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This Research Report gives an opportunity to reflect on the growth of the University’s research program over the decade or so since we have been designated a University, and is a fitting occasion to celebrate our success. At the same time we affirm the University’s commitment to building a coherent, co-ordinated, nationally relevant research profile.

As a University, we are now starting to realise the full impact of the Federal Government’s policy direction which has imposed enormous demands on universities, on business, industry and the wider community during a very challenging period in world history. We should remain positive in the hope that Australia will give education and research a similar precedence on the national list of priorities, as have other countries like the United States, Singapore and Ireland, which clearly recognise the requirement to invest in research, development and innovation.

During 2002, the Minister for Education, Science and Training, Dr Nelson undertook an extensive review of the Higher Education Sector through his Crossroads review. This review provides the basis for the most extensive shake-up of the sector since John Dawkins introduced the National Unified System to the sector, which resulted in the birth of this institution as a University.

I think it appropriate at this point in our development to consider some of the changes achieved in the University’s research profile over our first decade of existence. External research income has grown from less than $1 million in 1992 to approx. $6 million in calendar year 2002. After reaching a recent plateau, external income has doubled in the last three to four years. Annual expenditure on research is estimated to be four to five times this level, based on our most recent assessment for the Australian Bureau of Statistics. Much of the success for this growth can be attributed to the capacity of the University, industry, business and the wider community to respond positively and proactively to change.

In 1992 there were a number of small research groups scattered throughout the University. Now there are seven Designated University Research Centres and two Key Research Areas that underpin our research strengths. In December 2002, a joint venture was signed with the Austin Research Institute to form the Victoria Institute of Biotechnology.

Research outputs have grown similarly from a handful of publications each year to over 436 at the last count. One of our proudest achievements has been the institution of higher degree by research programs. Over the decade 1992-2002, nearly 500 students who have undertaken higher degrees by research have graduated from this University. Many of these have been our own staff members. In 2002 the Vice-Chancellor’s Scholarship Scheme was introduced to add further support to building our commitment to postgraduate research.

As in this past year, we will all have to make an even greater commitment to research training in the ensuing decade, if the University is to continue to realise the spectacular growth in higher degree enrolments that it has achieved in recent times. A continuing challenge for this and other universities is that we will have to work harder as a university to produce researchers who are not only creative thinkers and innovators, but keen strategists and entrepreneurs, people who are able to value and achieve excellence in their discipline-based research and link it with applied outcomes that are able to meet community demands. The University’s reputation, its research output and its future funding will depend on it.

The University’s research profile, which is greatly enhanced by the opportunities we are able to provide to researchers through our international agreements with institutions as renowned as Trinity College, Dublin, and the highly successful rate of employment of our postgraduates, further serve to increase the University’s national and global standing in a climate where we also need to increase our quota of fee-paying students.

This year and indeed the decade have been inaugurating years for research at Victoria University. We have built our successes on the foundation of a University-wide research community with broad links into the community. These fields not only identify areas of research excellence at Victoria University but they enable the University to be acknowledged externally for its achievements.

The University worked coherently through the year to identify and focus its research to develop into areas of research strength. The Annual Research and Research Training Management Report to the Federal Minister for Education requires the identification of the University’s areas of research strength and areas of emerging research strength. The criteria used for classifying these areas are a combination of research income, publications, numbers of staff and students involved with the activity, and peer perception of the University’s strengths. Victoria University has two areas of research strength that have international standing:

- **Strategic Economic Studies**
- **Environmental Safety and Risk Engineering**

Two other fields of endeavour are research strengths with national standing:

- Rehabilitation, Exercise and Sport Science
- Telecommunications and Microelectronics

Each of these five areas is supported by a strong University Research Centre. In addition to these fields, the University has identified six areas of emerging research strength:

- Corporate Governance
- Hospitality and Tourism
- Integrated Food Value Chain
- Medical Biotechnology
- Packaging, Transportation and Storage
- Social Diversity and Community Well-being.

These fields not only identify areas of research excellence at Victoria University but they enable the University to be acknowledged externally for its achievements.

The external research income received directly by Victoria University decreased to a small degree in 2002, mainly as a result of changes in funding for researchers based at the Austin Research Institute. External research income for research associated with the University’s Research Centres, Key Research Areas and Faculties was similar to 2001, including a large injection of funds from the Strategic Infrastructure Initiative (SII) funding pool, to extend the University’s experimental fire facility at Fiskville. The major sources of external research income continue to be derived from business and industry, in keeping with the University’s strategic focus on undertaking research that has application to the problems of society and our stakeholders.

Applications for funding under the first round of the Commonwealth Government’s Linkage Scheme for 2002 achieved a 53% success rate at Victoria University. This success rate is close to the national average of 49%, and a result of which we are proud. Victoria University researchers were successful also in winning one new ARC Discovery grant and two NHMRC Project grants for 2002. Research income from the Cooperative Research Centres continues to be a significant source of funding accounting for some 7% of the University’s external research income, through the activity of three CRC’s, one of which ceased operation during 2002.

These outcomes are the result of tremendous achievements by our staff and reflect well for both our future research and the endorsement of our standing by our business, industry and community partners. In addition there was a significant increase in research income from international sources. Recent examples are projects with Ersson International and with AST Sports, both of which involve our staff in major international collaborations.

The University’s publication output increased significantly during 2002 with the publication of 9 Books, 262 Book Chapters and Articles, and 164 refereed Conference Proceedings. This output represents a 30% increase in Author Weighted Points (AWPs) over that for 2001.

Our postgraduate researchers are seeding the University’s areas of research strength with energy and new ideas, which will ensure the quality of the next generation of researchers and the outcomes they are able to produce. Doctoral examinations at Victoria University over the past three years reflect the calibre of our higher degree research students. In 2002, 72 higher degree by research students had their theses classified, 48 at PhD level. Of these, 21 theses were passed ‘without further examination’ or ‘with minor corrections’.

According to the most recent data, the majority of these graduates were employed, with most holding positions closely related to their field of study. We pay tribute to the persistence and the successes of our research degree graduates.

Readers will be familiar with the recent concerns of universities about the distribution of Commonwealth funds that support the training of postgraduate research students – the Research Training Scheme (RTS) pool. I think it is important to report that Victoria University’s share of the RTS pool increased by some $50,000 for 2003, and would have increased more had our income from this source not been subject to the 5% capping on the increases available to individual universities whose performance in research and research training is improving rapidly. In fact the University should have received an increase of some 19% in RTS funding.

The University’s researchers are to be congratulated on the excellence of their research achievements. They are dedicated researchers and research supervisors striving for excellence in their respective areas of expertise. Some of their achievements are recorded in the following pages.
THE EFFECT OF FIRES IN BUILDINGS

Researcher: Professor Ian Thomas, Centre for Environmental Safety and Risk Engineering (CESARE)

Fire safety in buildings is a complex issue which attracts much public concern, with more than 70% of the building regulations being related to fire safety. Incidents of fires are given major attention by the media; for example, chemical fires, subway fires, bushfires and the collapse of the World Trade Centre.

Recently Victoria University has developed a complex risk-based fire safety systems model which has identified that substantial benefits might be gained by further research into fire severity. Experiments at Victoria University have revealed that fire severity models in current use sometimes seriously misrepresent fires in rooms. Observation of flames from windows has usually been taken as an indication of what is happening throughout the enclosure. In reality, those flames may only be localized near the windows. There is a need to undertake experiments and develop new models that predict the actual behaviour of fires, and a Linkage Grant obtained from the ARC will enable this work to be pursued further.

The need and the value of the work at Victoria University was recognised in the Federal Emergency Management Agency report on the World Trade Centre buildings following the September 11 events. As stated in the report "Most of the research on fully-developed fires has been conducted in relatively small spaces with near-square floor plans. In such cases, the conditions (temperature of the smoke and incident heat on the enclosure) are relatively uniform throughout the upper portion of the space. However, Thomas and Bennetts have documented differences in that behaviour for ventilation controlled fires in long, thin spaces or in large areas. In such cases, the burning occurs in the fuel nearest to the supply source of air. Temperatures are observed to be greatest nearest to the supply source of air." And "More recently, Ian Thomas in Australia has demonstrated that the combustion process in facilities where there is a depth from the vent opening (e.g., broken windows) to the actual fuel can produce conditions where a large portion of the vaporized fuel actually burns at a point removed from the location of the solid fuel (combustible material) source. The importance of Thomas’ work is that it demonstrates the fact that, in many fires, the reality is that the fire exposing the structural elements is not necessarily a constant in either time or space."

The fires that occur in buildings are governed by the nature of the enclosures (rooms, corridors, stairwells, ceiling spaces, ducts, lift and other shafts, atria, tunnels, underground railway stations, etc) and the ways in which these enclosures are connected, the materials from which they are constructed (structure, lining material, etc), the structural systems used, and the use and contents of these enclosures. Understanding fire growth and development is important because it is the source of all of the threats that may result: to the building itself, to the contents, the occupants and to emergency personnel.

Conditions in enclosures vary widely, and these variations lead to the gas flow that transports air (oxygen) into the enclosure and fire gases out of the enclosure. This research has shown that rather than being uniform throughout an enclosure, the fire moves in the enclosure depending on the ignition point, the fuel type and distribution, the position of the openings and the shape of the enclosure. Importantly it was shown that the fire may move from one end of the enclosure to the other without consuming all of the fuel in its path and may then move back through the enclosure consuming the remaining fuel. This phenomenon is important in that it can lead to an appearance of two points of ignition, even though there was actually only one. The identification of two points of ignition is often taken as proof of a fire being deliberately lit and may result in rejection of insurance claims and conviction of a supposed arsonist.

Our ability to conduct such research will be further enhanced by the $2 million Systematic Infrastructure Initiative grant for the construction at our existing Fiskville facility of a Large Scale Experimental Building-Fire Facility. This collaborative development will result in the construction of a major national facility for large-scale fire research. It enhances the current facility and will enable us to conduct larger scale experiments for research into fire phenomena.

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WATER MIST AS A FIRE SUPPRESSION AGENT ON LIQUID FIRES

Researcher: Mr Tore Magnus Andersen, assisted by Professor Ian Thomas, Director, Mr. Michael Culton and Mr Robert Ralph, of the Centre for Environmental Safety and Risk Engineering (CESARE) and Mr Ian Burch from the Defence Science and Technology Organisation (DSTO) and CESARE initiated a project to investigate the fire suppression capabilities of a water mist system on volatile liquid fires, and Tore Magnus Anderson from Norway was chosen to undertake the Master of Engineering Degree in Building Fire Safety and Risk Engineering.

A set of tests was first conducted in a small-scale enclosure to provide important information about nozzle performance and set-up for a large enclosure. Prior to any water tests being undertaken, a reference test for each fire location was conducted using a small enclosure. The water mist configuration for the small enclosure consisted of two nozzles operating simultaneously, in the roof spraying vertically, or in the wall spraying horizontally. Each fire source location was then tested using both nozzle configurations, i.e. vertical and horizontal spray, and three different water pressures. Mass loss, temperature, air-flow and radiant heat flux were all recorded for each test.

With the information obtained from the small-scale testing a similar set of tests were conducted in a larger enclosure, to examine whether the results were comparable, or not, as the dimensions were increased. In addition to the same nozzle configurations, a third configuration consisting of four nozzles spraying vertically was tested. The major finding was that the horizontal spray was not as effective in the larger enclosure. The vertical spray managed better to control the fire in the large enclosure.

By analysing the data it was found that the water mist was very effective in absorbing heat and blocking radiant heat flux. As the testing progressed it became obvious that to achieve fire extinguishment, the oxygen content had to be lowered to a concentration that would not sustain combustion.

Some of the fire scenarios undertaken were later modelled using a computer program called FDS (Fire Dynamics Simulator). This model was used to visualise and illustrate flame behaviour, air movement and temperature levels within the enclosures.

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SMOKE PARTICLE DETECTION

Researcher: Darryl W. Weinert, PhD candidate, and Supervisor, Professor Ian Thomas, Centre for Environmental Safety and Risk Engineering (CESARE)

How many times have you been cooking only to have your home smoke detector inform you of the fact that you are cooking? Have you burnt your toast lately? These events remind us of the presence of the smoke detector, that it is in working order and can suffer nuisance alarms. Similarly, if you were a business manager with highly important equipment (e.g. bank computer facilities), the smoke detectors you install should be very sensitive. Unfortunately, the very sensitive nature of these detectors means that something as simple as cleaning might disturb dust that leads to a nuisance alarm. The alarm results in the fire brigade being called or a system shut down, costing the business time and money in disrupted service or production.

One solution to this problem is to discriminate between nuisance particles and smoke particles when they flow through a smoke detector. Currently, very sensitive smoke detectors simply measure the small amount of light scattered by a low number of smoke particles. This PhD research project was designed to investigate discrimination of nuisance and smoke particles. It was made possible with an Australian Postgraduate Award (Industry) in partnership with the world leading Australian manufacturer of very early smoke detection systems (Vision Systems, VESDA Division). At a later stage a great deal of the project was undertaken in the United States, where Darryl was invited to the prestigious National Institute of Standards and Technology (NIST), Building and Fire Research Laboratory, under their guest researcher program.

The research project first had to examine the differences between different smoke particles, since two different types of fire can create smoke. A smouldering fire has no flame and produces smoke particles that are similar in form to spherical droplets, as for example the way a cigarette burns. Flaming fire produces smoke particles (soot) that is quite complex in shape and largely made up of solid carbon. Soot particles scatter light in patterns that are very different to droplets. Even more intriguing is that soot’s complex structure is nearly universal, no matter what type of flaming fuel material it comes from.

The research has shown that this universal nature of light scattering by soot allows definite discrimination from other smoke and nuisance particles. Discriminating between nuisance particles and smouldering fire smoke particles was demonstrated for isolated examples, but could not be accomplished as universally or confidently as with flaming fires.

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Halon was used as a primary fire extinguishing agent because of its favourable extinguishing capabilities. However, it was recognised in the late 1980s that the use of halon contributed to the depletion of the ozone layer, and, as a result, halon was banned under the provisions of the Montreal Protocol. This resulted in a search to identify suitable alternatives.

The abundance of water, its lack of toxicity, and its environmental acceptability offered attractive incentives to pursue a water-based system. However differences in specific gravity allow the flammable liquids to float on water and continue to burn. Earlier research has shown that this problem can be solved by applying the water in a fine spray as opposed to a conventional sprinkler system.

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CHINA’S FUTURE IN THE KNOWLEDGE ECONOMY: ENGAGING THE NEW WORLD

Research Team: Professor Bhajan Grewal, Professor Peter Sheehan and Dr Fiona Sun, Centre for Strategic Economic Studies (CSES), Professor Lan Xue, Tsinghua University

In times of rapid economic and social change, many new concepts emerge as attempts are made to describe and analyse the process of change. Most of these concepts prove to be of limited value, referring only to a marginal aspect or to a passing phenomenon, and quickly drift from common use. The distinction between ‘new’ and ‘old’ industries, much beloved of market analysts during the high-tech boom, is a case in point. But it is increasingly accepted that the concept of the knowledge economy describes fundamental aspects of the present period of economic change. Quite new activities, structures and arrangements are emerging on a global basis, characterised above all by rising knowledge intensity in, and increasing globalisation of, processes for the creation, production and distribution of goods and services. This is described as the emergence of the knowledge economy.

This book is about China’s future in the knowledge economy. China’s economic performance has been very impressive in the past two decades. China’s economy emerged from the Cultural Revolution of the mid-1960s in a poor state. Agricultural and industrial production was down and the educational institutions had been closed for a decade. The real economic reforms began in the 1978-79 and the economy grew rapidly during the 1980s and 1990s. Between 1978 and 1995, China’s real GDP per capita increased at six times the average annual rate of the world. Against the background of this impressive record, the focus of this book is on highlighting the new challenges that the country faces now for maintaining the high rates of growth in the future.

In pursuing economic development in the 21st Century, China now needs to deal with quite a new world, the world of the emerging knowledge economy. The imperatives of this new world are quite different from that in which the advanced countries of the West achieved advanced economic status. Even the context in which the Asian Tiger economies shot to prominence during the 1980s and early 1990s has changed significantly. The driving forces of new technologies, global competition and market pressures are being felt in every aspect of China’s economy. The knowledge economy will provide the central context for China’s development, conditioning the possibilities available to it and shaping the challenges to which policy and strategy must respond.

To successfully exploit the new possibilities, China must develop policies and strategies that are based on a clear understanding of the new global trends and their impact on Chinese realities. Given that it will not be sufficient to rely on the experience of the developed countries, or to apply the established models of development that were successful elsewhere in East Asia, China must develop its own responses to the new challenges of the knowledge economy.

The phenomenon of the knowledge economy is quite new and our current understanding of what knowledge economy means for developing countries is still quite limited, as none of the developing countries has yet successfully integrated the features of the knowledge economy into its development experience. Neither the process nor the final destination is yet fully clear. It is thus appropriate that this book provides many voices – those of the distinguished Chinese academics and scholars, Chinese practitioners and policy-makers, leading experts from the OECD and the World Bank, and academics from Australia and several other countries.

The present volume is a major output from a research project funded by AusAID entitled ‘China and the Knowledge Economy’. The collaborating partners from China in the project were the Ministry of Science and Technology, Tsinghua University and the Chinese Academy of Sciences. It was co-published by the Centre for Strategic Economic Studies at Victoria University and Tsinghua University Press. Reflecting the importance of the contents of the book for China’s current policy debates, the Tsinghua University Press has decided to publish a Chinese language version of the book later this year. Professor Stephen Fitzgerald, who was Australia’s first Ambassador to China in 1973, launched the book in Melbourne in April 2003.

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So much of Australia’s manufacturing and infrastructure industries have been developed by immigrants, that it is still common today for immigrant workers to be characterised as ‘factory fodder’. In fact, this image is fast becoming outdated, as the supply of factory jobs keeps shrinking, service industries expand, many manual jobs become ‘upskilled’ and immigration policy continues to favour highly skilled, often professionally qualified migrants.

Industrial relations researcher, Santina Bertone, has found the situation can be confusing and may be misinterpreted by policy makers. On the one hand, most recently arrived immigrants are more highly skilled, often professionally qualified migrants.

The research will focus on the actual work experience, working conditions and issues dealt with by these distinct workforce slices, ranging from unskilled workers up to highly skilled and entrepreneurs. The research will concentrate on the actual work experience, working conditions and issues dealt with by these distinct workforce slices, ranging from unskilled workers up to highly skilled and entrepreneurs.

IMMIGRANT WORK EXPERIENCES IN AUSTRALIA

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THE INFLUENCE OF OCCASION ON CONSUMER CHOICE

Wine marketing, and in particular the influence of consumption occasion on consumer choice of wine, is the subject of this project, which utilised both qualitative and quantitative techniques to investigate consumer behaviour associated with wine choice. A non-probability convenience sampling method was employed to select respondents that had purchased and consumed wines in the previous three months and were over 25 years of age. The interviews were undertaken in Melbourne.

A qualitative research process called a means-end chain analysis was used to examine the linkages between personal values and consequences, and their relationship to product characteristics. This process allows an in-depth understanding of the factors that influence consumer choice and in particular permits an understanding of the values that drive the decision process across different consumption occasions. Occasion as part of a theoretical model of means-end chain analysis was investigated, and a conceptual framework of consumer behaviour relating to wine was developed.

In addition to qualitative tools, quantitative data was analysed using chain analysis. The primary purpose of using this technique was to investigate the possibility of occasion based segmentation. Although this was a non-probability sample, a good representation of key consumer characteristics was achieved. The sample consisted of 54.7% males and 45.3% were female participants. Within this sample a broad representation of all age categories was achieved.

The interviews produced 648 ladders for 356 occasions. The 356 individual consumption occasions were aggregated into eight specific occasions, namely an intimate dinner, dinner with friends, dinner with family, business related occasions, outdoor consumption such as a barbecue or picnic, a party or celebration, drink by oneself and a casual drink with friends.

This research has identified the important role that consumption occasion plays in product choice. It has demonstrated that the occasion/attitude in the theoretical means end model developed by Gutman, and in the conceptual framework of Olson and Thach, is a viable and applicable construct and was one that added to the ongoing development of the conceptual framework. The research has also demonstrated the potential for occasion-based value-oriented segmentation strategies and procedures. In particular the research has demonstrated the importance of consumption occasion and personal values in the purchase of wine.

The research has uncovered many insights relating to the importance of the combinations of attributes, consequences and values influencing wine choice on different consumption occasions. These provide numerous opportunities to wine marketers. A variety of applications has been developed as examples with regard to the promotion, positioning, and segmentation strategies that can be applied to different consumption occasions by wine marketers. John is conducting further research with Dr. Barry O’Mahony, also from the School of Hospitality, Tourism and Marketing on hospitality-related aspects of wine marketing.

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The study found that while the small businesses have diverse backgrounds and characteristics and operate in very different markets, there are many commonalities in their experiences and in the factors that helped them succeed in growing their business and commencing to export. The six case studies highlight the genuine entrepreneurial spirit of small business owner-operators, and how this drive, coupled with their flexibility, resourcefulness and ability to identify opportunities, has been crucial to the initial success of their operations. The business-operators are very conscious of their customers and their needs, and they work hard to deliver a service that creates repeat business.

The small firms generally operate in niche markets and their unique products/services are seen as a strength. The operators place great importance on the development of skills of their staff in order to deliver good customer service and quality products. These firms were able to capitalise on the operators’ networks of contacts in generating sales opportunities and in accessing valuable information and support from government.

The studies indicate that there is no one set track to export success. It is possible for some to be born global, while others only contemplate export when confronted by a customer from another country seeking access to a particular product. The case studies also demonstrated that being small is not necessarily a barrier to involvement in overseas trade activity, especially if the principal and or a small number of staff have the requisite skills. The introduction of the internet, together with good communications and transport infrastructure, now makes it possible to sell product to customers around the world. It does require access to IT skills at the seller end to enable the process to commence, and a confidence to deal with the paperwork and regulations associated with the trading.

The report provides policy makers involved in the development of small business programs with some evidence of the many challenges and diverse conditions under which small business operates, particularly in the context of a competitive global marketplace.

This project was funded by APEC and supported by the Commonwealth Department of Foreign Affairs and Trade.

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INTERNATIONAL MUSIC PIRACY – INSTITUTIONAL AND ECONOMIC INFLUENCES

While Internet music piracy is a significant and growing phenomenon, physical sound recording piracy, which involves the mass production and smuggling of copyright infringing copies across national borders, remains the dominant form of music piracy. Estimates of PMS range from a low of 0% to 10% in the case of Australia and China respectively (2002).

The contribution of this research is the central role allocated to an affordability index (the ratio of legitimate price to average hourly earnings) and to the balance of trade in sound recording product. In simple terms, the affordability index measures the average number of hours an individual needs to work to generate the income required to purchase a legitimate copy of a sound recording. The model proposes that the higher the price-earnings ratio, the higher the residual (unsatisfied) demand for sound recordings. This residual demand represents a black market opportunity and raises expected profit for smugglers and distributors of pirated sound recordings. The model also sought to examine the perception that governments in countries that were copyright dependent (net-importers of domestic demand. For example, one country has a domestic demand of around 200 million units and a pressing capacity of 6 billion units [disc]. Much of this pressing capacity will likely satisfy purchase orders destined for the black market.

Using data for 84 countries, the research explores key factors thought to influence cross-country variations in sound recording piracy market share (PMS), defined as the proportion of the domestic market accounted for by pirate music product. Estimates of PMS range from a low of 0% to 10% in the case of Australia and China respectively (2002).

The study found that while the small operators are very conscious of their customers and their needs, and they work hard to deliver a service that creates repeat business.
Skeletal muscle is well known for its key role in the maintenance of body posture, locomotion and respiration, but lesser known for its function in insulin-stimulated blood glucose disposal.

The effectiveness of skeletal muscle as an insulin-regulated glucose disposal unit is markedly reduced in obesity and non-insulin dependent diabetes mellitus (NIDDM, type 2 diabetes), a progressive disorder often accompanied by obesity, which is claimed to be the most common metabolic disease in the world and is predicted to affect 1.15 million Australians by the year 2010. Clinical and experimental research carried out in the last 30 years has produced compelling evidence that (i) glucose transport into skeletal muscle is stimulated not only by insulin but also by contraction and (ii) physical exercise benefits individuals in whom the blood glucose disposal process is impaired. These findings have prompted a surge in the research efforts directed towards identifying cellular networks relating glucose transport to contractile events in skeletal muscle, identifying NIDDM/obesity-associated defects in these networks and designing drugs and/or exercise protocols for the management of impaired glucose homeostasis. The Muscle Cell Biochemistry team joined these efforts by embarking on a project aimed at investigating, at cellular level, the relationship between the contractile and glucose disposal-related functions of mammalian skeletal muscle from normal and diabetic/obese animal models, using single fibre/muscle cell preparations and a battery of sophisticated micro-analytical and functional tests.

A cognitive area to which the Muscle Cell Biochemistry group has been contributing steadily for the last decade is concerned with the molecular, structural and functional complexity of the mammalian and amphibian skeletal muscle tissue. Indeed, it is now widely accepted among myologists from various disciplines that skeletal muscle is not made up of identical cells (as implied by earlier paradigms), but of a variety of cell/fibre types that can be distinguished among other criteria by the molecular forms (isoforms) of myofibrillar proteins. So far, we have contributed to the field two important methods that allow analyses of myosin heavy chain (the molecular motor) and troponin C (a Ca²⁺-binding protein that plays a key role in the regulation of muscle contraction by calcium ions) isoform composition in muscle extracts and nanometre segments of single fibres from toad, rat and human muscles. Using this biochemical nano-technology we discovered, for example, that tonic and twitch MHC isoforms co-exist in amphibian (toad) muscle fibres. Currently we are investigating the physiological characteristics of these unusual biological hybrids.

The Muscle Cell Biochemistry Laboratory, a research unit started almost a decade ago by Associate Professor Gabriela Stephenson (then associated with the Department of Chemistry and Biology and currently a member of the School of Biomedical Sciences, Faculty of Science, Engineering and Technology), functions on the principle that, at this point in time, major cognitive leaps in our understanding of skeletal muscle function and dysfunction are most likely to come from a multi-disciplinary, single cell-based approach to muscle research. Consistent with this principle, the Muscle Cell Biochemistry Research group includes a biochemist/biophysicist (Gabriela Stephenson, group leader), a muscle cell physiologist (Ronnie Blazev, postdoctoral research associate), a chemist/biochemist (Brett O’Connell, final year PhD student), 2 exercise physiologists (Craig Goodman, final year PhD student and Justin Kemp, part-time PhD student) and a laboratory technician (Grant Barry, undergraduate student in a multidisciplinary course). In recognition of the contributions made to the field and the strength of its collaborative links with Australian, and overseas (United States and European) laboratories, Muscle Cell Biochemistry Laboratory has been, and continues to be, generously supported by highly competitive grants from the National Health and Medical Research Council (NHMRC) and the Australian Research Council (ARC).

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Building bigger muscles is the “whey” to go!

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The Muscle, Ions and Exercise Group (MIEG) was established in 2002 by Associate Professor Michael McKenna, six PhD students, Simon Sostaric, Ivan Medved, Robert Aughey, Eric Drinkwater, Aaron Pettersen, Kate Murphy; one MD student at The University of Melbourne; one Masters student, Jim Leppik; as well as several Victoria University students completing minor theses. MIEG has a very strong collaborative focus. Collaborators include academics and bioengineering staff within CRESS at Victoria University and from Deakin and RMIT Universities; clinicians from the Royal Melbourne, Austin and Alfred Hospitals; ... collaborators include academics and clinicians from Aarhus University and the Rigshospitalet in Denmark.

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Our research focus is to investigate electrolyte (ionic) regulation in skeletal muscle and in blood during exercise, with special applications in determining their role in skeletal muscle function at rest and in fatigue, importance in exercise limitation in disease and adaptability to physiologic stressors. The MIEG major research areas include investigating the effects of acute exercise and of chronic exercise (i.e. training) upon regulation of muscle and blood ions such as potassium, calcium and hydrogen ions; the role of skeletal muscle underlying exercise limitation in lung transplant recipients chronic renal failure; acute effects and adaptation of muscle ion regulation to physiologic stressors such as simulated altitude, antioxidants, drugs with clinical importance such as digoxin (heart failure), EPO (kidney failure). Highlights in 2002 include PhD graduation of Dr Steve Fraser. Publications include one book chapter, eight papers published or accepted for publication in prestigious international peer review journals, as well as four conference presentations. Major grants awarded in 2002 include M.J. McKenna, H Krum, R.I. Snow, and D Cameron-Smith for a project entitled "Acute exercise and digoxin effects on skeletal muscle Na+, K+-ATPase regulation, K+ homeostasis and fatigue in humans" from the National Health & Medical Research Council; of $170,000 (2003-04); MJ McKenna, M Carey, S Selig, A Hayes, J Carlson for a project entitled "Advanced Muscle Analytical System" from the Victoria University Research Infrastructure Block Grant of $70,000; and MJ McKenna for "Regulation of skeletal muscle Na+, K+-pump gene and protein expression in humans - effects of prolonged exercise", a Victoria University New Discovery Grant of $20,000.

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Whey is a naturally occurring dairy protein found in bovine milk. Our research has shown that whey isolate, the highest quality form of whey, improves the force development and energy production of isolated skeletal muscles. Furthermore, whey isolate also produces superior gains in lean muscle mass and strength in experienced weight lifters than the ingestion of the "other" milk protein, casein. In our recent follow-up study, experienced weight lifters were matched for strength and placed into one of four groups: creatine/carbohydrate (CrCHO), whey isolate (W), creatine/ whey isolate (CrW) or carbohydrate – only. All subjects undertook the same fully supervised eleven week weight training program and consumed 1.5 grams of supplement per kilogram of body weight per day. While all groups demonstrated increases in mass and strength, the CrCHO, W and CrW groups all demonstrated significantly larger gains in strength, lean mass and the cross-sectional area of the muscle cells. In addition, a highly significant correlation between the magnitude of strength gained and the increase in cell size was revealed. Thus, supplementation with a unique, 100% whey isolate formulation and creatine produced greater muscle growth, with the increases transferring into significant increases in functional strength.

Dietary strategies that enhance the results of resistance training and improve strength have important implications not only to athletes, but also to an ageing population and others that suffer from debilitating conditions that cause muscle wasting. The research team, with the support of AST Sport Science, is currently investigating the capacity of creatine and whey protein to reverse the effects of muscular dystrophy and ageing, and to improve recovery from muscle injury. The results from these studies will improve everyone’s ability to remain active and live better, longer!

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The Muscle, Ions and Exercise Group (MIEG) was established in 2002 by Associate Professor Michael McKenna, as a research group within the Exercise Physiology Unit, School of Human Movement, Recreation and Performance, and Centre for Rehabilitation, Exercise and Sport Science, Faculty of Human Development. The rationale for the formation of MIEG was to (a) increase interaction within the existing group members; (b) enhance understanding of group research activities and successes; (c) enhance the group research culture; (d) rapidly accelerate the group’s research productivity; (e) establish this as a premier international research group in this field.

Researcher:
Associate Professor Michael McKenna,
School of Human Movement, Recreation and Performance, and Centre for Rehabilitation, Exercise and Sport Science (CRESS)

Jo Ann Parkin, Chris Stathis, Jo Ann Parkin, (CRESS) and School of Biomedical Sciences

Our research focus is to investigate electrolyte (ionic) regulation in skeletal muscle and in blood during exercise, with special applications in determining their role in skeletal muscle function at rest and in fatigue, importance in exercise limitation in disease and adaptability to physiologic stressors. The MIEG major research areas include investigating the effects of acute exercise and of chronic exercise (i.e. training) upon regulation of muscle and blood ions such as potassium, calcium and hydrogen ions; the role of skeletal muscle underlying exercise limitation in lung transplant recipients chronic renal failure; acute effects and adaptation of muscle ion regulation to physiologic stressors such as simulated altitude, antioxidants, drugs with clinical importance such as digoxin (heart failure), EPO (kidney failure).

Highlights in 2002 include PhD graduation of Dr Steve Fraser. Publications include one book chapter, eight papers published or accepted for publication in prestigious international peer review journals, as well as four conference presentations. Major grants awarded in 2002 include MJ McKenna, H Krum, R.I. Snow, and D Cameron-Smith for a project entitled "Acute exercise and digoxin effects on skeletal muscle Na+, K+-ATPase regulation, K+ homeostasis and fatigue in humans" from the National Health & Medical Research Council; of $170,000 (2003-04); MJ McKenna, M Carey, S Selig, A Hayes, J Carlson for a project entitled "Advanced Muscle Analytical System" from the Victoria University Research Infrastructure Block Grant of $70,000; and MJ McKenna for "Regulation of skeletal muscle Na+, K+-pump gene and protein expression in humans - effects of prolonged exercise", a Victoria University New Discovery Grant of $20,000.

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The evolution of new telecommunication standards is increasingly leaning towards higher data transmission rates. The boundaries between digital and analog signal processing are impeding closer to the antenna, therefore aiming for a software-defined radio solution. This will allow more complex multi-standard mobile terminals design with multi-functionality, leading to higher power dissipation with reduced battery life. The IntelliCOOL architecture relates to intelligent functionality (Intelli) with the benefit of minimising power consumption (COOL) in the mobile terminals such as personal digital assistants, mobile phones, etc.

In terms of analog-to-digital converters (ADCs) of mobile terminal receivers, higher sample rate, lower power consumption and higher resolution are required. The pipelined ADC architecture has most successfully covered the wide resolution limits and data rate requirements for these terminal receiver architectures. However, even though set word-length pipeline ADC architecture could be a suitable device for the mobile receiver, it still has a distinct disadvantage when it comes to power consumption. ADC optimisation techniques could lower power consumption but will not reduce it to its most efficient level.

A solution is to use minimum resolution, and still meet the performance requirements of the next generation wireless terminal. To achieve this, interference signal powers need to be measured. The ADC then intelligently chooses the amount of resolution required to ensure the Signal-to-Noise Ratio (SNR) is met. This scheme will reduce power consumption, as it only utilises the required resolution as compared with traditional fixed complexity architectures. To solve this, a reconfigurable receiver ADC design is required, which will have a significant impact on battery life in the mobile terminal.

This research was further extended by combining the ADC with a filter, to see the effect a scalable filter, with variable filter lengths, would have on the reconfigurable ADC. The filter eliminates any interference received. The motivation for this design is that the filter in the mobile receiver is also one of the major components that consume vast amounts of battery power. An optimum balance between the ADC and the filter is achieved, optimising the power consumption between the two designs. This makes the architecture power efficient by only consuming minimum power to meet the signal-to-noise ratio of the system.

The fabricated chip will be tested at the Victorian Node of the National Networked Tele Test Facility (NNTTF). The $11.25 million facility was established with the support of the Commonwealth and State Governments of Australia as part of the Major National Research Facility. The Victorian Node is based at the Centre for Telecommunications and Microelectronics of Victoria University. This infrastructure provides engineers, scientists, researchers and innovators’ ability to comprehensively and interactively test very complex state-of-the-art integrated circuits, including advanced System-on-a-Chip technology. Presently, almost all the testing of the chips designed in Australia is performed overseas, with the distinct disadvantages of a risk of loss of Intellectual Property and time to market the product. The facility will allow the engineers, researchers and industry to test their chips locally and overcome the disadvantages.

The project was funded by an ARC Linkage grant, Semiconductor Technologies Australia (STA), Australian Telecommunications Cooperative Research Centre (ATCRC), Ericsson (Sweden) and the Heterogeneous Signal Processing Group.

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Tourism is seen as an important mechanism for enhancing development of a region. Within tourism, the role of events in the development charter is becoming increasingly important. While there has been some research investigating the impact of tourism on communities, little work has been undertaken on the social impact of events on communities.

Victoria University’s Centre for Hospitality and Tourism Research is currently conducting a Cooperative Research Centre for Sustainable Tourism study entitled “Assessing the Social Impacts of Events” with Griffith University and University of Queensland. The study documents a host community’s perceptions of the impacts of the Horsham Art Is…?? Festival compared with other events staged in Melbourne, including Moomba and the Grand Prix. The study utilises a combination of quantitative and qualitative techniques, in an effort to gain insight into the impact the event has on quality of life for local residents.

This research attempts to provide a generic framework to assess impacts. While investigations into the social impacts of tourism have taken place, many have taken place in different contexts with varying research methodologies, making it difficult to attribute variations in community reaction solely to the variations in the tourism industry. This study therefore examines how residents of the same community perceive the impacts of different types of events, compares the reactions of residents of a small regional community with those of a large urban community, and investigates the ways in which various subgroups within communities react to different types of events.

The study has developed an instrument to assess the social impacts of events on local communities, and, in addition, has produced a technical report synthesising the literature on social impacts of tourism activities. The research instrument identifies event management strategies that can be implemented to enhance the net social benefits of events for local communities. It is anticipated this research will underpin new events and modification of existing events in order to promote social benefits and minimise social costs, and to contribute to a research agenda to optimise social benefits of tourism in general.

Funding support was received from the CRC for Sustainable Tourism, and industry support was from Tourism Victoria and the City of Melbourne. Three Universities collaborated in the project: Victoria University, Griffith University and University of Queensland.

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Foresting tourism arrivals used to be reasonably straightforward. From 1975 tourism began to boom worldwide and it was a question of picking the rate of growth.

Then in the early 90’s with the first Gulf War it became apparent that travellers were sensitive to risk. The new mass markets were no longer the young risk takers but families. Tourism declined sharply and the forecasters were wrong for the first time.

New forecasting models were examined that could build in sharp fluctuations (interventions). Tourism growth and accurate forecasting returned. Then in 1997 Asia... crisis set in Indonesia and arrivals in this major growth region faltered and declined. Again the forecasters were wrong.

From 1998 tourism forecasting became more sophisticated and based in three major tourism research schools including Victoria University. The authors aided by Dr Nada Kulendran and Mr Hubert Fernando and several PhD students began experimenting with a range of new techniques. Models not only capable of interventions, but also able to handle combinations of explanatory variables and time series factors, were developed. In 1999 the authors published a leading series of short-term forecasts. These new forecasters anticipated sharp changes, and were short-term. This was just in time for September 11, 2001.

The industry declined rapidly in late 2001 but our forecasts had already indicated downturns based on problems in the airline industry. These new short-term forecasts became the only reasonably accurate forecasts available. On October 12, 2002 the Bali bombing struck another sharp regional blow, and the authors quickly reconfigured their models. The short-term forecasting methodology had shown its flexible power, and tourism forecasting was not sidelined by uncertainty.

In 2003 the second Gulf war was successfully forecast in timing and extent of impact on tourism. The previous understanding of war impacts enabled an accurate decline and recovery process to be built into the latest forecasts. Then SARS hit, totally unpredicted. Previous flu epidemics had not impacted on tourism. This new health based intervention still requires measurement, and it is currently becoming apparent that health based risks cause a more rapid decline in travel and slower recovery than war or terror based risks. However, in the future these uncertainties will also be modelled, as tourism forecasting moves to a new stage, again under development here at Victoria University.

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Techniques are being used to follow the genetic events occurring in yeast during ethanol challenge. To identify the key molecular responses to ethanol stress, a novel experimental approach has been adopted to overcome the typical problem of a large number of candidate genes appearing in the data, many of which do not have a major or direct role in promoting stress tolerance. Gene expression will be measured, not only during a normal ethanol stress, but also during ethanol stress in the presence of a known chemical stimulant (that stimulates stress adaptation) and in mutant yeast with improved ethanol tolerance. Triangulating the data from all three experiment types should eliminate most genes having a minor or no role in yeast tolerance, while defining a common gene pool having a crucial role in ethanol tolerance. To date gene expression has been characterised during a typical ethanol stress; the results have been submitted for publication. Macoarrays have been conducted on the ethanol stress response in the presence of the chemical stimulant and are currently being analysed; preliminary results were presented at a recent international genetics conference in Sweden.

Ethanol stress tolerant mutants have been made and their molecular response to ethanol stress will soon be characterised. The results of this work will be used to design molecular probes for identifying cells with inherently high stress tolerance and to develop programs aimed at increasing microbial tolerance to ethanol stress. This research will contribute to our understanding of cell stress and how to reduce its damaging effects, potentially increasing fermentation productivity and ethanol yields, increasing the market competitiveness of the brewing industry and fuel alcohol production.

External funding of $201,800 has been obtained for this program through two ARC SPIRT grants in collaboration with Carlton & United Breweries.

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Fermentation is one of the oldest biotechnological processes harnessed by society. It is generally associated with the production of beverages, but in recent times it is being used for the production of fuel alcohol, a renewable, environment-friendly fuel of the future. Yeast and bacteria perform a critical role in fermentation by metabolising the sugars in the culture medium to produce ethanol. The accumulation of ethanol during fermentation, however, reduces productively, eventually shutting down the fermentation altogether. This occurs because ethanol is toxic to the microorganism, with its toxic effect escalating with increasing ethanol concentration. Ethanol toxicity has financial and logistic impacts on the fermentation process by slowing fermentation rates, reducing ethanol yields, escalating fermentation turnover periods and limiting microbial lifespan.

Victoria University, in collaboration with Carlton & United Breweries, is using state-of-the-art molecular biology techniques to examine ways of reducing the impact of ethanol inhibition on fermentation performance. The research is focused on improving the inherent protective mechanisms used by yeast to combat the inhibitory effects of low ethanol concentrations; higher ethanol levels subdue the effectiveness of these built-in protective responses. Since little is known about these protective mechanisms, the first step is to identify and characterise the key genes responsible for defending the yeast cell from ethanol damage. To do this, macoarray and microarray techniques are being used to follow the genetic events occurring in yeast during ethanol challenge. To identify the key molecular responses to ethanol stress, a novel experimental approach has been adopted to overcome the typical problem of a large number of candidate genes appearing in the data, many of which do not have a major or direct role in promoting stress tolerance. Gene expression will be measured, not only during a normal ethanol stress, but also during ethanol stress in the presence of a known chemical stimulant (that stimulates stress adaptation) and in mutant yeast with improved ethanol tolerance. Triangulating the data from all three experiment types should eliminate most genes having a minor or no role in yeast tolerance, while defining a common gene pool having a crucial role in ethanol tolerance. To date gene expression has been characterised during a typical ethanol stress; these results have been submitted for publication. Macoarrays have been conducted on the ethanol stress response in the presence of the chemical stimulant and are currently being analysed; preliminary results were presented at a recent international genetics conference in Sweden.

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Many of the common materials used as cushions to protect goods in transit are not all that friendly to our environment. Much of the cushioning material is not easily recycled and ends up as solid waste. Over the past several years, researchers at Victoria University’s School of Architectural, Civil and Mechanical Engineering have engineered a sophisticated protective packaging system based on recyclable paperboard.

The fundamental element of the cushioning system is based on multi-layered corrugated paperboard which is structurally conditioned to produce the desired mechanical compliance characteristics. Extensive tests have shown that the cushioning system (produced under the brand Envirocushion®) is ideally suited for engineered packaging applications where specific levels of protection against environmental shocks and vibration are required. Tests have also revealed that the cushioning system retains its mechanical function and therefore provides significant levels of reliability. One significant advantage of the paperboard cushion is that it can be re-used or recycled together with the host paperboard container through one single recycling channel. Furthermore, as the paperboard cushion does not require the superior structural properties of paperboard containers, it can be manufactured entirely with recycled paperboard. One recent application of this cushioning system has been with the development of a packaging system for early warning smoke detectors manufactured by Vision Fire and Security. The use of the paperboard cushion afforded a number of distinct advantages such as firstly, a significant reduction in overall package volume, hence smaller transport costs; secondly, procurement of both the container and the cushioning system from a single supplier and finally, a considerable saving in manual labour costs associated with assembling the packaging system.

One of the expected benefits of this approach to packaging is the positive effect on end-users and consumers when they are dealing with packaging material, especially with regard to issues associated with reuse, disposal and environmental effects. This achievement has resulted in the authors (together with Micor Packaging and Vision Systems) being granted the Silver Award for Industrial Packaging (2002) by the Packaging Council of Australia.

Conventionally, cushion design requires the determination of the maximum expected shock levels or drop heights as well as their probability of occurrence. These are usually determined from statistical analysis of original field measurements or published drop height distribution data. With this conventional approach, it is acknowledged that the cushioning element will provide adequate protection for statistically likely events, such as repetitive smaller shocks, but not for extreme, statistically unusual, events.

Recent research effort has been focused on investigating the potential for using the initial deformation characteristics of virgin corrugated paperboard as an additional protective element for extreme impacts and drops. This approach is analogous to the crumple zone effect, whereby one or more sacrificial paperboard component is designed to offer additional protection against extreme impacts and drops, by irreversibly absorbing much of the energy produced by the resulting shock by permanent deformation of the cushioning material. Our research has shown how multi-layered corrugated paperboard lends itself to this type of sophisticated protective packaging system, by combining pre-compressed and virgin elements to provide an effective solution.

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Why is it that we all become so hostile when we hear of the collapse of companies such as HIH and FAI? No-one can legislate success or how to make a profit. Genuine mistakes or lack of competence can, if reluctantly, be forgiven. What makes our blood boil is when we hear of the excesses and extravagances of the leaders of the firms, when false and even fraudulent reports are made to shareholders, and especially when our life savings are lost. All sections of society are calling for a curb on the opportunities for these to happen. One response is to improve the governance and ethics of major corporations.

Governance concerns the behaviour, decisions and responsibilities of the leaders of organisations. In the private sector this refers to the Boards of Directors; in other organisations it refers to the people who exercise control and power in determining the direction and policies that guide an organisation.

The Centre for International Corporate Governance Research (CICGR) has been closely monitoring recent national and international developments in the area of corporate governance, as well as international efforts to find solutions to the root causes of some of these problems. Work is also occurring in regard to public sector corporate governance issues, such as government tendering and audit practices.

During the past year the Centre, through Professor Anona Armstrong and Professor Ronald Francis, in conjunction with Crime Prevention Victoria (CPV), received an ARC grant to evaluate the community governance of crime prevention and community safety. This research aims to evaluate the Safer Streets and Homes program using both in-depth data analysis and focus groups. It questions the theoretical assumptions underlying the program; identifies effective and cost-effective community governance structures and factors that enhance or inhibit a community’s capacity to participate in, and respond to, community safety initiatives; and evaluates the impact of the program on the incidence of crime and perceptions of safety and security.

The project uses both in depth quantitative data analysis and qualitative methodology and will continue over a three year period. In the first year, the project Advisory Committee was formed which consists of the University and Department of Justice project team as well as individuals from other organisations and government departments. Project work in the first year has included extensive literature searches, obtaining quantitative data and building up computer databases related to crime rates and community indicators, community resources and community participation for all 78 Local Government Areas (LGAs) in Victoria. Five papers related to the evaluation of the community governance of crime prevention and community safety, social indicators, ethnicity and crime, and community capacity and participation have been written, or are in progress. Further work over the next year will involve examining documents from 32 LGAs with safety plans, interviewing key informants and conducting discriminant analysis of LGAs to identify LGAs with different profiles. The evaluation will lead to the development of models of community governance that can guide the ways in which to most beneficially build community capacity. These models will be implemented in 3 high crime rate areas. Interviews with key informants, focus groups and use of participant observation at Plan Meetings are being undertaken to determine which strategies are successful for different types of communities. In year three, the project will focus its efforts on a quasi action research experiment to test the models.

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Isoflavones are predominantly found in soybeans and non-fermented soyfoods as biologically inactive glucoside conjugates, which comprise 80 – 95% of the isoflavone concentration. Recent research has shown that isoflavone aglycones in soy foods are absorbed faster and in higher amounts than their respective glucosides in humans. Intestinal bacteria chemically change daidzein to equol, which is more estrogenically potent than its precursor. Isoflavones are predominantly found in soybeans and non-fermented soy foods as biologically inactive glucoside conjugates, which comprise 80 – 95% of the isoflavone concentration. Recent research has shown that isoflavone aglycones in soy foods are absorbed faster and in higher amounts than their respective glucosides in humans. Intestinal bacteria chemically change daidzein to equol, which is more estrogenically potent than its precursor.

Bifidobacteria are able to metabolise in hexanal and pentanal and reduce the off-flavor. Soybeans contain trace amounts of mono-saccharides such as glucose and arabinose and measurable amounts of di- and oligo-saccharides with sucrose in the range of 2.5 to 8.2%, raffinose 0.1 to 0.9% and stachyose 1.4 to 4.1%. The latter oligosaccharides contain fructose, glucose and galactose as two or more units linked by β-fructosidic and α-galactosidic linkages. Several strains of bifidobacteria possess α-galactosidase activity, which can hydrolyse raffinose and stachyose. Breakdown of oligosaccharides with bifidobacteria will decrease the level, or completely eliminate stachyose and raffinose, thus eliminating the potential cause of flatulence for consumers.

**INTEGRATED FOOD VALUE CHAIN**

Fermented foods containing selected strains of bifidobacteria are claimed to provide several prophylactic, probiotic, and therapeutical benefits. Bifidobacterium species are natural inhabitants of the gut of many animals including man. Fermented dairy foods containing Bifidobacterium sp. are well-established in a number of countries in Europe and also in Japan, and the products are gaining popularity in North America and Australia.

Soybeans have been one of the most important nutritional sources for oriental people for many centuries due to high protein content, well-balanced amino acid pattern and high unsaturated fat content. One of the main objections to soymilk is its beany flavour due to the unpleasant off-flavour of n-hexanal and pentanal, which are naturally present in soymilk. Bifidobacteria are able to metabolise humans and pass on to the colon where they act as substrates for colonic flora, in particular bifidobacteria. Probiotics are ‘complex sugars that are not metabolised by humans and pass on to the colon where they act as substrates for colonic flora, in particular bifidobacteria’.

Several strains of bifidobacteria possess α-galactosidase activity, which can hydrolyse raffinose and stachyose. Breakdown of oligosaccharides with bifidobacteria will decrease the level, or completely eliminate stachyose and raffinose, thus eliminating the potential cause of flatulence for consumers. Bifidobacteria are able to hydrolyse the biologically inactive glucoside forms of isoflavones found in soybeans via β-glucosidase, and release bioavailable, and bioactive aglycone forms. Aglycone forms of genistein, daidzein, glycitein and daidzein metabolite equol are structurally and functionally similar to human estrogens.
Some of the intriguing questions in legal research have to do with how things come to be called law, and how they are experienced, and with what effects.

Legal research is not just about looking up past cases and statutes – an activity recently described as ‘finding the law’. Law often reflects norms of behaviour and living that have been formulated as a result of the calculating and measuring techniques in the human sciences. Philanthropy and charity work were gradually replaced in the 19th century by a new learning that moved beyond individual classrooms. This involved investigating their own learning and practice through action research, identifying student learning and the impact of technology use and identifying organisational learning strategies that would ensure new learning moved beyond individual classrooms.

This study investigated the professional learning conditions that led to teachers moving beyond technical competence with ICT, to more effectively preparing students for the challenges of a rapidly changing and increasingly technological world. With Victorian Department of Education funding for additional teacher release, 13 teachers from 6 schools (primary and secondary) agreed to work in a collaborative research partnership over a 2 year period. This involved investigating their own learning and practice through action research, identifying student learning and the impact of technology use and identifying organisational learning strategies that would ensure new learning moved beyond individual classrooms.

When teachers are provided with time and the opportunities to systematically investigate an aspect of their practice, visit and engage in each other’s classrooms, work collaboratively with their peers and engage in critical reflection, then change and learning move beyond the technical dimension. Of particular importance are strategies for critical reflection that move beyond descriptions of practice and events to encourage wonderings, sense making, self-confrontation and rethinking. In this environment, teachers become confident professionals, capable of making informed decisions about innovations and of inspiring their colleagues to participate in the genuine, energised learning communities.

The dominant uses of ICT that teachers focused on for this study were using the World Wide Web for research, engaging in online projects, developing animation as a medium for communication and using ICT to develop literacy and numeracy. It was discovered that a multiliteracies perspective assisted the group to move beyond the technical dimension of learning and develop vocabulary and thinking frameworks that enabled student reflection and critique of both the medium and the message. This meant developing students’ technical facility with multi-modal communication – print, graphics, photographs, video, animation, voice, music, sound-effects — while at the same time contextualising such learning in relevant social, cultural, historical, political and futures contexts. Of particular interest was the finding that students who were seen as ‘strugglers’ in the traditional literacy domain [print] produced multi-modal work that was perceived by both their teachers and peers as of superior quality. This consequently was perceived by teachers to increase their status amongst their peers. This study also identified the importance of remaining focused on the humanity of social interaction which can sometimes be masked, reduced or lost when communication takes place through a machine.

This research was conducted with support from an Australian Postgraduate Award.

Email contact details: morourke@sprint.net.au

Maureen O’Rourke, formerly PhD student in the School of Education, new Director, Global Futures (Aus), and Supervisor, Professor Maureen Ryan, School of Education.
There is much talk about a globalising world, but not much of this talk is translated into practice, with obvious benefits at the grassroots level, apart from identifying the negative impacts of globalisation on people’s lives. This research, part of the requirements for the PhD degree supervised by Professor Allan Patience and Dr Helen Hill, elaborates on the perspective of a popular environmental educator in contributing to this practice. In the first instance it is based on an extensive evaluation of the educational practice of a respected environmental non-governmental organisation, the Center for Environment Concerns-Philippines (CEC). Established in 1989 by the progressive federations of peasants, fishers, women, indigenous peoples, and students, CEC’s main task was to develop an environmentalism that was responsive to the needs of a social movement for change and development in the Philippines.

The research examined the development over a ten year period of CEC’s practice of successfully educating Filipinos in rural communities about their local environment and the impact of globalisation. This educational practice was described by the Asian Development Bank in 1991 as “unique in the Philippines in the degree of emphasis placed on the education process and the innovations being explored with creative and exponentially based learning techniques. This is participatory non-formal adult environmental education at its best.” CEC described this educational practice as progressive contextualisation.

The research proposed a definition of progressive contextualisation that challenges educators to view educational practice as a developmental process, informed by a creative tension between a wide range of local factors and a dynamic global context. Such educational practice situates itself within other social change initiatives, such as grassroots research, organising, and advocacy.

Throughout his research Dr Guevara maintained his involvement with the Philippines and established new links in Australia, which facilitated the application of his research findings in a wide range of settings. These include the design and conduct of Environmental Education Study Tours to the Philippines, through the Australia-Asia Pacific Institute of Victoria University and the Catholic Education Commission of Victoria; the development of context-based HIV/AIDS education workshops for gay Asian men, for the Victorian AIDS Council; and the design of leadership programs for adult and community educators in the Asia and Pacific regions, through the Asian and South Pacific Bureau of Adult Education. But more importantly, he continued to involve the CEC and its local partner organisations in the Philippines, who have benefited from an understanding of an educational practice that contributes to learning and action across the local and global levels.

Email contact details: ianed@alphahere.com.au
Allan.Patience@vu.edu.au

Sense of community can be considered to be about belonging to a place and a people, having a shared identity, looking forward as a cohesive group. Membership of a community can provide a lot of social support and positive mental health outcomes.

In Australia, we strike a balance between the community represented by the dominant culture inherited from British based traditions, and the communities of the many immigrant groups who have arrived over the years. For the future of Australia as a community, this balance must be struck with a valuing of the old and the new. Two major strands are incorporated in this research program. One is the exploration of Australian identity among members of the community. The other is that role that ethnic communities play in the adjustment of immigrants groups.

To explore Australian identities, an open-ended discursive interview approach was used to discover the narratives, symbols, and histories that people share in building their common identities as members of the community. In this way, the positives and negatives, stories and events, real and imagined history, ways of life and physical features of the country, are considered and articulated. This provides a shared vision of what it means to be an Australian, and the features of life that reinforce such an identity. It also shows ways by which people could be excluded or included, and how these can be manipulated for political ends, by excluding and even vilifying some ethnic groups.

The second strand of the research has shown ways by which people could be included or excluded, and how these can be manipulated for political ends, by excluding and even vilifying some ethnic groups. By combining the strands of research, we can see that the different communities assist in the development of people who are better adjusted to life in Australia. But we also recognise the need to place an importance on each of the communities and their development over a ten year period of CEC’s practice of successfully educating Filipinos in rural communities about their local environment and the impact of globalisation. This educational practice was described by the Asian Development Bank in 1991 as “unique in the Philippines in the degree of emphasis placed on the education process and the innovations being explored with creative and exponentially based learning techniques. This is participatory non-formal adult environmental education at its best.” CEC described this educational practice as progressive contextualisation.

Email contact details: Adrian.Fisher@vu.edu.au
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We all know, roughly, why the Soviet Union collapsed and when the bolts on the Iron Curtain were loosened. Just as we all know that the Cold War has ended. Or has it? One of the defining features of the domestic Cold War in America – McCarthyism – has recently resurfaced. Opponents, especially in the film industry, of George W. Bush’s war on terror and the war in Iraq found themselves pressured, marginalised and even blacklisted, just as they were fifty years ago. Patriotism, then and now, narrows the boundaries of tolerance.

Professor Deery observed, first-hand, such pressures for ‘100% Americanism’ when he spent much of 2002 in New York researching the Cold War. He had been awarded an international Fellowship at New York University to participate in a major three-year project, ‘The Cold War as Global Conflict’, and engage with leading scholars, from Budapest to St Petersburg, in this fast emerging field of research.

Our understanding of the Cold War has been transformed by access to new source materials from both East and West of the former ideological divide. Instead of being a one-sided enterprise, in which Anglo-American sources contributed most of our knowledge, and scholars, this has now become a genuinely international field of study, in which materials from Eastern Europe and the former Soviet Union are equally important in forming new approaches and challenging established truths.

Whilst in New York, his research also became more internationally focused. Comparative analyses of the impact of the Cold War enabled a more richly textured interpretation of the role of government security agencies and their effect on dissident groups and radical opinion.

One of the most exciting aspects of Cold War research is the sense of discovery. For example, knowing that he was amongst the first group of historians to examine a newly released, previously top-secret Foreign Office file on George Orwell in the UK archives, was spine-tingling. It contained the originals of Orwell’s hand-written letters in 1949, scrawled just after he finished Nineteen Eighty-Four and shortly before he died, informing Foreign Office officials of his readiness to collaborate with them in the fight against Soviet communism.

As the Cold War increasingly becomes a watershed in history and less a fact of life, more archival doors will be prised open to disgorge their occasionally startling contents. In this way our understanding will grow about how government policy was shaped during moments of high international tension – and this understanding carries clear lessons for wise decision-making today.

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SUSTAINABLE RIVER WATER QUALITY MANAGEMENT IN YARRA RIVER

Researchers: Dr Anne Ng formerly a PhD student in the School of the Architectural, Civil and Mechanical Engineering, now a Lecturer at the School of Engineering and Science, Swinburne University of Technology and Supervisor, Associate Professor Chris Perera, School of the Architectural, Civil and Mechanical Engineering

Sewage treatment plants across Melbourne may soon be able to manage their wastewater using an economical and sustainable treatment strategy. This PhD research project was undertaken to develop a generic modelling tool, which will enable authorities to simulate and accurately study the effects of river water quality, with different economic and sustainable wastewater management strategies, prior to their implementation. Such a strategy utilises the natural flow conditions in rivers, thereby reducing the level of wastewater treatment, as a substitute for additional chemical dosage.

Throughout this three and half year project, which was supervised by Associate Professor Chris Perera, Dr Ng received recognition for her research both nationally and internationally. She won the best student presentation award at the International Hydrology and Water Resources Symposium of the Institution of Engineers (Australia) in 1999 and was the runner-up in 2000 at the same conference. In 2001, she was the recipient of the Vice-Chancellor’s Citation for Excellence in Research. Her work was presented at the Sixth International Conference on the Modelling, Monitoring and Management of Water Pollution in Greece in 2001 as an invited presentation.

The research was undertaken in collaboration with Yarra Valley Water, the Environment Protection Agency of Victoria and Melbourne Water. A robust and well-calibrated water quality model was developed for the Yarra River in Melbourne. While the modelling technique developed in this research was generic, it could be applied to any river system with different data inputs. This model was calibrated using an advanced technique called genetic algorithm, which guarantees near-optimal parameters. In addition to model calibration, a detailed study of model parameter uncertainty was conducted, to identify the sensitive parameters of the water quality model. The developed model can be used to predict Yarra River water quality with an accuracy above 75% of the actual.

Varying wastewater treatment levels in different seasons were investigated using the developed Yarra River water quality model. The philosophy in this strategy was that during wet flows in winter (July to October) a reduction in treatment level from the standard level can be used, which can be counteracted with high dilution capacity in the river. On the other hand, during dry flows in summer (November to June), a standard level of wastewater treatment can be applied.

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IMAGING THE THREE DIMENSIONAL INTERNAL STRUCTURE OF A FIBRE BRAGG GRATING

Research Team: Associate Professor Greg Baxter, Associate Professor Stephen Collins, Daniel Kitcher, Nicoleta Dragomir, Dr Scott Wade, School of Electrical Engineering

The Optical Technology Research Laboratory (OTRL) was established in 1992. Since then it has been active in optical fibre research, graduating 16 PhDs, 3 MSc and 36 Honours graduates. It is part of the telecommunications and microelectronic area of research strength, located in the School of Electrical Engineering. It has active collaborations within the UK and France, with DSTO, as well as with Melbourne and Monash Universities. Currently its research activity has three focus areas: optical fibre sensors, microscopic characterisation of optical fibre devices and development of unique optical fibre amplifiers.

An optical fibre is a long cylinder of glass that has roughly the same diameter as human hair. When coated by an appropriate acrylic or polymer, the fibre can be very flexible, for example it can be safely wrapped around a pen. In the centre of an optical fibre is a very small cylinder of modified glass (about nine micrometres in diameter), which guarantees near-optimal parameters. In addition to model calibration, a detailed study of model parameter uncertainty was conducted, to identify the sensitive parameters of the water quality model. The developed model can be used to predict Yarra River water quality with an accuracy above 75% of the actual.

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The applied research conducted by the group of researchers at OTRL is focused on practical uses of optical fibre. This work continues to be fruitful, both in its application to industry and in the quality of its graduates.

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For telecommunication applications, different colours of light are sent along each fibre. In the near future there will be a demand for even more “colours” to be transmitted in order to increase the data carrying capacity of each fibre. In collaboration with researchers in Nice, France we are developing special fibres capable of increasing the brightness of certain of these “colours”.

When OTRL develops an optical fibre sensor we use special fibre into which we fabricate a device called a fibre Bragg grating. Our fabrication and measurement technique allows the accurate measurement of both temperature and strain. In collaboration with industry, we have used our devices to measure temperature, strain (and both simultaneously) in harsh environments including underground, and within electrical and optical cabling.

In a world first OTRL has imaged the three dimensional internal structure of a fibre Bragg grating. This work has the potential to have a significant influence on the quality of future gratings as we begin better to understand how the microscopic structure of the gratings contributes to the spectroscopic performance.

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RESEARCH AWARDS

The principal University Research Awards are the Vice-Chancellor’s Medals for Excellence in Research. In 2002 four medals were awarded, three to staff and one to a research degree graduate, in the categories of Staff Research, Research Team, Postgraduate Research Supervision and Postgraduate Research. To assist in furthering the work of the recipient, a cheque of $4,500 accompanies the medal. In addition, Citations for Excellence were awarded in each of these categories.

Vice-Chancellor’s Medals for Excellence in Research

1. Staff Research Category:
   Professor Philip Deery, Faculty of Arts Research in the area of Cold War studies, in which analyses of the nature and impact of the political and cultural conflict between alternative visions, between real or imagined enemies, carry significant lessons for the future.

2. Postgraduate Research Supervision Category:
   Michelle Grossman, Faculty of Arts Supervision of research theses in the areas of Literature, Culture and Communication, including creative arts theses.

3. Research Team Category:
   Wellness Promotion Unit Research Team, Faculty of Arts The focus of the Unit’s work is in evaluating and applying a unique model of community wellness to research practice. The model promotes prevention and early intervention in preference to sole reliance on individual psychological assistance.

4. Postgraduate Student Category:
   Dr Domenico De Clario, Faculty of Arts Research in the area of Cold War studies, in which analyses of the nature and impact of the political and cultural conflict between alternative visions, between real or imagined enemies, carry significant lessons for the future.

John Hall, Faculty of Business and Law Research relating to the development of theory as well as practical applications in the area of wine marketing in the hospitality industry.

Associate Professor John Orbell, Faculty of Science, Engineering and Technology Work in Environmental Research in collaboration with Australian Government Analytical Laboratories (AGAL), including work towards the development of Environmental Standards.

Category of Research Supervision
   Michelina Grossman, Faculty of Arts Supervision of research theses in the areas of Literature, Culture and Communication, including creative arts theses.

Dr Domenico De Clario, Faculty of Human Development Supervision of research theses in the areas of Literature, Culture and Communication, including creative arts theses.

Dr Wai Man Ng, Faculty of Engineering and Science Supervision: Associate Professor Chris Perera Thesis title: “Parameter Optimisation of River Water Quality Models Using Genetic Algorithms.”

Category of Research Staff
   Professor Philip Deery, Faculty of Arts Research in the area of Cold War studies, in which analyses of the nature and impact of the political and cultural conflict between alternative visions, between real or imagined enemies, carry significant lessons for the future.

Category of Research Team
   Wellness Promotion Unit Research Team, Faculty of Arts The focus of the Unit’s work is in evaluating and applying a unique model of community wellness to research practice. The model promotes prevention and early intervention in preference to sole reliance on individual psychological assistance.

LISTING OF SIGNIFICANT RESEARCH GRANTS RECEIVED FOR THE YEAR 2002

Professor A Armstrong, Professor R Francis, Dr I Dussuyer and Mr M Bourne, Centre for International Corporate Governance
   • Evaluating the Community Governance of Private and Community Banking
     Fund Source: ARC - Linkage Funding: $261,000 over 3 years Industry Partner: Department of Justice (Victoria)

Professor S Bhaskaran, Faculty of Science, Engineering & Technology
   • Product and Market Development: Pot Foods for Export to Asia
     Fund Source: Austrade Funding: $20,000 over 2 years

Professor P Boon, Faculty of Science, Engineering & Technology
   • Innovative Techniques for Managing Multiple Threats to High Value Aquatic Systems Project
     Fund Source: Land and Water Australia Funding: $201,169 over 3 years

Ms R Broadbent, Faculty of Human Development
   • Young People’s Reconciliation Project
     Fund Source: Dept of Immigration and Multicultural Affairs Funding: $52,500 over 1 year

Professor D Bruck, Faculty of Arts
   • Reducing Fire Deaths - A New Approach to Smoke Alarms
     Fund Source: ARC - Linkage Funding: $101,741 over 3 years Industry Partner: OneSteel Manufacturing Pty Limited

Professor D Bruck, Dr D Goodrick & Professor E Premkumar (Inscribed 31/12/02), Faculty of Arts
   • Community Based Coalitions for Safety, Health, Safety and Wellbeing: Development of a Best Practice Model
     Fund Source: VicHealth Funding: $85,940 over 2 years

Professor A Carey Innscribed 31/12/02, Dr A Hayes and Mr M Cooke, Centre for Rehabilitation, Exercise & Sport Science
   • To investigate the Efficacy of Dietary Supplementation on Parameters of Muscle Recovery and Regeneration from Damage
     Fund Source: ASTS Sports Science Pty Ltd (USA) Funding: $52,827 over 3 years

Professor A Carey Innscribed 31/12/02, Dr A Hayes and Mr Williams, Centre for Rehabilitation, Exercise & Sport Science
   • To investigate the Efficacy of Dietary Supplementation on Athletic Performance
     Fund Source: ASTS Sports Science Pty Ltd (USA) Funding: $49,525 over 2 years

Dr D Chairman, A/Professor A Fisher, Professor I Prilleltensky Innscribed 31/12/02, Professor B Mcavoy, and Ms M Field, Faculty of Arts
   • Research and Action in Medical Practitioner Wellbeing: Testing a Conceptual Model
     Fund Source: ARC - Linkage Funding: $82,640 over 3 years Industry Partners: Central Highlands Division of General Practice Ltd, Royal Australian College of General Practitioners

Dr E Cheng, Centre for Strategic Economic Studies
   • Qinghai Microcredit Consolidation Project
     Fund Source: Sagicor International Funding: $33,480 over 1 year

Dr P Clancy, Faculty of Science, Engineering & Technology
   • Approval of Performance-Based Building Designs
     Fund Source: CSIRO Funding: $9,390 over 3 years

A/Professor D Coleman and Mr T Tower, Centre for Rehabilitation, Exercise & Sport Science
   • Development Initiative Between Monash University in the Area of Community Participation in Sport and Recreation
     Fund Source: VicHealth Funding: $38,000 over 3 years

A/Professor S Dean, Dr C Leung and Mr Y Coull, Faculty of Arts
   • Challenging Discrimination - Berry Street Victoria
     Fund Source: ARC - Linkage Funding: $82,635 over 3 years Industry Partner: Glenstone Child and Family Services

A/Professor M Deery, Professor B King, and Professor L Jago, Faculty of Business & Law
   • Managing the Volunteer Workforce: Flexible Structures and Strategies to Integrate Volunteers and Paid Workers
     Fund Source: ARC - Linkage Funding: $82,635 over 3 years Industry Partner: Museum of Victoria National Museum of Australia

A/Professor M Deery and Professor A Roberts, Faculty of Business & Law
   • Audit of Food Management Safety
     Fund Source: Victorian Auditor General’s Office Funding: $38,280 over 1 year

A/Professor M Deery, Professor L Jago and Ms L Fredline, Faculty of Business & Law
   • Social Impacts of Special Events
     Fund Source: CRC for Sustainable Tourism Funding: $21,000 over 1 year

A/Professor M Deery, Professor L Jago, Ms A Hede and Dr S Diviskera, Faculty of Business & Law
   • Economic Impact Studies and Visitor Satisfaction Surveys
     Fund Source: Tourism Victoria: Definitive Events Bicycle Victoria: IMG Mildura Council Victorian Major Events Company Funding: $38,000

Dr S Diviskera, Faculty of Business & Law
   • Tourism Taxation
     Fund Source: CRC for Sustainable Tourism Funding: $84,000 over 3 years

Dr J Dougheany, Faculty of Business & Law
   • Developing Capable Communities
     Fund Source: Department of Treasury and Finance
Western Health Victoria University
Funding: $29,091 over 2 years

Dr J Doughney & Ms S Fidman, Faculty of Business & Law and Human Development
• Mature Age Workers
Funding: Commonwealth Bank of Australia
Funding: $60,000 over 2 years

Professor M Faulkner, Centre for Telecommunications & Microelectronics
• Deep Implementation of TDD Channel Select Filters
Funding: Ericsson Mobile Communications AB
Funding: $195,000 over 3 years

A/Professor A Fisher Implanting Professor I Prileitensky (Resigned 31/12/02), Faculty of Arts
• Promoting Well-Being in Culturally and Linguistically Diverse Groups: Towards Evidence-Based Practice
Funding: ARC – Linkage
Funding: $82,635 over 3 years
Industry Partners: Good Shepherd Youth and Family Service Inc.

Mr J Hall and Mr W Binney, Faculty of Business & Law
• Victorian Serrated Tussock Evaluation Program
Funding: Department of Natural Resources and Environment
Funding: $20,000 over 2 years

Dr C Hocking, Faculty of Science, Engineering & Technology
• Establishing Public Engagement Programs to Promote Ecological Sustainability in Outer Western Melbourne
Funding: William Buckland Foundation
Funding: $43,200 over 2 years

• Testing and Improving the Effectiveness of Best Practice Control of Chilasa Needle Grass in a Range of Practical Land Management Contexts Using Combinations of Competitive Replacement, Fire and Slashing
Funding: National Heritage Trust
Funding: $81,000 over 2 years

Professor J Houghton, Centre for Strategic Studies
• Changing Research Practices
Funding: Commonwealth Dept of Education Science and Training
Funding: $148,700 over 2 years

Professor T Merris and Professor T Teasman, Faculty of Human Development
• The Adoption and Maintenance of Physical Activity in 25-45 year Old Females
Funding: ARC – Linkage
Funding: $84,099 over 3 years
Industry Partner: VicHealth

Dr J O’Brien, Dr A McGrath, Ms M Shapley and Mr M Delia, Faculty of Human Development
• A Universal Approach to Sustainable Development: Economic, Environmental, and Social Indicators in Australia and Southeast Asia
Funding: ARC – Linkage
Funding: $124,000 over 2 years
Industry Partners: World Vision Australia Department of Premier and Cabinet

Dr K Kostaros and Ms D Cadillic, Faculty of Arts
• Coping in the Face of Life Adversity. A Model of Resilience for Stroke Survivors
Funding: ARC – Linkage
Funding: $46,290 over 2 years
Industry Partners: National Stroke Foundation

Professor I Prileitensky (Resigned 31/12/02) and Dr D Goodrick, Faculty of Arts
• Walking School Bus Program: Multi-Project Evaluation
Funding: VicHealth
Funding: $59,970 over 2 years

Professor I Prileitensky (Resigned 31/12/02), Faculty of Arts
• Promoting Wellness Through Social Justice and Social Action With Children and Youth
Funding: Morawetz Social Justice Fund
Funding: $10,000 over 1 year

Professor I Prileitensky (Resigned 31/12/02) and J Sharples, Faculty of Arts
• Promoting Family and Community Wellness: A Promotion, Prevention, and Early Intervention Strategy for the Spanish Speaking Community of Victoria
Funding: Federation and Community Services
Funding: $123,258 over 3 years

Mr B Rasmussen, Centre for Strategic Studies
• Identifying Export Opportunities
Funding: Department of Transport and Regional Affairs
Funding: $70,000 over 2 years

Dr V Bouilloud, Faculty of Science, Engineering & Technology
• Investigation of the Endurance Characteristics of Railway Interconnecting Hoses Due to Dynamic Loads
Funding: Werley Pty Ltd
Funding: $27,300 over 1 year

• Investigation of the Contact Pressure Distribution of All Terrain Crane Tyres
Funding: National Road Transport Commission
Funding: $22,441 over 1 year

A/Professor B Perera and Mr P Letchie, Faculty of Science, Engineering & Technology
• Use of Stormwater As An Alternative Supply Source Within Urban Environment
Funding: CSIRO
Funding: $46,647 over 2 years

A/Professor B Perera and Dr M Kularathna, Faculty of Science, Engineering & Technology
• Multi-Objective Optimal Operation of Urban Water Supply Systems
Funding: ARC – Linkage
Funding: $120,000 over 3 years
Industry Partner: Melbourne Water Corporation

A/Professor M Sek and Mr V Roulillard, Faculty of Science, Engineering & Technology
• Limitation of Hydrogen Assisted Combustion for Internal Combustion Engines
Funding: HAC Technologies Pty Ltd
Funding: $82,000 over 2 year

A/Professor M Shah, Faculty of Science, Engineering & Technology
• Stability of Bioactive Isolatones Agrocinones and Predolistic Bacteria in Soy Based Food During Processing and Storage
Funding: ARC – Linkage
Funding: $84,099 over 3 years

Industry Partner: Sanitarium Health Food Co.

Professor P Sheahan, Professor M Munasinghe, Dr S Islam and Professor A Philpott, Centre for Strategic Economic Studies
• Climate Change, Industrial Structure and the Knowledge Economy: Key Issues for An Effective Response On Greenhouse Gases
Funding: DEST Systemic Infrastructure Initiative (SII) Fund
Funding: $2,000,000 over 2 years

Professor I Thomas, Dr I Bennetts, Centre for Environmental Safety and Risk Engineering
• An Integrated Systems Analysis: Fire Growth and Severity in Enclosures
Funding: ARC – Linkage
Funding: $187,000 over 1 year
Industry Partners: Chadwick Group Pty Ltd

Dr P Wolfe, Europe-Australia Institute
• Racism Classifications in Transnational Context: Aboriginals and Islanders in Australia, Native Americans, African Americans and Afro-Brazilians
Funding: ARC – Discovery
Funding: $47,561 over 2 years

A/Professor M Xie (Resigned 10/07/02), Faculty of Science, Engineering & Technology
• Efficient and Robust Bi-Directional Multi-Project Analysis Method for Large-Scale Three-Dimensional Topological Design
Funding: ARC – Discovery
Funding: $165,000 over 3 years

A/Professor M Xie (Resigned 10/07/02), Faculty of Science, Engineering & Technology
• Development of Topological Optimisation Techniques For The Conceptual Design of Multi-Storey Buildings
Funding: ARC – Linkage
Funding: $82,635 over 3 years
Industry Partner: Facilities Pty Ltd
The University focuses its research activities, and strives for research excellence, in a number of areas where the University’s research strengths match the needs and interests of existing and potential external stakeholders. These areas, defined as programs associated with current University Research Centres, Key Research Areas (KRAs) and other major collaborations with Cooperative Research Centres (CRCs) and the Austin Research Institute, have been further refined to represent areas of international and national research strength, and of emerging strength. They are:

- STRATEGIC ECONOMIC STUDIES
  - Centre for Strategic Economic Studies (CSES)
  - Director: Professor Peter Sheehan
  - Phone: 9248 1341
  - Fax: 9248 1350
  - Email: Peter.Sheehan@vu.edu.au

- FIRE SAFETY AND RISK ENGINEERING
  - Centre for Environmental Safety & Fire Risk Engineering (CESARE)
  - Director: Professor Ian Thomas
  - Phone: 9216 8033
  - Fax: 9216 8058
  - Email: Ian.Thomas@vu.edu.au

- REHABILITATION, EXERCISE AND SPORT SCIENCE
  - Centre for Rehabilitation, Exercise & Sport Science (CRESS)
  - Director: Professor John Carlson
  - Phone: 9688 4111
  - Fax: 9688 4539
  - Email: John.Carlson@vu.edu.au

The University has been successful in recording an increase in the amount of external funding for research over the five-year period. Total external research funding has doubled over this period, with the greatest increase being funds from Industry and International sources.

Research Student performance, as indicated by effective full-time student load, has also increased, most notably in the area of Professional Doctorates and for the PhD, while there has been a slight decline in the category of Masters by Research.

Research Student completions, for both Masters and Doctorates, have shown an increase in 2002 over the 1999 figures.
<table>
<thead>
<tr>
<th>ACKNOWLEDGMENT OF OUR INDUSTRY PARTNERS</th>
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