



ChemEng *focus*

TEACHING AND RESEARCH NEWS FROM THE
DEPARTMENT OF CHEMICAL ENGINEERING,
MONASH UNIVERSITY

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DAIRY INNOVATION AUSTRALIA

Brown Coal Research Leader

Two Monash University researchers have been awarded \$8.5 million through a partnership between HRL Technology Pty Ltd, Brown Coal Innovation Australia (BCIA) and the University to tackle environmental challenges associated with the exploitation of brown coal.



Prof Klaus Hein, BCIA Research Leader Fellowship recipient. Prof Hein will join Monash later this year.

Professor Klaus Hein, who will join the Department of Chemical Engineering later this year, and Associate Professor Alan Chaffee (School of Chemistry) have been awarded

BCIA Research Leader Fellowships to investigate high-value, low-emission uses for Victoria's unique brown coal resource and to develop technologies to reduce and capture carbon dioxide emissions from brown coal electricity generation.

Senior Deputy Vice-Chancellor and Deputy Vice-Chancellor (Research) Professor Edwina Cornish said that "This essential research will assist in finding more environmentally friendly methods of using brown coal, which

have the potential to benefit communities in Australia and around the world."

Professor Hein's BCIA Research Leader Fellowship is Australia's first joint industry and university professorial appointment in brown coal technology. His research program will focus on advanced technologies for coal preparation, power generation cycles and the development of new low emissions products

from brown coal.

"The BCIA Research Leader Fellowships will also strengthen the linkages and complementary research capabilities of Monash University with HRL Technology's applied research, project development and industrial experience," Professor Cornish said. "The partnership between Monash, BCIA and HRL Technology is a positive example of what can be achieved when industry and the tertiary sector join forces for a common goal," she added.

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Mumbai-based students Saroj Yadav, Jubina Balan, Priyanka Gupta and Siddhart Gadkari with Vice-Chancellor Professor Ed Byrne.

A trans-national research experience

Mumbai-based students Priyanka Gupta and Jubina Balan have swapped laboratories in Mumbai for those at Clayton, Chemical Engineering.

As part of their PhD program with the IITB-Monash Research Academy, a joint initiative between the Indian Institute of Technology Bombay (IITB) and Monash students are required to spend six months of their study at the Monash Clayton campus. The students are jointly supervised by IITB and Monash. A recent intake resulted in 25 students being offered a place out of 1800 applications.

Their stay at Monash provides them with the opportunity to work closely with their Monash supervisors, further progress their PhD research, and also benefit from the use of Monash facilities. Upon graduation the students will receive dually-awarded degrees.

Priyanka said the opportunity to study outside of India meant she could further her research, while also experiencing a new culture.

Priyanka's work involves the design of a bioreactor to assist in the large scale production of stem cells for use in medical treatments.

"Stem cell research is a vast field with huge potential in a variety of biological areas starting from cellular therapies to maintaining biodiversity," Priyanka said.

"Stem cell research is in its nascent stage in India. The exposure to the world class facilities at Monash and fruitful interaction with the world renowned experts in the field has created a shift in my understanding of the science and has helped fast-track my research," Priyanka said.

My stay here has been a true all-round learning experience and I am going back with a lot more expertise, knowledge and confidence in my field of research," Priyanka said.

Jubina is developing a method to generate pluripotent stem cells without the integration of viral genes.

"Pluripotent stem cells are the cells which are seen during the early stage

of development of an individual and give rise to all the specialised cells and tissues of the body. These cells are of special interest in cell therapy, for treatment of various diseases like Parkinson's, Alzheimer's and diabetes," Jubina said.

"These early stage cells give rise to all the specialised cells like neurons, muscles and all the other cells of the body. So once a cell is committed to form a specialised cell it doesn't revert back into a stem cell."

Jubina is excited by the medical possibilities of stem cells and plans to continue research in this area through to a post doctoral career.

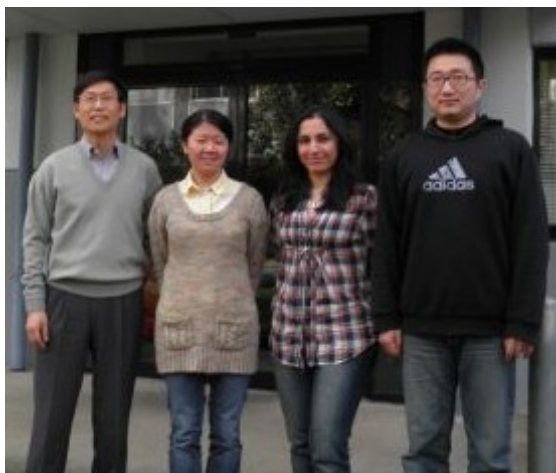
"After the completion of my PhD I want to earn a post doctoral fellowship and continue to pursue research. My aim is to apply all the knowledge and skills that I have gained throughout my PhD in the area of medical genetics and contribute something so that stem cells can be applied for cell therapy for various diseases."

Research into Liquid Marbles becomes a hot topic

Liquid marbles as a natural phenomenon are developing into a hot area of research as researchers begin to realise their potential engineering applications.

Three Monash Chemical Engineering students, Junfei Tian, Tina Arbatan and Xu Li, supervised by Associate Professor Wei Shen, have had their research into Liquid Marble published in Chemical Communications and highlighted by the Royal Society of Chemistry.

The research group has shown a new area of application of liquid marble in gas sensing and gas reaction. This idea will also lead to using liquid marbles as gas emitters and micro gas reactors. "The significance of this article is that it presents an intuitive application of the liquid marble that has been overlooked. This application takes advantage of the fact that liquid marble shell can only allow gas to diffuse through, not liquid. The liquid marble shell is therefore a natural gas-liquid separator which has important application implications".



L to R: Associate Professor Wei Shen, Xu Li, Tina Arbatan and Junfei Tian

Inexpensive sensors are becoming a key research direction of the group, as they realise that gas detection and sensing are also important.

"Our future research in this area will be to use liquid marbles to build micro reactors, since we have shown that gas transport between liquid marbles are possible. We will also investigate the use of liquid

marble as gas emitters; this property of liquid marble makes it possible to use gases as indicators for sensing and detection purposes".

The leader of Canadian's Sentinel Bioactive Paper research program, Professor Robert Pelton (McMaster University) commented that "It's a really good example of creative synthesis of disparate elements in the literature – marble preparation and chemical analysis".

Australia-India Research Funding

Prof Huanting Wang and Prof Paul Webley were awarded \$300,000 each by the Australia-India Strategic Research Fund,

Professor Wang's research aims to develop new carbonaceous polymer membranes for industrial separation including water desalination, carbon dioxide capture and natural gas purification - which will have important economic and social benefits for both Australia and India. He will be working with the Indian Institute of Technology Bombay.

Professor Webley's research proposes to develop advanced, low cost technologies for upgrading bio-gas to



pipeline quality natural gas and thus contribute to combating climate change. His Indian partner is the In-

dian Institute of Petroleum.

The AISRF was established in 2006 to facilitate and support science and technology research cooperation between Australia and India. The fund assists Australian researchers from both the public and private sectors to participate in leading edge scientific research projects and workshops with Indian scientists and supports the development of strategic alliances between Australian and Indian researchers.

2010 ALTC Outstanding Contribution to Student Learning



Dr Karen Hapgood, a Senior Lecturer in the Department of Chemical Engineering, has been awarded a 2010 Australian Learning and Teaching Council Citation for Outstanding Contributions to Student Learning. The citation recognises and rewards the diverse contributions made by Dr Hapgood to the quality of student learning.

Dr Hapgood received her citation “for using her industrial experience to mentor chemical engineering students to achieve their career aspirations and to prepare students for life after university.”

“Dr Hapgood uses her unique career background to illustrate the relationship between the chemical engineering course and engineering profession. She considers that students are the future leaders of chemical engineering and uses her engineering experience to ensure that her students understand the broader context of what they are

learning. She mentors and encourages individual students to reach their full potential as they embark on their new careers as graduate chemical engineers.”

For Dr Hapgood, receiving this acknowledgment is “fantastic recognition that my teaching and mentoring style really do add value – not just to the students I meet – but to the Faculty of Engineering and to Monash University as a whole.”

Receiving this award highlights “that Monash Engineering has some outstanding teachers – including many who have not yet been formally recognised, who teach not only the Engineering curriculum, but also encourage students to become part of the profession of Engineering,” says Dr Hapgood.

Apart from being passionate about teaching, Dr Hapgood is also passionate about her research on powders and granules, and encouraging women in engineering.



“for using her industrial experience to mentor chemical engineering students to achieve their career aspirations and to prepare students for life after university.”

Building stronger links with Sunway Campus

Professor Martin Rhodes and Professor Carlos Tiu are teaching chemical engineering at the Monash Sunway Campus in Malaysia. Martin and Carlos have taught at the Clayton campus for many years, and joined Sunway earlier this year as part of the teaching and research staff.

Martin was the Head of Department at Clayton before his retirement in 2008, and is currently Discipline Head at the Sunway campus.



Monash Sunway Campus, Malaysia

Both Carlos and Martin have a wealth of teaching experience that they bring to Monash Malaysia, and they are each currently teaching several units. Prof Rhodes’ experience was also invaluable during the recent successful accreditation visits by Engineers Australia and the Board of Engineers Malaysia.



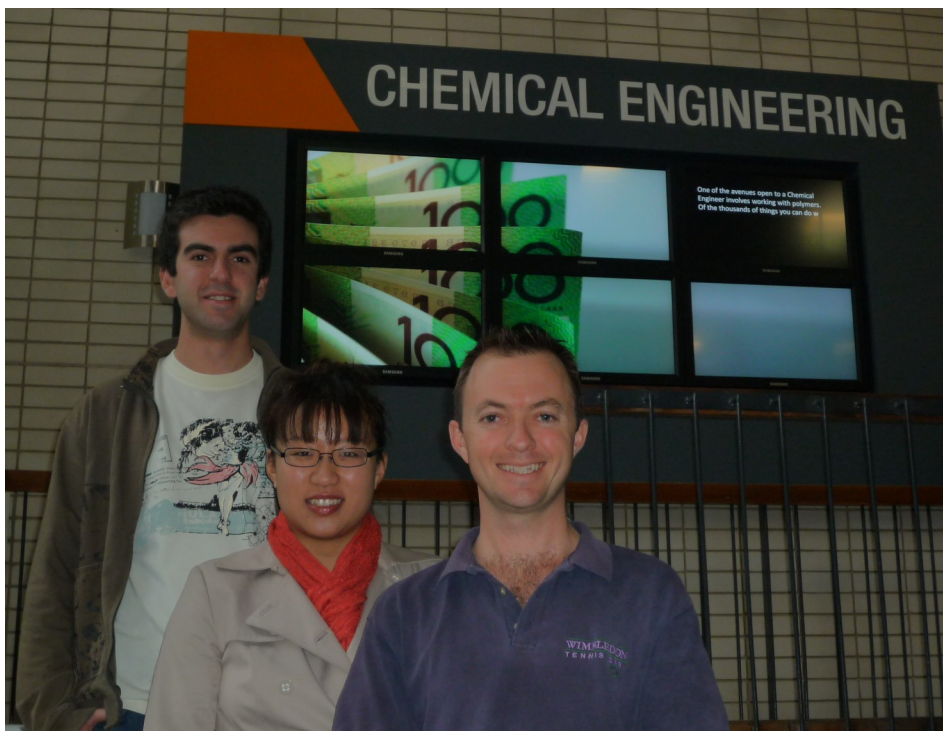


International Exchanges and Funding Success

Con Dimitrakakis, a new post-graduate student supervised by Dr Bradley Ladewig, has been selected to attend the 3rd Asia-Oceania Neutron Scattering Association (AONSA) Neutron School. The school will be held at the Bhabha Atomic Research Centre in Mumbai, India in October. The school comprises of lectures and practical sessions aimed at improving knowledge of neutron scattering techniques as an advanced material analysis tool amongst new and early-career researchers. Con hopes that the knowledge gained will assist with the development of highly selective gas separation membranes for a variety of applications.

Con has also received support from the Australian Institute of Nuclear Science and Engineering (AINSE) to attend the conference, including airfares and accommodation, as one of only five Australian postgraduate students to receive sponsorship.

As part of a project developing nanocomposite polymer membranes for bioelectrochemical wastewater treatment systems, PhD student, Rebecca Yee will study at the Institute of Urban Environments, a division of the Chinese Academy of Sciences (IUE-CAS) in Xiamen, China. Rebecca will stay at IUE for 3 months to utilise their unique facilities for membrane manufacture and characterisation. The international exchange will also assist in strengthening the ties between Monash University and their Chi-



L to R: Con Dimitrakakis, Rebecca Yee and Dr Bradley Ladewig

nese partners at IUE-CAS. Professor Kaisong Zhang from IUE-CAS is currently spending three months at Monash.

Rebecca's travel and accommodation will be funded by The Australian Research Council Nanotechnology Network, which provides funding support to postgraduate students for Overseas Travel Fellowships at collaborating research institutions.

Finally, Dr Bradley Ladewig was recently successful in two funding applications to the National Centre of Excellence in Desalination. The first of these projects is a collaboration between Monash University, The University of NSW, Victoria University, Dow Chemical, Sydney Water, WA Water Coproation, SA Water, and the non-profit organisation, Skyjuice.

This project with a total value exceeding \$850,000, will examine a variety of reuse options for spent reverse osmosis membranes, addressing what will be a critical issue in Australia and internationally as seawater reverse osmosis becomes a major supplier of water.

The second project, valued at almost \$1.4m, will evaluate a relatively novel membrane technology which uses oscillatory vibrations to enable the processing of extremely highly concentrated waste streams. This project is also a large collaboration, involving Monash University, Curtin University, WA Water Corporation, Orica Watercare, and New Logic Research Inc. and UTEP (both in the USA). A PhD student will be based in the Department of Chemical Engineering as part of this project, with frequent travel to Perth where the pilot project will be installed.

Leeds International Summer School 2010—Laura Aston

As I dutifully opened an email from SMUCE, I was amazed at the opportunity as I read the notice. There, in front of me, was an opportunity to attend the Leeds International Summer School and an enticing scholarship! Eager to seize any chance to travel the world, I investigated. It was apparent that the course had no direct relevance to Chemical Engineering but presented an opportunity to be immersed in all things English: with a recipe that consisted of learning and exploring in simultaneity. Irrespective, I took a chance and signed up.

Less than two months later I found myself travelling to Leeds. After a luxurious fast-train journey from London, I was greeted by the enthusiastic facilitators of the Summer School. The concept, in its pilot year, was conceived and implemented by a particularly dedicated member of Leeds' Study Abroad Office. Her goal was to further the University's rapport with foreign Universities while delivering students with an authentic and enriching English experience. The unfolding chain of events did more than just satisfy this goal.

The four week program was designed to allow participants to undertake two modules of study, from four possible choices. The choices were *Pop Music in the North*, *The Country House*, *The Olympic Games and Sport in the UK*; and *British Literature and the Brontes*. The study program en-



tailed a series of lectures, excursions and assessment tasks. Ultimately, the aim was to learn about British culture and visit places which complemented each unit of study. The result was a thorough, first-hand cultural experience like no other.



Regardless of which modules were selected, each participant was invited to attend every excursion. These included the Bronte parsonage at Haworth, Manchester (the music city), various stately homes; and the incredible whirlwind tour of London. The latter incorporated VIP tours of both Lords cricket ground and Wimbledon; as well as a ticket to a performance of Shakespeare's King Henry IV at the Globe. Each module was spread across two weeks; with an average of three hours per day dedicated to class work, and additional time for ex-

cursions and practical tasks. This meant that our evenings and weekends were our own.

Despite the allocated leisure time, every moment in Leeds was precious. Between pubs, stately architecture, live music venues, parkland, shopping strips and galleries - there was no shortage of distractions. The cultural activities on offer catered largely for the astounding student population in Leeds, which is renowned for being a 'student city'. With beer on tap for £2 per pint, the nightlife was not short on fuel and pub crawls were a ritual.

In addition to the inherent entertainment in Leeds, there was a diverse entourage of international participants to establish friendships with. The designated accommodation comprised a series of apartments in a high-rise building which housed much of the student population in Leeds.

Having spent four weeks traversing the North of England as well as London; learning to fence and master the compound bow, utilising the remarkable facilities on offer at the University of Leeds, learning about the inspirational social movements that accompanied British rock throughout the 20th century; and generally living the student life in Leeds, I have no regrets about taking the opportunity to apply for the Leeds International Summer School. For anyone who is seeking to explore the physical attractions of a foreign country while also learning about the associated culture and meet fellow outgoing students, the Leeds International Summer School is the ultimate undertaking.



Meet our undergraduate students

Mai Bui

Bachelor of Biomedical Science and Bachelor of Engineering in the field of Chemical Engineering

Students hoping to combine their interest in maths and science with practical applications often find themselves pursuing a career in engineering, and this has been the case for Mai Bu. Mai is currently studying Engineering and Biomedical Science at Monash University's Clayton Campus.

"I have always enjoyed studying mathematics and science, and so far Engineering has been a discipline that perfectly combines these areas of study. Engineers design almost everything and becoming one would allow me to fulfil my desire to design things that benefit society."

After getting a taste of the various branches of engineering on offer at Monash, Mai decided to pursue Chemical Engineering, specialising in Biotechnology. She has been able to complement her studies in Biotechnology with the Biomedical Science component of her double degree.

"The Biotechnology stream within Chemical Engineering appealed to me as it has many applications in a range of industries that I want to work in. **Studying Biomedical Science with this branch as a double degree reinforces my knowledge and expands my understanding of the biotechnology concepts.**"

Mai goes on to explain that the majority of the units studied in the Biotechnology stream are common to all Chemical Engineering students. This allows students to have a strong foundation in design and control, chemistry and reactor design. The specialising units have been designed in such a way as to give an insight into how chemical engineering principles can be applied within the biotechnology-related industries.

"There are a number of industries which utilise biotechnology concepts, including the pharmaceuticals industry, the dairy and food industry, water industry and the biomedical industry. It is still a very new branch and there is a great deal of potential for advancement that will undoubtedly further broaden the field."

Outside of her studies, Mai keeps herself occupied through her active involvement with Engineers Without



Borders. Her association with the society has given her a great opportunity to apply the engineering skills she has acquired throughout her time at Monash.

"I am the president of the Monash University Chapter of Engineers Without Borders and have been on the committee for a few years. The organisation gives students opportunities to apply their engineering skills to sustainable development work within Australia and overseas in disadvantaged communities."

"Some of the EWB projects that I contribute to include the Monash Computer Cooperative, where students refurbish and fix up used computers to donate to disadvantaged students; the From Guns to Pens program, where students collect old text books to donate to Kabul University in Afghanistan; and the Bioediesel Project, which aims to generate biodiesel from used cooking oil to fuel Monash Grounds vehicles." Mai's involvement with the society has also given her the opportunity to meet many like-minded engineers at various conferences.

"Once I graduate, I look forward to continuing my involvement with Engineers Without Borders by joining the Professional Chapter. I also look forward to the opportunity to travel overseas for an engineering volunteer position, an experience I am sure will be both rewarding and moving."

Mai's varied experiences through her time at university has meant that she finds herself in good stead as she looks towards life after graduation.

"I would like to work in an industry that utilises both of my degrees, such as in drug manufacture in the pharmaceutical industry, or in food production."



Alumni Profile: Nada Abubakr

MEngSc in Chemical Engineering

Graduating Year: 2009

Senior Business Development Associate, Faculty of Engineering



After I completed my Bachelor of Biotechnology (Honors) from the University of Auckland I gained a scholarship from Monash. Full of excitement, I crossed the Tasman Sea to join the Department of Chemical Engineering to start work as a research student.

My thesis was, 'Microencapsulation of water-soluble bioactive particles'. My research was focused on the microencapsulation of Vitamin B12 using biodegradable polymers. The aim was to optimise the encapsulation process to enable a more controlled release of the drug.

While completing my Masters, I received an email advertising available scholarships on offer. I successfully applied for a scholarship and an opportunity to further my studies at Monash through a Graduate Certificate in Commercialisation Research (CTS) program.

The Commercialisation Training Scheme (CTS) aims to assist students understand how the interests of business and science can come together. Areas covered include intellectual property law, the commercialisation of research and new venture financing. The CTS

program was extremely helpful in bridging the gap between my postgraduate research experience and the research commercialisation world. I was given the opportunity to build a commercialisation plan for my research, and this was a great insight on how Business Development Managers can evaluate the commercial potential of research and add value to move it from the lab to the market. The knowledge I have gained from this course has given me the confidence to pursue a career in commercialisation.

Prior to taking up my current role as Senior Business Development Associate, I completed a ten month internship as an Investment Analyst with the Trans Tasman Commercialisation Fund (TTCF). TTCF is a \$30M pre-seed fund that invests in early-stage research at Monash University and four other universities in Australia and New Zealand.

My current role in the Faculty of Engineering includes negotiating various agreements with industry partners and research organisations, commercialisation management of early-stage technologies, identification and protection of Intellectual Property and promoting technologies for investment.

What I love about my job? Having the rare opportunity to gain exposure to the very exciting research activities across the entire Faculty of Engineering is among the best aspects of my role. I also find working with researchers and assisting them in the identification of the commercial potential of their research activities and building and managing their IP portfolios highly rewarding.

I highly recommend the CTS course to others who are interested in applying their research and analytical skills in other areas such as commercialisation.

What was the most enjoyable part of my academic career? Learning to problem solve in a research environment is when the world of possibilities started to open up to me. Travel, collaboration opportunities with overseas institutions and researchers, all paid for by your supervisor is an added benefit! **The opportunities on offer to research students through Department of Chemical Engineering are endless - You only have to reach out to grab hold of them!** Don't hesitate for one minute if you are considering undertaking a postgraduate degree. The commercial world will wait for you.

Would you like to be featured in a future Alumni profile issue? Please email lilyanne.price@eng.monash.edu.au

NEWS in brief.....

- 2011 scholarship online applications are now open. The 2011 scholarship round is the main round for new postgraduate applicants wishing to start their degree in 2011. This scholarship round will close on 31st October 2010.
- We are looking to feature profiles on you (Chemical Engineering)! Tell us about where you are and what you're doing since graduating. If you are interested, please contact Tamara Snow who will arrange for a story and your photo to be taken.
- The Faculty of Engineering Awards Dinner was held on 26 May 2010. Congratulations to **Constantinos Dimitrakakis**, was awarded "The Owen Potter Award for Chemical Engineering Excellence", and to **Jonathan Wajchman**, who received "The Yong Cher Biau Memorial Award". The "Deans Award for Excellence in Research" went to **Professor Paul Webley**.
- Congratulations to **Mohidus Samad Khan** who won the 2009 State Winner (VIC) in the "Ausbiotech-GSK Student Excellence Awards" for his PhD work on 'Bioactive Papers'. The award is a national award aims to encourage promising student studying life-scientists and bio-entrepreneurs. This award is co-sponsored by AusBiotech and GlaxoSmithKline. AusBiotech Ltd. (Australian Biotechnology Organisation) is the national body for the biotechnology and life science industry in Australia. Ausbiotech chief executive officer Dr Anna Lavelle, Glaxosmithkline's Head of Research and Development Alliances Dr Ashley Bates and Minister of Environment, Climate Change and Innovation Hon. Ganin Jennings MLC presented the awards at the official opening of the conference.
- Congratulations to **Mr Gang Li** who received the "2009 National Award for Outstanding Self-Financed Chinese Students Study" Abroad by China Scholarship Council (CSC). This award was founded by the Chinese government in 2003 with the purpose of rewarding the academic excellence of self-financed Chinese students studying overseas. Only those with outstanding performance in their PhD studies will be considered by the award selection panel and no more than 500 awards are presented each year all over the world. Mr Gang Li received a \$5000 prize cheque from the China Scholarship Council (CSC) which was presented by Dr Liu Jinghui, Secretary-General, China Scholarship Council.
- Congratulations to our recent Postgraduate graduates (May 2010 – August 2010): PhD – **Gang Li (PW)**, **Winston (Duo) Wu (DC)**, **Shu Zhang (C-Z L)** and Masters – **Nada Abubaka (DC)**,
- The Ladewig Group is also currently hosting Professor Kaisong Zhang from IUE-CAS as a Visiting Professor for three months.
- Congratulations to Ben Weeraratne, who represented the department in the "3 minute thesis" competition this month.

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