportunities for R&D collaborative activities with AMREP partners. These companies include among others Cryptome Pharmaceuticals Pty Ltd, Cytopia Pty Ltd, Metabolic Pharmaceuticals Ltd, and Starpharma Ltd.
- The development of AMREP has led to a new era in biomedical research strength and leadership in the fields of cardiovascular medicine (Baker Institute); infectious diseases (Burnet Institute and The Alfred Department of Infectious Diseases); trauma (National Trauma Research Institute); blood diseases (Australian Centre for Blood Diseases); preventive medicine and public health (Monash Department of Epidemiology and Preventive Medicine, supported by work in the Baker Institute and Burnet Institute); and clinical trials (Clinical Trials Victoria and the Centre for Clinical Studies).
- Internationally recognised research at the Baker Institute includes studies of risk factors for heart disease (hypertension, high cholesterol, diabetic complications, obesity, depression and other mental illnesses); preventive strategies (diet, dietary supplements, exercise); diseases of blood vessels (including atherosclerosis); protein characterisation and genetics; factors in, and treatments for, advanced heart disease (arrhythmias, heart failure and transplantation). The Baker is a World Health Organisation Collaborating Centre for Research and Training in Cardiovascular Disease.
- The Burnet Institute provides international leadership in two major areas: research into the mechanisms by which viruses infect humans and cause disease (with the aim of developing new

methods to prevent and treat viral diseases such as the development of vaccines and new therapeutic agents); and investigation of the processes by which infectious diseases spread within the community (including the development, implementation and evaluation of public health actions against important infectious diseases such as HIV and measles). The Burnet Institute is the only medical research institute to be accredited for funding by AusAID, the Australian Federal Government overseas funding agency. The Burnet Institute is a Collaborating Centre of the United Nations Program on AIDS.

- Translating research discoveries into tangible benefits is an increasing focus for all the AMREP partners. This has resulted in implementation of intellectual property management processes and facilitation of staff access to expert advice on commercialisation of research and innovation. For instance, the Burnet Institute has made substantial progress towards commercialisation of their research through the establishment of three start-up companies to fund and manage current R&D projects: Hepgenics Pty Ltd (hepatitis diagnostics and vaccines), Picoral Pty Ltd (antivirals for rhinoviruses and enteroviruses) and Hepitope Pty Ltd (development of novel DNA vaccine technology).

Australian Mathematical Sciences Institute

The Australian Mathematical Sciences Institute (AMSI) was allocated a \$1 million Round Two grant to improve Victoria's mathematics capabilities.

- The project is now valued at more than \$20 million with the Institute receiving an additional \$7.8 million over four years from the Commonwealth to establish the International Centre of Excellence for Education in Mathematics (ICE-EM). At the tertiary level, ICE-EM assists research training of honours and post-graduate students through the National Summer and Graduate School Programs. At a school level, the ICE-EM Schools Project is developing resources for teachers and students at the middle years. ICE-EM markets its projects on and offshore.
- AMSI is also a partner in the Australian Research Council Centre of Excellence for Mathematics and Statistics of Complex Systems (MASCOS) that attracted \$11 million in Commonwealth funding (head office in Melbourne). AMSI received a further \$489,000 from the Federal Department of Education, Science and Training for Summer Schools. AMSI has established a 'Mathematics in Industry Program' in association with MASCOS that aims to solve industry problems. Projects to date have involved companies in the finance and mining sectors and focused on risk management. The financial projects have addressed client risk modelling while the mining project concentrates on staff safety.
- AMSI has run 29 workshops and conferences on topics ranging from Algebraic Dynamics to Natural Resource Modelling and Data Mining. Such events have been well attended by those working in industry, government and academia.
- Instalment of the AMSI Access Grid will commence in 2005. This will provide a live video/audio environment for collaborative teaching and research in the mathematical sciences both nationally and internationally.

Australian Sustainable Industry Research Centre

The Australian Sustainable Industry Research Centre (ASIRC) is an independent R&D body that supports responsible management of Australia's resources and environment. In particular, the Centre is assisting industry to develop improved methods of minimising 'next generation' waste. The \$10.25 million Centre was opened in April 2004 in Gippsland and was seeded with a \$2.4 million Round Two grant. Several projects are underway at ASIRC including:

- Three studies on waste minimisation for the metal recycling sector.
- Two projects examining materials efficiency in the food and furniture supply chains.
- One project dealing with biosolid remediation.

- One project that uses fly ash waste from power stations in building and road products – the fly ash is incorporated into concrete making it ideal for road barriers because of the sound-limiting qualities and for high-strength but lightweight tilt slabs for building.
- Three studies on industrial water use minimisation.
- The Victorian New Water Alliance was formed to assess and verify technologies to treat wastewater for reuse.
- ASIRC currently has 12 industry members and is implementing:
 - Cleaner production technologies that minimise waste at the source;
 - Recycling technologies that ensure maximum use of recycled materials for non-renewable sources; and
 - New treatment technologies that reduce the quantity of residues requiring storage or disposal and minimise the hazardous characteristics of these residues.

Bundoora Plant Bioscience Facility

A \$300,000 Round One Grant was awarded for the development of a business plan and detailed design specifications and a cost plan for construction of the facility.

- The project has been re-scoped and La Trobe University is committing \$12.72 million in funding for construction of the Victorian AgriBiosciences Centre. The Victorian Government is providing \$7.5 million for fit-out costs. La Trobe University's consortium partners include the Department of Primary Industries, RMIT, Monash University, and Amersham Biosciences.

Centre for Drug Candidate Optimisation

The Centre for Drug Candidate Optimisation (CDCO) was awarded a \$4 million Round Two grant to enable it to enhance the development and commercial potential of new drug candidates from local pharmaceutical and biotechnology companies and not-for-profit research ventures. The Centre is the only one of its type in the world working collaboratively at the critical 'value creating' interface in pre-clinical drug development.

- Since the CDCO opened in December 2003, more than 15 biotechnology and pharmaceutical companies, the WHO, and the Bill and Melinda Gates Foundation-funded *Medicines for Malaria Venture* have funded it to undertake pre-clinical studies on their behalf.
- The majority of CDCO projects are commercial-in confidence, but over the past two years it has contributed to three drug candidates that have entered Phase I clinical trials. The *Medicines for Malaria Venture* candidate – a new orally-active, low-cost peroxide drug that is more potent than any antimalarial currently available has been designed – has even progressed to Phase II studies. Malaria is responsible for more than 300 million acute illnesses and at least one million deaths annually. The results of the work were published in *Nature* during 2004 and they attracted worldwide interest.
- Another exciting project involves designing drugs for treating tropical disease infections, including malaria and African sleeping sickness. The World Health Organisation awarded a \$670,000 grant to the Walter and Eliza Hall Institute and the CDCO to conduct a collaborative drug discovery project.
- The CDCO has exceeded the number of budgeted contracts (30 against a budget of 17) in a two-year period, and has regularly exceeded its budgeted revenue targets.

Centre for Drug Design and Development

Victoria University and the Austin Research Institute used their \$100,000 Round One grant to undertake a feasibility study and draft a business plan for the establishment of the Victorian Institute of Biotechnology.

Clinical Trials Victoria

Clinical Trials Victoria (CTV) was awarded an \$8 million grant in Round Two. CTV aims to make Victoria the premier clinical trial location in Australia and the Asia Pacific region, and secure world class clinical research trials. Founding consortium members included Cancer Trials Australia (CTA), Neurosciences Victoria, Melbourne Health, and the Centre for Clinical Studies (comprising the Baker Heart Research Institute, the Alfred Hospital and Monash University).

- CTA has operated since 1993, accrued more than 10,000 clinical trial patients, been involved in over 860 clinical trials, and brought \$10 million of investment into Melbourne. Half of the grant funding went towards upgrading of Positron Emission Tomography scanning facilities at Austin Health and the Peter MacCallum Cancer Centre to enhance the capabilities for the production of novel radiopharmaceuticals used in clinical trials; and establishment of a patient database to register personal and treatment details of every cancer clinical trial patient for improved future treatments. CTA also opened a new \$900,000 laboratory at the Royal Melbourne Hospital that assesses the activity of new therapeutic agents and evaluation of molecular targets. CTA is now operating independently of the consortium and the Baker Institute is assuming a greater role in CTV.
- CTV completed installation of a 24-bed facility for the Centre for Clinical Services Studies (located at AMREP) in 2004 for conducting early phase clinical trials and has engaged 13 fee-for-service contracts with local and international companies to date.

Collaborative Optical Leading Testbed

The Collaborative Optical Leading Testbed (COLT) was awarded a \$4.0 million Round Two grant to establish a telecommunications testbed facility in Ballarat. The project aimed to overcome one of the key barriers to developing broadband telecommunications technology – testing, demonstration and marketing. Lead project organisations include research and industry partners: CEOS Pty Ltd, c-Ballarat, Ballarat Shire Council, The University of Ballarat, Swinburne University of Technology, Victoria University, RMIT, and Australian Telecommunications Co-operative Research Centre.

- COLT has attracted significant international interest. Intel has become a member and has published COLT and Ballarat as a case study on the Intel website. COLT has also supported trade missions from Japan, the UK, the US and NZ and is acting as a catalyst for international investment attraction into Victoria.
- COLT catalysed the development and testing of CEOS's Passive Optical Networks (PON). This resulted in a \$10 million investment by world electronics and ICT leader Hitachi into CEOS. CEOS and Hitachi have been working closely on the deployment of PON equipment in the exciting Fibre-To-The-Home market. PON is currently considered by experts to be the best way to deliver cost-effective high-speed data (ultra-broadband) to the customer using existing fibre infrastructure. The investment by Hitachi is set to create at least 50 commercial and technical jobs in Victoria and CEOS and an estimated \$50 million in exports from Victoria. It will also drive the deployment of PON technology, not just in Australia, but in overseas markets. The strategic partnership will potentially increase PON sales revenues in Australia by more than \$100 million over the next five years. The partnership sees Hitachi gain access to the intellectual property that has been built up here in Victoria and CEOS gains access to the manufacturing facilities and marketing capabilities of a major global company. For Victoria, the growth in PON activity will deliver solid jobs and revenue growth in industries that are involved in network construction, optical fibre manufacture, and communications service provision. And the consumer gains access to ultra-broadband capabilities of 100 megabits per second, 400 times the rate of conventional broadband technology, which means:
 - High-speed Internet services that are virtually instantaneous for users.
 - Multiple voice lines at significantly lower cost.

- Video on demand.
- Better, faster broadcast and pay tv.
- Seamless video conferencing and broadcasting.
- Telemedicine applications such as digital radiography and breast screening, 3-D imaging for surgeons, maybe even diagnosis in the home.

Direct-to-Vat Starter Cultures

The Australian Starter Culture Research Centre's (ASCRC) new large-scale R&D facility in Werribee is consolidating Victoria's leadership position in the dairy industry. A core focus of the Centre is to assist dairy industry stakeholders through improvements in the selection, analysis and use of starter cultures for cheese and yoghurt production. The \$320,000 Round One grant has been used to expand ASCRC's capacity to undertake new research for the large-scale production of lactic acid bacteria for the improvement of cheese flavour and digestibility.

- Plant installation and equipment is complete. An ultra-high temperature plant for sterilisation and a culture growth vessel have both been installed.

Projects undertaken include:

- The development of a concentrated bacterial culture for use in cream cheese production in partnership with Kraft. This particular culture is now regularly produced at the centre and supplied to Kraft.
- The successful production of adjuncts (bacterial cultures used to deliberately add flavours and/or texture) with the plant's assistance. Trials of the inclusion of these adjuncts in cheese manufacturing have proved the product is useful and a number of these cultures are in stock ready to be supplied to companies when required.
- It was very important to the dairy industry that it have an alternative supplier of concentrated starter cultures for direct inoculation of the cheese vats. Currently Australian dairy manufacturers pay high prices to overseas companies for this type of concentrated bacterial culture. ASCRC has successfully developed a 'cheddar-type' culture. This product has been named 'direct-to-vat' and has proven itself in a number of the Centre's stakeholder cheese manufacturing processes. In the near future, ASCRC will be launching this product for commercial use and hopes to make it available for the smaller Australian cheesemakers. Further development will see a 'mozzarella-type' product available shortly. This particular 'direct-to-vat' product could not have been produced without the current capacity enabled by the STI grant.
- Due to the nature of the concentrated culture product, a large fermentation volume is required. It also makes the production of these types of cultures at the ASCRC cost effective. The project has resulted in an increase in fermentation capacity.
- By allowing the ASCRC to supply concentrated starter cultures, it has created an alternative for the dairy manufacturers and increased competition in the market.
- The project has led to an increase in the infrastructure for culture production, which in turn could lead to further development and expansion into other agrifood industries such as wine cultures and silage inoculants.
- Whey is normally a waste product of cheese manufacture. The ASCRC has been utilising a waste whey-based medium from cheese manufacturing as a raw material, reducing its negative impacts on the environment.

Grains Innovation Park, Horsham

Horsham is an important hub for research, development and production of cereals and broad-acre crops. This project received a \$1.01 million Round One grant to establish a business incubation centre on the Grains Innovation Park.

- The Business Centre accommodates start-up and spin-off businesses with a strong focus on the grains industry. The Centre offers both office and laboratory accommodation. Co-location on the Park places companies at the leading edge of the industry and provides unprecedented opportunities for strategic partnerships.
- The Park is an initiative of the Department of Primary Industries (DPI) and aims to cluster grain related industries onto the one site, creating a dynamic and synergistic environment for research, development and commercial activities. DPI has over 100 scientific staff at the Park. The University of Melbourne maintains a presence at the Park with staff and students involved in grains industry research.
- The Business Centre has been open since May 2004, and currently has 100% occupation of office space. Park tenants are:
 - Australian Crop Accreditation Systems, a not for profit company.
 - Australian Grain Technologies (AGT) is a private wheat breeding company established through an amalgamation of the Roseworthy and Waite wheat breeding programs. AGT won the right to access and commercialise germplasm from the DPI program.
 - Beaumont Broking is a grain marketing company with a focus on harvest management, managed marketing, machinery & equipment finance.
 - Cropfacts conducts agronomic consulting and has paddock recording software.
 - Marcroft Grains Pathology provides pathology services to DPI.
 - Nutrihealth, an Australian start-up company that was established in 1997 to capture value from the development, management and commercialisation of intellectual property for technology-based agricultural initiatives.
 - O'Callaghan Rural Management is a Bendigo-based company that recently opened a branch in Horsham to provide farm management consulting and training services.

Infection, Immunity and Vaccine Development (ImmunoID)

There are a wide variety of human and livestock diseases for which effective vaccines have not yet been developed. Victoria is at the forefront of vaccine design and development and has a competitive advantage in these areas. The use of modern proteomics based technologies and effective immune monitoring will facilitate current R&D initiatives in this area. Infection, Immunity and Vaccine Development (ImmunoID) is exploiting its expertise and infrastructure in proteomics for research and development into infectious diseases and vaccines. The \$1.20 million Round Two grant has provided an R&D facility based at the University of Melbourne that will become a hub for immunology research, diagnostic and vaccine development.

Innovative Foods Centre

The food industry is one of the largest manufacturing sectors in Victoria, directly employing around 47,000 people. The Innovative Foods Centre (lead organisation Food Science Australia) was awarded \$3.07 million in Round One to develop research infrastructure that allowed advanced food processing technologies to be evaluated. To help achieve this objective Food Science Australia has acquired a range of advanced pilot and laboratory technologies. The Centre focuses on investigating new food preservation methods and creating new products with improved storage life, sensory characteristics and food safety. Techniques under investigation include new physical, heat-free methods for treating food and beverages. These technologies include high-pressure processing, ultrasonics, pulsed electric fields and ultraviolet light. The Innovative Foods Centre has used the Round One grant to achieve the following:

- The Centre has now developed a reputation for attracting industry investment in new research projects – in 2003/04 the proposed value of industry projects was \$1.7 million.

- Several new products and processes are in the advanced stages of technical and business evaluation by industry. And the Victorian research community (including five universities) is heavily involved in underpinning research projects.
- A high-pressure processing pilot plant has been upgraded from pasteurisation to sterilisation capabilities in Werribee. The plant was launched in September 2004 and is used to develop processes for foods to give stronger and fresher flavour, firmer texture and better nutritional value. The pilot plant is one of only three operating in the world (other plants are in USA and Italy). Information from the plant will have an impact on research on food pathogen and food spoilage bacteria in low-acid shelf stable foods, shelf-life determinations and improving food functionality without using additives. The pilot plant is capable of small-scale food and beverage production. This capability is particularly useful for test markets using high pressure alone or high pressure with temperature as the preservation methods.

Mobile Architecture and Built Environment Laboratory

MABEL is the first mobile laboratory of its type in the world that can test a building's energy performance (power, sound, comfort and light) under actual working conditions. MABEL involved teams from universities, industry and government and was awarded a \$600,000 Round Two grant.

- The launch of MABEL by the Minister for Innovation at Deakin University in Geelong in early 2004 coincided with the 2004 Year of the Built Environment – a year that celebrated the buildings and supporting structures that make up our urban environment. In the next 30 years Melbourne is predicted to grow by one million people and 620,000 households. In order to manage this growth in a sustainable way the Government is implementing strategies such as the State network plan, *Melbourne 2030* and the 5-Star standard for new homes. MABEL is making a valuable contribution to this work by providing integrated energy performance data on location aimed at maximising energy efficiency in building design and construction.

Materials and Surface Science Facility

In the future, the surface and bulk properties of chemical, semiconductor, environmental, biological and industrial materials will be explored on the nanometre scale (one billionth of a metre). The \$500,000 Round One grant was used to purchase a 'time-of-flight' secondary ion mass spectrometer for materials science research. The instrument has applications in the microelectronics and semiconductor industries, manufacturing and packaging, and in biotechnology. Users include academic and commercial researchers.

Monash Research Cluster for Biomedicine

The \$2 million Round One grant went towards the construction of a new \$17 million building and refurbishment of existing facilities to house the newly formed Monash Health Research Precinct. The project continues the tradition of maintaining high quality biomedicine research for which the area has become renowned.

- The Cluster has secured \$1.3 million in research grants since 2002.
- A commercialisation manager has been appointed and the marketing strategy is being implemented, enhancing collaborations and attraction of industry partners.
- Consortium members include Monash University, Bioinformatics, Departments of Physics, Chemistry, and Robotics Research, Biota, Optiscan, Meditech, Metabolic Pharmaceuticals, DNA Solutions, and Norwood Abbey – and together these members have submitted 291 publications.
- The first of the three buildings at the Monash STRIP has tenants.

Murdoch Childrens Research Institute

The Murdoch Childrens Research Institute (MCRI) was awarded \$4.9 million to upgrade and refurbish facilities. The aim was to establish Victoria as a key destination for international paediatric medicine clinical trials and provide laboratory space and facilities for new biotechnology start-up companies. The new building and refurbishment activities are expected to be complete in the latter half of 2005.

- Three MCRI spin-off companies are now housed in the new precinct - Ausgenics Pty Ltd (novel gene therapy delivery systems); Antisense Therapeutics Limited (development of antisense drugs - these are drugs that enter cells and block the protein-producing activity of specific genes with applications in diseases such as psoriasis and MS); and SciBAC P/L which is responsible for the development of technologies that allow for the insertion of large segments of genes (including the gene regulatory components) into cloning vectors. These specialised vectors reduce the risk of damaging fully functional genes caused by having to compromise on the length of inserted genetic material. This technology is proving to be an important tool in researching large chromosomal regions and because of its ability to conserve the gene sequence it also increases the possibility of introducing 'healthy' copies of genes into patients undergoing gene therapy.
- The project has also seen the establishment of the Australian Paediatric Pharmacology Research Unit (APPRU). This Research Unit is actively involved in a large number of clinical trials performed in Victoria. These clinical trials have included studies investigating medications for the treatment of juvenile chronic arthritis, pharmacokinetic studies in young children with herpes simplex and chicken pox; investigations into the effects of Tacrolimus on children with eczema who also received the meningococcal vaccine; and a Atomoxetine study looking at the effectiveness of this medication in children with Attention Deficit and Hyperactivity Disorder and Oppositional Defiant Disorder.
- Early in 2004, the MCRI and the Royal Children's Hospital signed an alliance with one of the largest clinical trials organisations in the world, Quintiles Limited. The alliance means the two institutes are now recognised as a world centre of excellence for clinical trial pharmacology studies by Quintiles. New paediatric medicines are being tested, and existing medicines that are approved for adult use are being tested specifically for use in children. The expert studies are being undertaken by the APPRU.
- The STI Initiative is also contributing an additional \$2.5 million towards equipment at a new \$46 million Paediatric Magnetic Research Imaging (MRI) Research Centre project at MCRI as part of the new facilities. The Centre assists in establishing Victoria as a major destination for international paediatric R&D and provides an international-standard training facility. Most importantly it will provide Victorian children and their families with the highest standards of clinical care while their illnesses are diagnosed and treated. MRIs enable researchers and doctors to take 3-dimensional images that can reveal heart malformations, positioning, blood flow and contraction information. They are also critical in diagnosis and research into brain development and function in premature babies and children, as well as the diagnosis of congenital defects. The centre has attracted \$2.5 million in federal funds.

Nanotechnology Victoria

The project received a \$12 million Round Two grant to ensure Victoria benefits from advancements in nano and micro technology-related science by linking the resources and activities of key research institutes, and providing commercial focus.

- Nanotechnology Victoria Limited (NanoVic) was incorporated as a not-for-profit company by its founding Members: Monash University, Swinburne University of Technology, RMIT University and the CSIRO. The total entity value of \$28 million comprised \$12 million from the STI funds and commitments of \$16 million from the founding Members.

- NanoVic is now established within the Monash University STRIP facility at the Clayton Campus. It has five full-time employees, together with two part-time employees.
- It has an informal agreement with the Bio21 Institute to work together on projects of mutual interest. NanoVic supports the development of new clean room facilities at the Institute. NanoVic also works closely with MiniFAB and the Victorian Centre for Advanced Materials Manufacturing.
- NanoVic is developing strategic partner relationships with the University of Melbourne and the Australian Institute for Bioengineering and Nanotechnology in Queensland. It is a member of the Australian National Nanotechnology Network, a founding member of the Australian Small Technologies Alliance, and was a contributor to the Prime Minister's Science Innovation and Engineering Council working party on nanotechnology, completed in March 2005.
- NanoVic has made over 40 presentations on nanotechnology over the last two years, in local, national and international forums. It has conducted industry focused workshops and contributed to national public discussion on nanotechnology. It has developed one of the most visited websites in Australia, averaging nearly 100 visits per day.
- NanoVic has made its first infrastructure investment project, the \$2.2 million NanoArrays project with Monash and Swinburne, announced in December 2004. NanoVic has contributed \$960,000 to this project, which will develop revolutionary diagnostics for the veterinary, environmental, and human health industries. NanoVic is responsible for the commercial outcomes of this investment.
- NanoVic has three other infrastructure investments under development: for a Small-Angle X-Ray microscope, a major FEG-TEM/FEG-SEM microscope package, and a nanoparticle-based medical diagnostic facility. NanoVic hopes to complete these agreements by the end of 2005.
- NanoVic has completed its first industry project; the development of products which incorporate nanostructured materials in household surfaces. It has earned revenue of \$30,000, with another \$30,000 now committed by the commercial firm.
- Demonstration activities for three companies are underway. These are expected to lead to industry projects earning revenues for NanoVic by end 2005. NanoVic is focused on activities in the textiles, consumer products, aerospace, medical products and defense sectors.
- NanoVic also contributes substantially to nanotechnology education. An educational package developed based on that pioneered at the Bendigo Discovery Centre has been prepared, and is supplied to schools upon request. NanoVic has also arranged a studentship, supported by an external firm, and has supported three tertiary students itself over the last year. NanoVic is working directly with the Curriculum Authority for Victoria around secondary education of nanotechnology, and with three universities about their tertiary nanotechnology programs.
- Most recently, NanoVic has announced the awarding of the first round of NanoVic Prizes for innovation in industrial nanotechnology. Two industry prizes and two postgraduate prizes were awarded.

National Printing Laboratory

The direct printing sector in Victoria has an annual turnover of around \$5 billion, exports over \$130 million in printed products and employs 18,000 people (31% of national industry employment). The Victorian industry utilises traditional processes and also has a rapidly developing digital printing sub-sector. Globally, the printing and packaging industry is set to undergo a significant technological transition through adoption of digital technologies. The National Printing Laboratory (NPL) was established in 2001 and awarded a \$910,000 Round One grant.

- The Laboratory provides new capabilities to enable the investigation of technical issues related to printability and print quality, surface tension and tack of inks, colour of print and substrates, surface and bulk microstructure, friction, surface strength, contact angle, dimensional stability and surface treatment.

- NPL went on to successfully bid for a \$58 million Co-operative Research Centre (CRC) for Functional Communication Surfaces which is headquartered at Monash University. The NPL provides facilities and technology transfer for the CRC and advice, trouble shooting and testing services for the printing and associated industries.
- NPL has expanded its knowledge base by establishing linkages with such prestigious overseas organisations as PIRA International, a leading UK commercial consultancy, testing and media business specialising in the packaging, substrate, printing and publishing industries, Printing Industries of America/Graphic Arts Technical Foundation, the world's largest graphic arts trade association and FOGRA Graphic Technology Research Association – based in Munich, Germany.
- The expertise of NPL staff has attracted funding from large international companies such as BASF, which is funding a project on chemical modification of surfaces.
- NPL has solved a technical problem widespread in a segment of the printing industry – poor adhesion of UV cured ink to metallised polyester/paperboard laminates. The cause of the problem was identified after analysis revealed the presence of low levels of silicone that prevented the UV inks from keying properly to the surface of the film.
- The main area of concern in the flexographic printing sector has been ink colour strength which affects the mileage achieved on the printing press and hence the economics of the process. NPL has benchmarked inks by checking deliveries of ink against a standard and thus controlling the economics of the printers' operations.
- The wine merchanting business is very competitive and wine companies sometimes produce elaborate labels to differentiate their product – labels which do not adhere well to the bottles on high speed labelling equipment. NPL has developed a range of standard tests for the labels and also tolerances for the glass bottles.
- NPL was involved in detailed studies on the effects of certain classes of chemicals on lithographic printing plates has identified the source of a particular printing problem, resulting in the saving of millions of dollars through reduction in product losses.
- NPL has also investigated the mechanisms involved in a long established process, offset printing. This has shed new light on the source of a range of printing problems, resulting in potentially huge savings across the industry.

Neurosciences Victoria

Brain and mind disorders affect as many as 1.5 billion people worldwide, with that number expected to grow as life expectancy increases. The World Health Organisation estimates no less than 25% of the total burden of disease in established market economies is presently attributable to brain and mind disorders. In Australia, 75% of the population will suffer from a brain or mind condition in their lifetime. Neurosciences Victoria (NSV) was awarded \$13.34 million to raise the capacity of Victoria's renowned neuroscience research groups to a level that is set to attract substantial industry investment from the world's leading pharmaceutical companies. It has been established to provide a unique interface between government, academia and industry, facilitating collaborative research and inward investment into the Victorian neuroscience cluster, as well as contributing to the transfer of intellectual property into marketable products. In its first three years of operation this partnership between Victoria's universities and research institutes has achieved:

- Consolidation of more than \$100 million in public, private and industry support.
- Creation of collaborative research programs focusing on a broad spectrum of brain and mind disorders and featuring multi-institute, cross-functional research projects.
- Establishment of the \$42.5 million National Neuroscience Facility: an integrated set of eight platforms of high-cost technology, infrastructure and expertise available to Australian researchers

on a cost-per-use basis and capable of progressing research from concept phase through to clinical trials.

- Creation of spin-off entity Neuprotect Ltd built on NSV pre-seed funding.
- Creation of over 70 high value employment positions throughout the Victorian Neuroscience cluster.
- Increased awareness and promotion of Victorian R&D on an international scale
- Attraction and retention of leading scientists to Victoria, including Federation Fellow Professor Ashley Bush (MHRI), Dr Ralph Dringen (Monash), Dr Steve Petrou (HFI) and Professor Chris Pantelis (MNC).
- In addition, NSV currently has commercial contracts valued at over \$20 million. Commercial linkages currently include:
 - A five year R&D agreement with German pharmaceutical company Schering AG. This agreement now extends to Schering's wholly owned subsidiaries Berlex Biosciences (USA) and the Nihon Schering Regeneration Research Institute (Japan).
 - A co-development agreement with Nihwa Pharmaceutical Corp in Victoria's sister state, Jiangsu Province. This agreement allows for the testing of new treatments for CNS disorders based on three compounds identified by NSV as having high potential for successful pre-clinical development.
 - NSV is represented by Sojitz Corp in the Japanese market. This agreement has resulted in a number of meetings with pharmaceutical companies in Japan and offers NSV a strengthened platform for its Japanese business activities. The agreement has resulted in the execution of an MTA with Fujisawa and in NSV being short listed as one of three potential suppliers for R&D for another major Japanese pharmaceutical group.

Rapid Engineering Development Laboratory (REDlab)

One of the main barriers for small to medium sized companies trying to enter the broadband communications market is the very high cost of R&D test facilities. *Rapid Engineering Development Laboratory (REDlab)* is a world-class test facility for the research and development of broadband communications, photonics and high tech electronics products. It was established with a \$2.75 million Round One grant to provide access to the latest test instruments for small to medium sized enterprises, universities and Co-operative Research Centres (CRCs) and established organisations.

- Lead project organisations included research and industry partners: CEOS and REDcentre, Pacific Broadband Networks, Nokia, ITEC Technologies.
- REDlab has advised it has facilitated \$20+ million in export revenue and an extra 150+ high tech jobs in Victoria at the end of 2003-04.
- REDlab has secured 126 members including SMEs, universities and CRCs.
- REDlab has expanded its test capabilities into ultra-broadband (400 times faster than broadband) systems testing which will provide REDlab users with a unique environment to perform both component level testing and also system level testing on their completed products.

Research Centre for Advanced By-Wire Technologies

The automotive manufacturing industry is Victoria's largest complex manufacturing sector and contributes around 2% of Victoria's Gross State Product. The industry is also a leading user of advanced technologies. One of these advanced technology areas is known as 'drive-by-wire' - a revolutionary technology that is likely to replace mechanical and hydraulic systems. Put simply, drive-by-wire technology eliminates the need for pedals, gearsticks and steering wheels. Instead they are replaced with buttons and joysticks and better performing steering, braking and suspension. It is readily accepted in the aerospace industry and moving into the automotive industry with uptake expected to accelerate in this decade. In response, industry, educational and research groups in

Victoria formed the Research Centre for Advanced By-Wire Technologies (RABiT), which is a collaborative venture aimed at bringing cohesion and focus to the development and commercialisation of by-wire technology in Australia. A \$4.73 million Round Two grant seeded the development of a by-wire facility as part of the RABiT project.

- RABiT was able to leverage its STI funding with partner contributions of \$5.3 million to secure the first by-wire facility in the Asia Pacific region. Comparable facilities are located in North America and Western Europe, and mostly owned by multinational companies.
- RABiT represents the combined efforts of Pacifica Group Technologies Pty Ltd, the University of Melbourne, and Swinburne University of Technology. As key stakeholders, these three partners ensure the venture is viable and sustainable in the long run and they also provide a commercial focus for the initial research efforts, along with established networks for the early commercialisation of intellectual property generated by RABiT.
- RABiT members have been awarded \$367,995 in Australian Research Council Linkage grants.
- A new RABiT node has been established at Swinburne University of Technology to investigate the human design aspects of by-wire technologies and to facilitate industry based learning.
- A by-wire research and teaching laboratory has been completed at PBR in East Bentleigh. RABiT now has 20 students and nine staff involved in collaborative by-wire projects.
- RABiT has completed the design of the hardware-in-the-loop to simulate and measure by-wire braking systems fitted on its BMW test car. The hardware-in-the-loop test bench simulates the vehicle's dynamic behaviour in a computer environment by using the actual vehicle control algorithm and inputs from the brake calipers. This allows a vehicle control algorithm, for example, ABS, development in a laboratory environment instead on the test track.
- One of RABiT's founding consortium members, Pacifica Group Technologies, won the Society of Automotive Engineers Australia Gold award for design excellence for its Electric Park Brakes and have commenced testing a second generation of Electro Magnetic Brakes. This second generation brake system is using FlexRay as its communication protocol and is designed and developed to be a production feasible (cost, packaging, performance, etc.) brake system. The system will replace the known hydraulic components like master cylinder, fluid reservoir and pipes, ABS pumps, etc by improving the system performance over the currently used systems. This platform will allow vehicle dynamic simulation to be performed with computer hardware available 'off the shelf' to provide a very economical and expandable solution to the simulation of complex vehicle behaviours.
- RABiT has filed several patent applications in the area of advanced control systems and is continuing its research in the drive-by-wire field. Some of the activities are to communicate new technology development, and so far RABiT has run technical seminars for 17 firms.

Sustainable Aquaculture Systems

Aquaculture is one of the world's fastest growing primary industries. Australian aquaculture was valued at \$494 million in 1994-95 and \$732 million in 2003-04 – an annual growth rate of 4%.

Victorian aquaculture is a small but growing sector in cool water production with the industry valued at \$21 million in 2001-02 and likely to approach \$50 million in 2006-07. The Sustainable Aquaculture Systems (SAS) project was seeded with a \$2.06 million Round Two grant.

- The new Warrnambool facility at Deakin University, which opened in August 2004, includes latest cutting edge technologies such as four aquaculture systems which will trial re-circulation and filtration systems that use far less water than traditional fish farming. The facility was part of a \$5 million project developed by a consortium made up of Deakin University, Australian Aquaculture Systems (Alexandra), Australian Aquaculture Products (Euroa) and the Warrnambool Trout Farm (Warrnambool).

- The SAS consortium has successfully demonstrated the viability of the commercial year-round production of Murray Cod in aquaculture. Sales of Murray Cod to the Melbourne and Sydney fish markets have peaked at over 50kg per week. Local restaurants including award winning 'Pippies By the Bay' in Warrnambool now offer SAS-bred cod on their menu. During the 18-month set-up phase total fish sales have produced over \$120,000 in income.
- SAS have also successfully bred Murray Cod out-of-season (a first for this species) by manipulating temperature and daylight regime. Wild stocks of Murray Cod are estimated to be less than 10% of the population present at the time of European settlement. Yet the species is one of the most expensive products in our fish markets. Successful year-round breeding will ensure a steady supply of Murray Cod to the Australian and International markets.
- Future projects will focus on extending knowledge of other native species such as eels, estuary perch and mulloway.

Urban Water Conservation Research & Development Facility

Located at CERES in Brunswick this project was awarded a \$300,000 Round One grant and aims to reduce water demand by raising awareness of water conservation through demonstration activities focusing on use of water in an urban environment.

- Since it was launched in April 2003 by the Premier and Minister for Innovation, the project has attracted \$310,000 in additional support and the total project value is estimated at \$900,000. The success of the project has also helped secure a further \$450,000 for an innovative new community site building.
- CERES Community Environment Park is leading by example with this innovative facility. On site water conservation demonstrations include:
 - wastewater treatment and reuse;
 - direct grey water reuse;
 - composting toilets;
 - water efficient appliances;
 - stormwater collection, treatment and reuse;
 - water efficient landscapes; and
 - rainwater harvesting systems.
- Innovative research includes the development and demonstration of urine diverting toilets. Source separation of urine has huge potential to facilitate nutrient processing and reclamation. Project partners include RMIT University and Yarra Valley Water.
- A dam for gathering street water runoff has been built and stormwater is being collected from car parks for use on nurseries and gardens. Monitoring of the cafe, house rainwater and wastewater collection systems has been extended as part of the research. And CERES has upgraded the organic farm irrigation system with a more efficient dripper system.
- CERES was a major participant and sponsor in the 2004 National Water Week, presenting water smart ideas for the home and garden, partnering a grey water forum, and involving students in special water activities projects.
- CERES recently won a Savewater Award® - Community Achievement for outstanding achievement in water conservation and was a finalist on the education program category.

Victorian Bioinformatics Consortium

Bioinformatics is an emerging research field that combines information technology, applied mathematics, molecular biology and genetics. It is one of the most important techniques for the scientific and commercial exploitation of DNA sequence information. The Victorian Bioinformatics Consortium (VBC) comprises Monash University, the Victorian Department of Primary Industries and CSIRO, and was awarded a \$4.89 Round One grant. It aims to give the State a strong bioinformatics

base to analyse the vast amounts of genetic information being generated by the State's research organisations.

- VBC has acquired computer hardware, established the Management Committee, appointed the Scientific Director, and relocated to the Monash Science Technology Research and Innovation Precinct (STRIP).
- The VBC has attracted \$450,000 in new Australian Research Council grants
- The project has resulted in the publication of 73 research papers.
- The VBC currently manages 61 research projects under the portfolio of bioinformatic activities. Current research projects include development of improved methods of genome analysis, involving gene finding algorithms, identification and functional characterization of novel domains in proteins, application of information theory to DNA analysis and improved methods in structural genomics. New algorithms have been developed to improve the sensitivity and specificity of microarray analysis. A particular area of interest is the development of novel databases for the handling of diverse data types including clinical histories, genome sequences, microarray results and various images. A special focus is the genome of *Leptospira borgpetersenii*. *Leptospira* is a bacteria in animals that can cause illness in humans. VBC says it is Australia's only complete genome project.
- In 2003, the Consortium facilitated a collaboration with Swinburne TAFE that involved students working on a defined six-month software project in the rapidly growing field of bioinformatics. Three projects have been completed, all of which have produced novel and exciting software products notably CLIMS and REFOLD. CLIMS is a Laboratory Information Management System for protein crystallography. REFOLD was designed to assist in the design and implementation of methodologies for the in vitro refolding of proteins. Monash University is actively using the software for research involving the production of engineered proteins and subsequent elucidation of their 3-dimensional shapes. There are also laboratories around the world adopting the software for their own research. The VBC is now stepping up the activities to include a new and exciting project that will create the software backbone for a collaborative research effort involving 17 laboratories from eight countries.
- The commercial link with Intervet International continues via the Australian Research Council grant – sequencing and analysis of the *Brachyspira hyodysenteriae* (causative agent of swine dysentery). The VBC's role is to provide appropriate bioinformatic support to assist Monash University (Dept. Microbiology).
- The project has confirmed three new academic licence agreements for AutoSNP (for high throughput genetic analysis).
- The project has confirmed one new academic licence agreements for SSR Primer (for high throughput genetic analysis).

Victorian Centre for Advanced Materials Manufacturing

The Victorian Centre for Advanced Materials Manufacturing (VCAMM) has established a new model in collaborative research through provision of analytical services, materials research and research project management for the manufacturing sector in Victoria. VCAMM acts as a one-stop-shop to solve specific problems by directing industry to access skills and infrastructure within the research community that support their specific needs. The consortium was awarded a \$5 million Round Two grant enabling VCAMM to develop and promote the use of carbon fibre technologies, light metals, and lightweight structures and composites in the auto, aerospace, defence and engineering industries.

- Major nodes have been established in Geelong and Clayton.
- VCAMM, Holden, Air International and a number of Australian universities were awarded \$38.5 million in federal funding for the Automotive CRC proposal to undertake vital research in support of the Australian Automotive industry. Specific areas of research will include Agile

Manufacturing, New Materials, Powertrains, Safety & Intelligent Vehicle Systems, and Virtual Engineering.

- International aerospace manufacturers, as well as local and Detroit auto plants, are showing strong interest in a new carbon fibre and composite material process (Quickstep®) being developed at VCAMM's Geelong node. VCAMM's industry focus meant it was also the first to purchase, test and validate equipment and instrumentation involved in the Quickstep® process. The process relies on fluid instead of air to transfer heat during the manufacture of high strength carbon fibres and composites. This novel process results in stronger structures that are cheaper and quicker to produce. Quickstep® was invented in 1994 in Western Australia by Neil Graham who hatched the idea while sitting in his bath.
- Five VCAMM researchers have been invited to attend the prestigious international JEC composite conference in April 2005 to present papers on VCAMM's research into the Quickstep® process to an international audience of industry and researchers.
- VCAMM's composite team has been providing research support for local Olympic rowing component manufacturer Sykes Rowing. Such support ensures that Sykes and the Australian Olympic team will maintain a competitive edge into the future.
- The Centre has also provided regular analytical services in support of Noble and the Ford Motor Company in the testing and validation of new tailor welded blanks now used routinely in the production of Ford cars.
- VCAMM's researchers are also involved in exciting new research within defence related sectors to help deliver innovative solutions to specific problems facing Australian and international military forces in today's environment.
- VCAMM has also been instrumental in the formation of joint ventures and spin off companies from technologies developed under funding from the Victorian Government. Examples of such activities include a stakeholding in H.A.R.D. Technologies which has developed revolutionary coating technologies for ferrous metals. The novel H.A.R.D. process has already generated high levels of interest and licensing requests from large US and European heat treaters. VCAMM's relationship with Quickstep® is also beginning to generate royalties for VCAMM, ensuring the long term viability of the VCAMM organisation.
- VCAMM's reputation for project management and its success in facilitating the Automotive CRC has seen it selected to facilitate formation of the recently announced Automotive Industry Strategic Action Group (AISAG). In this initiative, jointly funded by the Victorian Government (DIIRD) and the Federation of Automotive Products Manufacturers (FAPM) will see VCAMM developing key recommendations regarding the Automotive Centre of Excellence (ACE) and a strategic vision essential for the long term viability of the Australian automotive industry.

Victorian Centre for Oral Health Science

Australians spend over \$3 billion each year on dental services. Oral diseases are estimated to be among the most widespread diseases in the community with dental decay, loss of all teeth, and gum disease ranked as the first, third and fifth most prevalent conditions in Australians. The Victorian Centre for Oral Health Science (VCOHS) was awarded a \$3.5 million Round Two grant.

- The VCOHS project, which operates from the University of Melbourne, catalysed a successful Victorian-led bid for CRC funding in oral health valued at \$21.2 million and the opening of the new \$117 million CRC for Oral Health Science in Melbourne.
- The STI grant supports mobile oral health examination facilities to gather high-quality data to support clinical trials and epidemiological surveys. It also allows the purchase of state-of-the-art analytical instruments to enable detailed studies into the biochemical basis for gum disease.
- VCOHS researchers have also received National Health and Medical Research Council grants and NIH to the value of \$4.6 million.

- In addition, VCOHS participants have attracted substantial industry support for a variety of research and development projects and clinical trials. One such project is a clinical trial supported by a multi-national confectionery company examining the benefits of sugar-free chewing gum on Victorian school children.
- The University of Melbourne's School of Dental Science, being the lead VCOHS participant, has also recently signed a license agreement with CSL Ltd for the commercialisation of patented vaccine technology targeting periodontal diseases.

Victorian Centre for Plant Functional Genomics

The two core partners in Victorian Centre for Plant Functional Genomics (VCPFG) are the University of Melbourne through its Plant Cell Biology Research Centre and the Victorian Department of Primary Industries through its Plant Biotechnology Centre at La Trobe University. The \$20 million Centre was kick-started with a \$4 million Round Two grant. The Centre builds on a continuum of key platform technologies for plant functional genomics that underpin a range of research projects exploring ways to produce plants resistant to drought, frost, salinity and disease.

- Centre researchers are already screening a range of native and exotic grasses and legumes that carry adaptive genes expressing tolerance to a range of environmental stresses, including:
 - A salt-tolerant grass, *Agrostis robusta*, that was previously thought to be extinct;
 - Weeping grasses, *Microlaena stipoides*, that are tolerant to aluminium levels in soil;
 - Antarctic hair grass, *Deschampsia antarctica*, which can handle extreme cold; and
 - Hypoallergenic ryegrasses that can reduce hay fever.
- The Centre's researchers, in collaboration with colleagues at the University of Adelaide, are also examining quality characteristics of cereal grains.
- The VCPFG suite of key enabling platform technologies for the biotechnology sector support national collaborative research programs such as the Australian Centre for Plant Functional Genomics (valued at \$55 million), the Cereal Functional Genomics Centre (\$1.2 million per annum) and the Molecular Plant Breeding CRC, which attracted \$4.93 million supplementary CRC funding in the 2005 round.

Victorian Institute for Chemical Sciences

The Victorian Institute for Chemical Sciences (VICS) is aligning new research opportunities with Victoria's strategic priorities in R&D areas such as drug design and development, environmental solutions and molecular sciences education. The \$5 million Round Two grant is being used for equipment and laboratory upgrading at Melbourne, Monash and RMIT universities for the new institute that is dedicated to the chemical sciences.

- VICS has implemented a program based on four chemical science themes: drug discovery and chemical synthesis, environmental solutions, molecular analysis and dynamics and chemistry education and outreach.
- Twenty-nine collaborative projects have been established across four campuses of the three member universities. Some of these projects have been aligned with two of Victoria's strategic priorities, health and pharmaceuticals and environment protection.
- VICS has also invested in new scientific instrumentation which is transforming teaching laboratories and strengthening university research, leveraging its investment with Commonwealth and University funding.
- The VICS outreach program to schools has been in great demand, reaching increasing student numbers and now participating in popular annual events, for example the 'Chemical Mystery Day' and the 'Science Summer School'.
- The VICS Centre for Scientific Instrumentation is designing and prototyping high technology instruments and accessories, with an eye to overseas markets.

- A multimedia project is developing a safety teaching product, 'SafetyNet', for laboratories and schools.
- Several VICS projects aim to discover new biologically active molecules, by synthesis or extraction from marine organisms and plants, of value in the pharmaceutical pipeline.
- Institute Director and CEO, Dr Peter Lehman, attended Pittcon 2005, the world's largest exhibition of scientific instruments and services, held in Orlando, USA, presenting the VICS-CSI range of instruments and seeking international distributors. The VICS presence generated considerable interest, from which ongoing discussions with seven Australian and overseas manufacturers/distributors are being pursued.

Victorian Microarray Technology Consortium

The Victorian Microarray Technology Consortium (VMTC) was established with \$4.42 million grant to underpin the State's biotechnology strategy in the agrifood and biomedical fields. Microarrays are sets of miniaturised chemical reaction areas sites on a glass slide, filter or wafer that may can be used to test DNA fragments, antibodies, or proteins. The Consortium provides microarray tools for gene discovery and functional genomics research for the agricultural, biotechnology and biomedical sectors. This work enables identification of novel targets for new pharmaceuticals and development of new diagnostic tests. VMTC partners include the DPI AgVic-Plant Biotechnology Centre, the Peter MacCallum Cancer Institute and the Australian Genome Research Facility.

- The consortium is providing the facilities in open access arrangements and is presently negotiating with a private investor to explore commercialisation opportunities. Over 50 researchers work across these sites and more than 2,000 people have participated in its training programs. VMTC has achieved open access to microarray technology platforms with operational nodes with Peter MacCallum Cancer Institute and the Plant Bioscience Centre, including 15 groups from research and industry groups.
- Investment attraction through VMTC projects either using or requiring access to the microarray technology platform totals \$23.75 million.
- The project has resulted in the creation of six full time staff and training for over 400 people from national and international research organisations.
- In 3-5% of new cancer cases, the site of origin of a tumour cannot be readily identified. Gene expression profiling through microarray technology has allowed the Peter MacCallum Cancer Centre to develop a highly accurate diagnostic test to determine the origin of these cancers. This work is now being partnered with Circadian Technologies and groups in the UK to commercialize this technology.
- Additionally, the STI grant was instrumental in the Peter MacCallum Cancer Centre securing a \$5 million grant from the United States Congressionally Directed Medical research Programs to establish the Australian Ovarian Cancer Study, one of the world's largest program in the molecular epidemiology of ovarian cancer.
- The project has seen the establishment of Victoria's first Affymetrix GeneChip Platform and provision of an open access regime to researchers in academia and industry to this globally competitive equipment infrastructure. Use during January-June 2004 averaged 7.6 hours per day.
- The project has resulted in the development of the world's first unigene cDNA microarrays for genomics applications in grasses, pasture legumes and lactation genomics.
- The project has resulted in the development of the world's first fungal endophyte unigene cDNA microarray for comparative genomic applications.
- The project has resulted in the development of novel microarray based molecular profiling tools for tumour diagnostic applications.
- VMTC has facilitated the provision of Australia's first theoretical and practical workshops on DNA-chip and protein microarray technology and its applications.

- VMTC has facilitated attraction of world class, overseas experts from leading institutes in the field of microarray technologies and microarray data analysis as workshop speakers.

Victorian Microtechnology and Manufacturing

Identified producers in micro and nanotechnology industries are expected to grow to \$US68 billion by 2005. While Australia has significant expertise in these areas, developers of these technologies often have to go overseas to access the facilities that can turn their ideas into products. This lack of micro and nano-production facilities has been a real barrier to the early-stage commercialisation of potential products. This project won a \$100,000 Round One grant to explore the feasibility of establishing a multi-nodal, open access microtechnology facility.

- The project succeeded in catalysing private investment that led to the launch of MiniFab – a new facility built on the outskirts of Melbourne that is already causing a stir amongst international companies looking to produce high quality, competitively priced miniature technologies capable of detecting small fractures in aircraft rivets. MiniFab provides the clean rooms, working spaces and expertise required to have a world-standard bio and nanotechnology manufacturing factory. MiniFab allows companies to move their ideas from the drawing board to production-ready prototypes at a low cost and to negotiate commercial deals for large-scale production. MiniFab either works with companies for a straight fee or the company takes some equity in the start-up firms. Later when a company signs a deal with a larger firm, MiniFab will ideally become manufacturer of that product, or a partner in the venture that becomes the manufacturer.
- MiniFab is already proving that being one of the world's few micro-manufacturing plants is smart and lucrative. The company has signed deals with big names such as Varian and IMEC in Belgium.
- The company has been working with Amcor to look at the breathing ability of polymer wraps for fresh food products to extend shelf life, and in medical applications.
- Scientists at MiniFab are assisting in development of a 'lab on a chip' – effectively a microscope slide with microchemistry embedded into laminate on the slide. By placing a drop of water or blood on the slide a scientist could find out whether a city's water supply is contaminated or whether a person has a particular disease, without the time and expense of sending the sample to a laboratory.
- In addition MiniFab attracted Dr Carl Chen from the prestigious Massachusetts Institute of Technology in the US to Australia to develop new types of scientific instrumentation. The development project involves Varian Australia (a manufacturer and exporter of scientific equipment). The project would not have been started if Australia was not building a synchrotron (MiniFab has indicated it will be actively engaged in the Australian Synchrotron project).
- MiniFab is working towards becoming a partner in a European 6th Framework project on point-of-care medicine.
- The company has hosted visits from several international scientists and international students for work placement stints.

Victorian Partnership for Advanced Computing

The Victorian Partnership for Advanced Computing (VPAC) is a consortium of six Victorian universities and was awarded a Round One grant of \$6 million. VPAC secures Victoria's participation in the Australian Partnership for Advanced Computing (APAC). The Partnership is improving the effectiveness and competitiveness of Victoria's universities, research organisations and industry by giving them access to high performance computing facilities and organisations, interstate (ANU) and overseas. Key target areas are biotechnology, IT, aerospace, automotive, mining and agriculture.

- VPAC has attained commercial self-sufficiency of its R&D company in just three years and is now a successful commercially-driven company employing over 40 staff, with \$5 million+ in

annual revenue, and has its member shareholders renew their support. Deakin University has joined as a new shareholder.

- VPAC has been a major commercial partner with several national and international companies including IBM and Holden. Annual contracts for commercial R&D total over \$2 million. VPAC's support for Holden has delivered massive improvements in productivity and quality at Holden, ranging up to an 80% reduction in costs to design new vehicle components.
- VPAC is a major partner, with member universities and companies, in many Commonwealth funded R&D efforts, including the AutoCRC and the ACCESS MNRF. More than a dozen Australian Research Council grants have been funded with VPAC support and collaboration in the past four years, totaling more than \$40 million.
- VPAC has funded a wide range of competitive e-Research seed projects at member universities over the past four years, providing funding of \$3.9 million to more than 100 projects in geoscience, biotechnology, virtual engineering and computational software development. These projects have generated many publications and several million dollars in grants and support. The latest round featured projects such as development of a reliable data approximation and forecasting system, simulation of knife-stabbing for application in developing protective clothing, computational analysis of aerodynamic interactions between passenger cars, and advancing global navigation satellite systems.
- The Partnership has established 'bioplatform', a common base of biotech tools for use by the biotechnology community in Victoria, and has major partnerships and collaborative research with the Victorian Infectious Diseases Reference Laboratory (VIDRL), Bio21, and the Victorian Bioinformatics Consortium. Outcomes of these partnerships include patents, publications, grants, and computer models of the SARS coronavirus enzymes and the hepatitis B virus polymerase enzyme.
- VPAC is working on a cystic fibrosis database project for the Royal Children's Hospital.
- VPAC is a key partner in a major USA R&D effort – VPAC has a Director on the executive of the Center for Computational Infrastructure in Geodynamics which has US\$5 million in funding. The Center's members include researchers from MIT, Harvard, Columbia, Stanford, and Caltech.
- VPAC has established a satellite facility at Fisherman's Bend, with about a dozen VPAC employees, to serve the needs of the manufacturing sector.
- VPAC operates several large HPC cluster systems, to support Member Universities and industry – these systems support close to 500 users, with supercomputing capacity equivalent to about a thousand-fold greater than a desktop PC, and a thousand-fold greater storage.

Virtual Reality Observatory of Melbourne

This virtual room was awarded a \$1.3 million grant and was opened at the Melbourne Museum in late 2003. The Virtual Reality Observatory of Melbourne project is a partnership between the Museum, several universities and Adacel Technologies Limited. Using the latest visualisation technologies, the permanent exhibit simulates a three-dimensional moving image that changes perspective as the visitor walks around it.

- New projects include shows on the Sacred Angkor, Devonian Sea, interactive real-time virtual plants, camera tracking and real time astronomical data sets, and the Future of Visualisation.
- VROOM was also an Australian Teachers of Media Award and Eureka Award finalist.
- The Department of Innovation, Industry and Regional Development used a VROOM unit at the 2005 Melbourne International Motor Show which drew around a quarter of a million visitors this year. The display was extremely popular, and featured a three-dimensional presentation on Victoria's automotive capabilities. The Department will continue to use VROOM in promotion of Victorian automotive manufacturing capabilities at trade and motor shows and expos in Australia and overseas including the Society of Automotive Engineers (SAE) trade show in Detroit (11-14

April 2005) and various promotions (21-29 April) in Japan based around the Aichi Expo. The concept is to use content on the VROOM to promote Victorian automotive component manufacturers overseas, particularly in Japan. Successful promotion in Japan will give Australian manufacturers access to a large number of Japanese based car manufacturers, such as, Toyota, Mitsubishi, Suzuki, Honda, Isuzu, Mazda, Daihatsu, Nissan and Subaru amongst many others.