THE SECRET OF SUCCESS
Creating a world-beating research centre

MONOPOLY AND MENTORSHIP
Nurturing the next generation of researchers

BLAZING AHEAD
Innovative ideas become a reality
“All that is valuable in human society depends upon the opportunity for development accorded the individual,” said Albert Einstein. This is a sentiment we embrace at UTS, not only with the education we provide for our students, but also in the development opportunities we afford our staff and researchers.

We recognise that central to creating a strong, vibrant research future is attracting the next generation of research leaders and research talent. Namely the brightest research students as well as those researchers establishing their career.

As a result, a key focus of the UTS Research Strategy 2010-2015 has been attracting the best research students and postdoctoral research fellows through an increased number of scholarships and career development strategies.

However, we must also ensure they have the environment and tools to succeed. In fact, this is true for all our researchers, from established Professors to our mid career researchers, and is why researcher development is so important at UTS.

One of the aims of the strategy is to establish UTS as the leading university in Australia for researcher development. We are well on the path to achieving this. The launch of the UTS Framework for Doctoral Education in 2011 completely reshaped the way we educate research students. This framework was the first of its kind in Australia – formalising a study plan between the student and their supervisor to help them meet their research and professional goals.

We also want to ensure our research students fit the needs of industry and government and are equipped to become the leading professionals that Australia needs. This is why we have taken a leading role in initiatives including the Australian Technology Network’s Industry Doctoral Training Centres.

The PhD students involved in these centres are tackling projects that have been set by industry partners; their research studies are directly tackling real-world issues. The model has proved so successful in mathematics and statistics that we plan to roll it out to a number of other discipline areas.

By ensuring we have the right mix of staff and students we can achieve our vision to be a world-leading university of technology. Our focus on attracting research talent to UTS supports our commitment to produce research that delivers real benefits for society, industry and the environment.

This special research issue of U: magazine provides a great opportunity to showcase just some of the incredibly talented researchers and the work they are doing right here at UTS. I am looking forward to seeing their achievements, and those of their peers, deliver real results and benefits for Australia and beyond.

Professor Attila Brungs
Deputy Vice-Chancellor and Vice-President (Research)

RAISING RESEARCH TALENT

The University of Technology, Sydney aims to be a leader in collaborative research and a preferred research partner for industry, business and the professions.

We are committed to supporting our researchers, research students and industry partners. We achieve this through our multi-institution collaborations and the services we offer.
CONTENTS

FEATURES

BLAZING AHEAD 6
THE ACADEMICS AND RESEARCH STUDENTS TURNING THEIR IDEAS INTO REALITIES

MONOPOLY AND MENTORSHIP 8
THE ROLE OF STRONG LEADERSHIP IN NURTURING THE NEXT GENERATION OF RESEARCHERS

THE SECRET OF SUCCESS 10
HOW QCIS BECAME A WORLD-BEATING RESEARCH CENTRE

REGULARS

EXECUTIVE COLUMN: ATTILA BRUNGS 2
RESEARCHER DEVELOPMENT: WHAT IS IN A NAME? 4
RESEARCH NEWS: BREATHING EASY 5
RESEARCHER FOCUS: MORE THAN SKIN DEEP 13
RESEARCH NEWS: NEW STAR ON BROADWAY 14
TWO OF U: FROM APPLICATION TO IMPACT 16
RESEARCHER FOCUS: LAND GRABS 18
RESEARCH NEWS: CHAIN REACTIONS 19

U: is published by the Marketing and Communication Unit and provides a voice for the university community. As such, the views in U: are not necessarily the views of the university or the editorial team.

U: reserves the right to edit as it sees fit any material submitted for publication.

Circulation:
5000 copies circulated on UTS campuses and distributed to the UTS community. UTS has more than 35,700 students and 2,797 staff.

Director: Jacqui Wise
Managing editor: Izanda Ford
Editor: Fiona Livy
Contributing editor: Michelle Callen
Editorial coordinator: Katia Sanfilippo
02 9514 1971
u@uts.edu.au

Contributors:
Alexandra Berriman
Michael F. Good
Claire Thompson

Art direction: Shahnam Roshan
Design: Hoc Ngo

Media enquiries:
Robert Button
02 9514 1734

Printer:
Lindsay Yates Group
A focus on attracting and developing the next generation of research talent has led to an expanding role for the University Graduate School. It’s even sparked a name change.

From January next year, the school will officially become known as the University Graduate Research School (UTS:GRS). It might not seem like a radical new step, but Dean of UTS:GRS Professor Nicky Solomon believes it’s a recognition of a significant change in UTS’s approach to researcher education and development.

“This change is making it clear that researchers, be they academics or students, are at the heart of all of the school’s activities, and in turn that we are supporting and implementing the UTS Research Strategy 2010-2015.

“As a university, we’re focused on increasing the number and quality of research students, as well our research active staff. Not only are our research students the next generation of research leaders, they’re also at the forefront of a revolution in research right here at UTS.”

The change fits with a number of recent initiatives that focus on improving the quality and rigour of undertaking a Higher Degree by Research. This includes the roll out of the UTS Framework for Doctoral Education, which was developed by UTS:GRS and is designed to ensure research students become active members of the research community.

“The framework has given a formal structure to support students in developing their research skills and disciplinary knowledge in a tailored way,” says Solomon.

“The induction and workshop program we’ve developed specifically for research students is the start of what we see as a program of lifelong professional development.

“The next step in this is further expanding the professional development aspects of researcher education. We want to ensure students have the communication and project management skills necessary to complete their studies, as well as to progress their career in academia or industry.

“Research is an increasingly attractive, if challenging, career path. Here at UTS we offer a suite of programs that span all stages of an academic research career – from PhD to fully fledged researcher. This includes specific workshops and courses for research students, eConnect – a dedicated program for early career researchers – and our Leadership Masterclasses for those academics aspiring to head up their own research teams or centres.”

Underpinning this approach, says Solomon, is a commitment to tackling the perception that an academic path is an isolated one.

“The notion of the lonely PhD student trapped in an isolated lab or cubby hole with a computer is rife. We’re creating a vibrant environment that provides much more support and mentoring than a supervisor-student relationship.”

They’re tapping into social media too. UTS:GRS has created a successful program of events and activities, promoted through Facebook and Twitter.

“The networking and social support we have provided has given research students the impetus to organise their own activities – which is what we want to see.

“The really great news is, we know this is going to become easier and easier. An exciting part of the City Campus Master Plan is the creation of new spaces that are dedicated to research students. This will include a PhD lounge and other communal learning and socialising spaces,” says Solomon.

The focus on researcher development and research talent at UTS is one that is set to continue well into the future.

Michelle Callen
Marketing and Communication Unit
Photographer: Fiona Livy
Comment on this article at newsroom.uts.edu.au/news/2012/07/what-is-in-a-name
For most of us, breathlessness is a short-lived result of physical exertion – running for the bus, taking the stairs, going to the gym. But imagine if you couldn’t catch your breath; if, after your heart rate had slowed and your body temperature had returned to normal, you still couldn’t get enough air into your lungs.

Breathlessness is one of the leading symptoms of chronic obstructive pulmonary disease (COPD). And, according to PhD student and Lecturer in the Faculty of Nursing, Midwifery and Health Rebecca Disler, “it certainly has the largest impact on patients’ lives”.

COPD is a terminal disease more commonly seen in older people. In developing countries, exposure to biofuels, from cooking with oil fires in poorly ventilated areas and smog from burning crops, has resulted in a rise in COPD cases in recent years. In Australia, smoking remains the number one cause.

People with COPD may live with the disease for many years before symptoms become visible; however, once they’ve been admitted to hospital for an acute respiratory episode, research shows their life expectancy shrinks to around two years.

“One of the big components of breathlessness is anxiety, which leads to breathlessness, which leads to anxiety, and so on. It becomes a self-fulfilling cycle.”

In a bid to stop the cycle, Disler, and her fellow researchers from UTS’s Centre for Cardiovascular and Chronic Care and the University of California San Francisco (UCSF), are collaborating on a project dealing with the management and patient experience of COPD.

One part of this work will extend to a self-management program created by UCSF’s Professor Ginger Carri-Kohlman, an international research leader in the field of COPD. The program aims to increase the confidence of COPD sufferers in managing their condition and create new opportunities for them to engage with the community.

“We know what elements of self-management are important, but what we don’t necessarily know is how those elements should be combined and what specific components are the really important ones,” says Disler. “So if you’re looking at coping strategies, for example, what’s the best ways we can teach someone to conserve their energy while doing day-to-day activities so they have energy for social activities later?”

Carri-Kohlman’s program combines a range of self-management techniques, including physical rehabilitation that targets daily activities for improving stamina, online chat rooms for peer support, and coaching in managing the psychological impact of the disease. This means there’s a large focus on coping strategies and self-management techniques that help people with COPD control their symptoms and feel confident about the way they live with their disease.

Resources like internet-based programs are important, not only because they help take the pressure off the health care system by creating community-based solutions to the management of COPD. They also provide COPD sufferers with ways to maximise their quality of life at the end-stage of the disease.

“COPD changes the way people interact with society,” says Disler. “Sufferers alter their lives enormously in response to their condition – they tend to avoid going out because of fear of triggering their symptoms, and it also changes the way they interact with their families – they stop attending family events because they feel like they’re going to be a burden.

“It’s important we create opportunities for people to get as much out of their lives as they can while they’re still here. A lot of people with COPD don’t want to focus on dying, they want to focus on living.”

Claire Thompson
Research and Innovation Office
Photographer: Joanne Saad
Comment on this article at newsroom.uts.edu.au/news/2012/07/breathing-easy
Trailblazer is an annual ideas competition that rewards entrepreneurial thinking. UTS Trailblazer competitors, working with UniQuest Managers of Innovation and Commercial Development (MICD), pitch their most innovative ideas to a panel of commercialisation and intellectual property experts who judge whether or not the idea has commercial potential. Applicants compete for the chance to share in $100 000 worth of prizes, to win a spot at the national Trailblazer finals and to begin the commercialisation journey.

Taking an entrepreneurial idea to the marketplace can be one of the greatest challenges and most rewarding aspects of a research career, says UniQuest’s Technology Commercialisation Group Manager David Israel. “Commercialisation is one of the key pathways to impact for many research projects but many researchers aren’t familiar with how the commercialisation process works.

“Trailblazer aims to increase researchers’ understanding of the process and benefits of commercialisation while giving them a chance to showcase their great ideas. We want to help researchers sharpen their ability to identify projects that have the potential to be brought to market, and build their confidence in communicating their ideas.”

2012 marks the fourth Trailblazer competition to be run at UTS. This year’s participants have big shoes to fill – previous competitors have presented projects on everything from novel water conservation applications to diabetes and cancer treatments. Last year’s open competition, and the subsequent national final, were both won by Chancellor’s Postdoctoral Research Fellow in the School of Medical and Molecular Sciences Dr Andrew Hutchinson for his work on a novel treatment for multiple myeloma.

If you’ve ever had a ‘eureka’ moment, you’ll know that split second of brilliance is usually quickly replaced by life’s more mundane realities. But, for a few enterprising UTS academics and research students, the opportunity to take their work to the world is a becoming a reality, thanks to the UniQuest/UTS Trailblazer competition.
WHERE ARE THEY NOW?
So, what happened to the Trailblazer competitors of 2009, 2010 and 2011? Four participants tell us what happened to their big ideas – and how commercialisation and external engagement opportunities have changed the shape of their careers.

SIMON DARCY
UTS Business School
Project: Sydney for All e-portal, 2009
This website portal, providing collaborative marketing opportunities for businesses offering accessible destination experiences for people with disabilities, received a highly commended award in the 2009 UTS Trailblazer competition. Named Sydney for All, it was developed by UTS Associate Professor Simon Darcy and Bruce Cameron, from Easy Access Australia, in response to the constraints on urban tourism opportunities for people with disabilities.

“Simple things like having a holiday become so complex for people with disabilities because of the structural constraints of the environment and service attitudes that they experience,” says Darcy.

Since the competition, Darcy and his research team have worked in collaboration with Destination NSW to commercialise the project and launch the portal as a permanent feature of the company’s online tourism offerings.

“The commercialisation is of the underlying intellectual property behind translating accessible experiences into meaningful web-based content,” says Darcy. The academic now has an ongoing role in providing advice to Destination NSW and continues to develop new modules and content for the portal.

“We have created a tremendous public good for people with disability from Australia and overseas who now have free access to a resource to assist in travel planning and enjoying the wonderful features of Sydney. “Trailblazer was instrumental in getting us to this point as it helped us to sharpen our thoughts in order to visually and audibly sell the concept to an audience. “

ALISON HEATHER
Faculty of Science
Project: Anti-doping assay, 2010
Dr Alison Heather has a growing reputation as an anti-doping expert, thanks in part to a project that saw her awarded runner-up in the open category for the UTS round of Trailblazer 2010.

“My project was about developing a really sensitive assay, or detection method, that can measure androgens, or performance enhancing drugs, in elite athletes,” Heather says.

“Companies who produce performance enhancing drugs familiarise themselves with the testing procedures that are used and then design an androgen that will beat the test. So my work is about trying to outsmart the chemists and design an assay that will detect anything that has any androgen activity.”

Since the competition, Heather has been awarded a grant from the Australian Sports Anti-Doping Authority to further develop the assay and has used it to screen for androgens in a range of neutraceuticals – food or nutritional supplements purporting to provide health and medical benefits – that can be purchased on the web.

Heather adds, “I’ve also used it to help some of our current Olympic athletes to check the nutritional supplements they’re taking don’t have any androgens in them.”

DANIEL VIRGONA
Faculty of Design, Architecture and Building
Industrial design student Daniel Virgona received a highly commended award in the 2011 Trailblazer competition for his design of the Watchman Safe Series Extension Lead – an extension lead with built-in safety features to protect users from electrical accidents.

“After the competition I was in close contact with the MICD for my faculty, who was extremely helpful in trying to commercialise my project,” Virgona says.

“Non-disclosure agreements were signed and the project was sent to be reviewed by a leading electrical equipment supply company.”

However, when discussions with the company slowed, Virgona made the decision to exhibit his work publicly and enter it in a number of competitions, winning first place in the Casey Hyun Industrial Design Graduate Award.

“Exhibiting the product effectively diminished the chances of patenting the technology because it was put on public display,” he says.

“I was aware of this at the time, yet made the decision on the basis that the company looked unlikely to continue negotiations and because I thought the graduate show and subsequent competitions proved to be an effective way to promote the work.”

While the path to commercialisation can be slow and uncertain, Virgona says he is grateful for having had the chance to explore a commercial avenue for his work.

HUU HAO NGO AND WENSHAN GUO
Faculty of Engineering and Information Technology
Project: GEMFLOC, 2009
“GEMFLOC’s success is a direct result of our Trailblazer experience,” says Associate Professor Huu Hao Ngo about his sustainable, high performance wastewater treatment technology.

Since Ngo and Guo entered GEMFLOC into the 2009 UTS competition, the impact of the technology has been felt around the world. The system, known as a bioflocculant, uses biodegradable, starch-based materials to help prevent the clogging of membranes in wastewater systems. It was successfully piloted at the Sydney Olympic Park wastewater plant and is in the process of being showcased to water utility companies in Australia, the UK and US.

National phase patent applications have been filed in Australia, USA, Europe, China and Japan, and Ngo is in discussions with a global water treatment company and a European investor – both are interested in commercialising the technology.

“GEMFLOC demonstrates how environmentally friendly technologies can improve the overall wastewater treatment process towards water sustainability.”

Claire Thompson
Research and Innovation Office
Photographer: Si Darcy, A Heather: Joanne Saad
Photographer: HH Ngo, W Guo: Alexandra Berriman
Photograph (D Virgona) supplied by: Daniel Virgona
Photograph (Lights): K. Foley

Comment on this article at newsroom.uts.edu.au/news/2012/07/blazing-ahead
RESEARCH OPINION
ITHREE INSTITUTE

MONOPOLY & MENTORSHIP
Strong leadership is pivotal to successful research. Former CSIRO Eureka Prize winner for Leadership in Science and member of the ithree Institute Advisory Board Professor Michael F. Good explains why mentoring is so important and how he’s helping to foster the next generation of scientific research leaders at UTS.

“Creative people don’t follow the crowds; they seek out the blank spots on the map.” So said journalist David Brooks in an article he wrote in the New York Times last April.

Though Brooks was referring to successful business people and what he calls the “creative monopoly”, there is a lesson here for researchers.

Instead of allowing competition to become “a proxy for value” (which we see in almost all walks of life, including parliament, business, church and science) Brooks suggests, “We should seek to be really good monopolists. Instead of being slightly better than everybody else in a crowded and established field, it’s often more valuable to create a new market and totally dominate it. The profit margins are much bigger, and the value to society is often bigger, too.”

When thinking about my colleagues, many of whom have become scientific leaders in Australia and abroad, it is those who define the paradigms and think outside the box that become leaders.

Fierce competition within a defined paradigm is hard work, with little progress made for a lot of effort. But those who define paradigms are monopolists and can make enormous contributions to science – Barry Marshall and Robin Warren identified an infective cause for stomach ulcers; Jim Peacock, Liz Dennis and Emma Whitelaw established epigenetics as a major discipline for understanding biology and disease; Graeme Clark pioneered the bionic ear; and in my own field of immunology and vaccine research, American Steve Hoffman is pioneering a whole parasite malaria vaccine.

I doubt these and other successful scientists started their careers as ‘monopolists’ but they probably had good mentors, saw an opportunity and, through hard work and backing their own instincts, managed to create a field others could then follow and build upon.

All research scientists, in fact all researchers, should have mentors. Not only for inspiration and bouncing off ideas, but to impart confidence in what we do. Ultimately, they are the people who keep us engaged in our work and support us when times get tough.

Perhaps the most feared ‘tough’ times are funding droughts. Like thousands of others, I lament that funding for medical research is not higher and last year marched to protest against proposed cuts to the National Health and Medical Research Council (NHMRC) budget. Those marches, and the members of the public who spoke about the importance of medical research in their own lives, saved the day – and our funding.

However, we shouldn’t overlook the vulnerability of the next generation of Australian researchers. I lament when I hear some senior scientists advise young people not to enter a career in research because of the vagaries of funding. We all should follow our passions and no one who is keen about science should be dissuaded from a career in it.

Again, this is where the benefits of mentorship are seen. As a member of the ithree Advisory Board, I feel honoured and delighted to hear the enthusiasm of the younger researchers there and to offer whatever advice I can to help them with their careers in science.

I was fortunate in my own research to have as mentors some very creative people who fit into the category of ‘creative monopolists’. They include Professors Chev Kidson and Sir Gustav Nossal in Australia and Drs Louis Miller and Jay Berzofsky in America.

Their guidance and example certainly gave me inspiration for my own research and I know my achievements would not have been possible without their support and mentoring.

I have spent my career of almost 30 years trying to understand immunity to malaria and streptococcus and developing vaccines for these organisms. After decades of hard work, my research now is at a really exciting stage.

For streptococcus, I’m working with colleagues at Griffith University to develop an experimental vaccine that can protect mice from infection – the organism responsible for rheumatic heart disease. For malaria, we’re developing a method of attenuating, or weakening, malaria parasites and have shown that small numbers of whole malaria parasites can generate a protective immune response. We are using this approach as the basis to develop a low-dose, whole-parasite vaccine into a form suitable to begin phase one clinical trials in humans.

I believe all researchers need to become better at recognising that if we follow our dreams and work hard, then good and creative research often follows, and funding will follow that. We should spend the bulk of our time, as PhD students, early career researchers and senior scientists, thinking about our ideas and no one who is keen about science should be dissuaded from a career in it.

Our experiments or research findings can then give us the buzz that is so addictive. In the end, that passion for what we do is a key factor in our ability to secure grant funding enabling us to follow our dreams; and to achieve better outcomes for society at large.

Michael F. Good
NHMRC Australia Fellow and member of UTS’s ithree Advisory Board
Research Leader, Institute for Glycomics
Griffith University

Photographer (students): Chris Bennett
Photograph (M Good) supplied by: Michael F. Good
Comment on this article at newsroom.uts.edu.au/news/2012/07/monopoly-and-mentorship
Most universities in Australia would love to have the recipe for a world-beating research centre. Or for successful Australian Research Council (ARC) Future Fellowship applications, a few fruitful ARC Linkage Projects, a fistful of IBM PhD Fellowships, or the sort of applied research outcomes that have industry clamouring to work with them.

QCIS Director Professor Chengqi Zhang believes he knows the secret formula. Zhang is convinced his centre’s success can be chalked up to what he calls the “triangle strategy of leadership”.

“This is a strategy that I’ve devised to capture the essence of how we conduct business at QCIS. It basically boils down to three key components: brand, talent and governance,” he says.

The brand component is about the quality and impact of the research being conducted at the centre. “It’s essentially about identifying your mission – what sort of research do you want to be doing? What sort of reputation do you want to build for your centre? And how do you go about it?” Zhang says.

The approach is a good match for the UTS Research Strategy 2010–2015, which has a focus on both theoretical and applied research that delivers real benefits for society, industry and the environment.

The talent section of QCIS’s strategy reveals Zhang’s insatiable ability to recruit the best of the best in quantum computation and data analytics from around the world.

Three questions Zheng asks himself are: how desperately do you need a certain researcher? How will they fit into your team structure? What do you have to do to get them?

“We handpick people from around the world who have the outstanding track record, the drive and the ability to really succeed.”

When it comes to governance, the strategy is centred on effective leadership – a topic Zhang is particularly passionate about.

“Being an effective leader means having a vision, and the ability to implement that vision at all levels of an organisation by communicating with the people around you and making the most of your planning skills.

“You need a genuine vision – What are you hoping to achieve in the next three years? In the next six? And how do you use recruitment, retention and motivation strategies to get you to those goals?”

Zhang’s strategy is already paying off. QCIS’s numbers are impressive, not least for a university and a centre that are relative newcomers to the research scene.

QCIS researchers are currently working on nine highly competitive ARC Discovery Projects and four ARC Linkage Projects with companies like IBM and Westpac. They have published 212 papers in prestigious journals and conferences since 2008 and are expecting to bring in nearly $1.8 million in research revenue this year.
“WE HANDBPICK PEOPLE FROM AROUND THE WORLD WHO HAVE THE OUTSTANDING TRACK RECORD, THE DRIVE AND THE ABILITY TO REALLY SUCCEED.”

OF SUCCESS

In addition, three of the only four PhD students in Australia to receive an IBM PhD Fellowship between 2010 and 2012 are students from the centre (the fourth is also a UTS student). But, perhaps most significantly, QCIS is also home to four ARC Future Fellows – Associate Professor Sanjiang Li, Professor Xingquan Zhu, Associate Professor Yuan Feng, and Associate Professor Michael Bremner – whose fellowships denote their outstanding achievements in Australian research.

“Future Fellowships are some of the most highly contested awards in the country,” says Zhang. “It’s these academics who will play key roles in the future of research in their fields.”

At the same time, QCIS is building a reputation as a top-notch partner for industry organisations seeking data mining and analysis expertise. Multinational organisations like IBM and Alcatel have built lasting research collaborations with QCIS on a range of projects, including technologies that protect companies against fraudulent online activities, and a number of data mining and analysis projects that assist organisations in managing and interpreting their data.

Zhang himself is a member of the ARC College of Experts for 2012 – 2014 and is recognised as an international leader in the field of information technology. Last year, he won a NSW Science and Engineering Award in the Engineering and Information and Communications Technology category and a UTS Vice-Chancellor’s Award for Research Excellence in the Research Leadership category.

And there’s no denying Zhang loves what he does. Just talking about his researchers brings a smile to his face – he refers to them as ‘superstars’, peppering his conversation with stats and figures about their achievements.

“We’ve built a collaborative environment with a focus on excellence,” he says, beaming. “I truly believe tomorrow’s leaders are being nurtured here with us. There’s a lot to be happy about.”
If you’re like most people, packing your bags for a trip to Sweden would probably involve selecting clothes and personal items to take with you. But when PhD student Rony Novianto won a six-month Endeavour Research Fellowship to study at Lund University, he got busy packing his robots.

Welcome to the world of artificial intelligence, where robots have the capacity to shape our lives and Smokey the bear and Nao (one’s a social robot, the other a soccer-playing robot) are your travel companions on international junkets.

For Novianto, robotics has been a long-term interest that stemmed from a fascination with how robots could integrate into daily living. “I always wanted to create robots to transform human lives, making our lives better and easier,” Novianto says.

“However, current technology doesn’t have the full capability to develop robots that can truly transform human lives.”

Novianto has set about rectifying this problem through his work with QCIS. He’s currently developing a novel cognitive software architecture, known as Attentive and Self-Modifying (ASMO), that can be applied to self-directing systems including software agents and autonomous robots. The architecture orchestrates information from a range of sensory data to solve complex problems.

Novianto is also quickly developing a reputation in the field of information technology. On top of his Endeavour Fellowship, he was the only candidate in Australia to receive an exclusive IBM PhD Fellowship in 2011.

“I chose to undertake a PhD to challenge and push myself to create new technologies and develop something that would advance the world,” he says.

“Working at QCIS and building connections with world-leading organisations like IBM has been a great way to start my career. I’d like to keep working in research and development to create technologies that can transform people’s lives.”

Claire Thompson
Research and Innovation Office
Photograph (C Zhang) supplied by: Chengqi Zhang
Photographer [R Novianto and S Li]: Joanne Saad
Comment on this article at newsroom.uts.edu.au/news/2012/07/the-secret-of-success

Those of us who exist outside the field of information technology might find the work of ARC Future Fellow Professor Sanjiang Li a little over our heads.

As Li explains it: “My research aims to establish expressive representation formalisms of qualitative spatial knowledge and provide effective reasoning mechanisms.”

To clarify, space plays a key role in many human activities. Li’s research looks at the role of space in how ‘cognitive agents’, such as humans and robots, make rational decisions.

“While people now can easily and quickly acquire their location information with the help of mobile devices, the rapid development of technologies such as remote sensing and medical imaging has also brought us huge volumes of spatial data that’s hard to process in a useful way,” says Li.

The researcher is building an internationally recognised body of work in spatial knowledge. Since joining UTS from Tsinghua University in China, his research has been reported at some of the leading artificial intelligence conferences in the world and published in the *Artificial Intelligence* journal, the most prestigious in his field.

In keeping with the UTS ethos of impact-driven research, the practical applications of Li’s work spell good news both for the environment and the community at large – some of his modelling work will provide a basis for monitoring critical changes in events like fires and oil spills, providing efficient techniques for solving environmental disasters and enabling the development of intelligent systems for early warning and disaster management.

“The breakthrough research in spatial cognition will bring a new generation of intelligent systems with true human intelligence. The success of this project will have big impacts on both the research community and real-world applications,” he says.
Over one billion species of microbes touch our lives every day. Invisible to the naked eye, they are crucial to keeping our environment and bodies healthy. However, chronic diseases like diabetes can upset the balance between humans and these bacteria.

In a bid to help Australians living with diabetes, Chancellors Postdoctoral Fellow Dr Catherine Burke, a member of the iTHree Institute, is applying her research background in marine microbial ecology to investigations of human skin. Her research aims to develop diagnostic tools and therapies for diabetic patients suffering from chronically infected wounds. Her approach is a world first.

“Diabetics experience changes in the skin as a result of having elevated glucose for a long period of time. They often have damaged nerve endings in the peripheries, making them prone to sores and wounds, and they won’t always feel pain when they are injured.

“As a result of an impaired immune system, wounds on diabetics don’t go through the same stages of healing as non-diabetics do. Wounds are often colonised by bacteria and get severely infected and in some cases do not heal, which can result in dangerous secondary infections or amputations.

“Current treatment of this type of infection is antibiotics; the problem is that bacteria are building a resistance to antibiotics faster than we are developing them. We need alternative ways to treat infections.”

Burke adds, “Some bacteria produce an antimicrobial compound that works with our immune cells to protect us from a number of infections. When you take an antibiotic you disturb the bacterial communities not only on your skin, but throughout your body. Doing this means bacteria cannot perform the same protective function and creates the opportunity for pathogens to come in and cause infection.”

Burke’s research looks at DNA sequencing, RNA sequencing (ribonucleic acid, or RNA, plays a role in transferring information from DNA to the cells), and community profiling of bacteria to provide insights into which types of bacteria are on skin and how they impact on the wounds of diabetic patients. Her approach is a world first.

“This work builds upon a conclusion from my PhD where I found the function of a community cannot necessarily be inferred from knowing which species of bacteria are present. When a gene is expressed it is made into a protein and carries out a function. As only some genes are expressed at any given time, this project looks at what genes are there and which of those are expressed.”

Microbial communities are most often studied by sequencing a single marker gene, but Burke’s work utilises a method known as metagenomics – sequencing all the genes in a microbial community. This information is used to form an ecological framework that identifies characteristic features of microbial communities in diabetic skin and wounds.

“It’s a really exciting project. No matter what the results are, they will have implications for the prevention and treatment of chronic wounds.

“I think a lot of people are going to become really interested in this topic. People are always going to try and understand human health but I think a lot more people are going to become really interested in the bacteria that live with us every day.”
With its angled, binary-coded facade, the new Broadway Building, which will house the Faculty of Engineering and Information Technology, will have a dramatic urban presence on Broadway. Yet it’s what’s happening within the walls of the building that’s causing a stir. The installation of embedded sensors throughout its construction will allow researchers to collect real-time data from the ‘living’ building – both as it rises and well into its completion come 2014.
“THIS IS A ‘LIVE’ BUILDING, OFFERING MEANINGFUL DATA THAT BUILDERS WILL BE ABLE TO CONSIDER FOR FUTURE DESIGNS. IT HASN’T BEEN DONE ANYWHERE BEFORE.”

Fact: The Tower building moves up to one metre in high winds. You may not be able to feel it, but imagine being able to see it for yourself, on a public screen, as the building’s actually moving.

The vision for creating a living, breathing building began when Dean of the Faculty of Engineering and Information Technology Hung Nguyen and Research Laboratories Manager Ray Clout sat down and put together a wish list for what they envisaged for the new Broadway Building.

“Amongst many other innovative ideas, that wish list included the collection of data from every possible source the building could give us – things like temperature, air quality, noise and dust particles in the air. That led to the possibility of watching the building as time passed – the concrete reinforcement steel ageing inside, the concrete itself shrinking or expanding, the columns that support the decks bending, that kind of thing.”

Working with construction contractors Lend Lease, the faculty is using part of a $50 million Education Investment Funding grant from the Federal Government to assist with putting strain gauge and ion selective sensors in place to monitor the building’s progression and standing.

The two types of sensors, which are being placed in the concrete footings of the buildings and on various levels, will be used to feed data back to research students for the lifespan of the sensors – up to 25 years for one sensor type.

“The data we’re collecting is sent to a server that’s accessible to any student or researcher,” explains Clout. “It might be 10 years from now that they’ll want to see what it was like as the building was being built and that data will be there. The researchers will also be able to use that data in their teaching tasks, not just for research. So it’s very exciting.”

Clout and his colleague, Electrical Safety Manager Richard Turnell, have been going on-site to install the strain gauge sensors, which will monitor the building’s downward weight and movement, as well as the ion selective electrode sensors which measure the chloride ion levels in the concrete.

“That’s what attacks the steel and causes it to rust, which then causes the concrete to crack. Our sensors will monitor the rate of that rust,” says Clout.

PhD research students, from the Centre for Built Infrastructure Research in the School of Civil and Environmental Engineering, Behnam Vakhshouri and Osama Elsaid will be monitoring the data results, under Senior Lecturer Dr Shami Nejadi’s supervision, for the duration of their degree. They were selected by Nejadi from high ranking technical universities overseas and invited to join his research program.

“In this information age, structural health monitoring is one of the most powerful tools for infrastructure management,” says Vakhshouri, who moved from Iran for the opportunity to be involved in the unique project. “It closes the gap between the traditional world of structural engineering and the frenetic one of information technology.”

Vakhshouri and Elsaid have been preparing and gluing the sensors onto steel bars before they’re delivered on site and set in concrete.

“The glue we use has a 48-hour curing time,” says Clout. “So that means if we take our sensors on site and glue them to the steel, the builders can’t do anything for 48 hours. In the building industry that’s quite a lot of lost time. So we came up with the idea of installing the sensors on the steel bars ahead of schedule, then taking them over for the builders to tie into the steel. We then run the cable back to a central collection point on each level.”

Clout says the data collected will prove useful to building companies worldwide, especially as the concrete is laid and set. “To see how the concrete shrinks, for example, once it has dried and how it responds over the next 18 months is valuable to any civil engineering institution because it’s happening in real time.

“Our students build a concrete beam model in a lab and monitor the strains, stresses and load over a period of 200 days. But this is a ‘live’ building, offering meaningful data that builders will be able to consider for future designs. It hasn’t been done anywhere before.”

Research work will begin once staff and students have moved into the new building in 2014, however students have already started monitoring the data. “We can watch and monitor the building load as successive levels of decks go on. With this information, there’s a great deal of opportunity for our civil engineering researchers to look at ways to improve building structures.

Internal environment sensors will also help determine comfort levels in the new building once the faculty moves in. “For instance, if the long-range weather forecast says two days from now we’re getting a hot period coming through, the building management system will tell the building to start cooling down so when the hot period hits, the building will be at a comfortable temperature,” explains Clout.

Vakhshouri says, the project provides him with the chance to gain expertise in the development of performance-based, design-oriented procedures.

“The performance-based design approach has been promoted as an alternative to traditional or prescriptive building codes, and it’s increasing in popularity,” says Vakhshouri.

“Building codes haven’t kept pace with technological innovation and current construction practices. We’re using the most recently developed technology to record the long-term structural behaviour of a reinforced concrete building, as well as its response under day-to-day service loads, so the data results will have real meaning.”

While the project may effect change on traditional design codes, for Clout, the experience is more personal. “I’ve been at UTS for 25 years but to be able to work on something like this is fantastic. It’s a legacy I can leave behind for future students and researchers. It’s an opportunity you’d be mad to pass up.”

Katia Sanfilippo
Marketing and Communication Unit
Photographer (R Clout): Claire Sargent
Photographer (B Vakhshouri): Joanne Saad
Broadway Building image supplied by: Denton Corker Marshall
Comment on this article at newsroom.uts.edu.au/news/2012/07/new-star-on-broadway
Helen Thomson is a Research Development Manager in the Research and Innovation Office. Heidi Norman is a Senior Lecturer in the Social and Political Change Group and a member of the Cosmopolitan Civil Societies research centre. In 2008, Helen began helping Heidi prepare an Australian Research Council (ARC) Discovery Indigenous Researchers Development grant application for her work into the NSW Aboriginal Land Rights Act 1983. The experience, which culminates this year, has proved life-changing.

Heidi Norman

I’ve been interested in the history of the Aboriginal Land Rights Act in NSW for many years so it almost feels like I was always going to write about it. It’s often said that Aboriginal people are researched to death but that’s actually not the case; there’s a real gap in terms of good quality history. Several years ago I began research and subsequently published work and photos on the NSW Aboriginal Rugby League Knockout. Prior to this work there hadn’t been any study or documentation, even at the very basic level, of why the knockout started, who started it or how it changed over time. That’s the same with land rights in NSW and I could see it was critical the story was told. I also wanted to think about it in more theoretical terms, about how the story of the formal recognition of land rights contributes to our understanding of the relationship between Aboriginal people and the state.

Helen was a phenomenal help; at one point I thought she should be on the research team. It took two years, not full-time obviously, to put the proposal together. Helen was very generous – I would speak to her maybe 10 times a day – on the mobile, landline, early in the morning, late at night, sending things through email. With ARC grants, the success rate is quite low – they’re highly competitive and there’s a limited pool of funds and a lot of applicants. It’s time consuming, quite intimidating and the bureaucratic process is very tricky. Helen was very attuned to tying up all the administrative loose ends.

I get quite anxious asking people for things, but Helen’s got a really calm way about her and was really good with that. The application extends to about 20 or 30 pages and you have to follow that with the CV of everyone involved, their recent publication records, their acquittal reports from other ARC grants. For this project, I worked really closely with Professors Heather Goodall and Gillian Cowlishaw as supervisors and with Professor Jock Collins as a mentor. Having the wisdom of academic elders is really important because it helps you keep everything in perspective.

Research is a very, very solitary activity – as the Chief Investigator on the project I spent two years, on and off, in the field doing research, but I’ve had the best time of my academic life. This kind of research could only be possible through an ARC grant; part of the funding was for teaching buyout. Doing the field work, mostly conducting interviews as well as long stints in the State Library’s Mitchell Library, was enormous fun. I was struck by the generosity and enthusiasm of many people including members of Aboriginal Land Councils and former government ministers. I’ve collected a significant archive, from the many participants involved in my research, which I will deposit in the State Library for future researchers.

I’ve finished my research and already written a full draft of the book; it’s titled From Activism to Enterprise: A political history of the NSW Aboriginal Land Rights Act. At the moment I’m in the process of making final corrections. I’m really looking forward to it being over! I can’t imagine tackling another research project just yet; these things have a long incubation time. But, maybe, when it’s over, it’ll create a lot of space in my head and I’ll be ready to go again. Who knows?
Heidi was great to work with – she was really receptive, really appreciative and very responsive when I made suggestions. In a sense, Heidi’s job was to write about the research project: what she wanted to investigate, what the outcomes would be. My work was more around making sure the proposal fit the actual scheme requirements. Writing a grant proposal is very different to writing journal articles; it’s more like a CV and business plan. It has to be written in a very active, inspiring and exciting way. We often say to researchers, “Assessors are really busy people, they’re researchers too and they often don’t start reading the proposals until maybe 10 o’clock at night”. Each element has to add up to something that looks to be a good investment to the funding body, something that’s really worthwhile, significant and timely. Heidi often says to me, “Thank you, I couldn’t have done it without you”, but that’s my job. I really enjoy my work because I find out about some amazing research that solves problems and benefits society. I think one of the nicest things is the fact that we get to know the researchers. It builds a sense of community – you see each other around uni from time to time. Heidi and I were recently packing vegies together in the organic food co-op and she said the research grant has changed her life, which I think is amazing.

Fiona Livy
Marketing and Communication Unit
Photographer: Joanne Saad
Comment on this article at newsroom.uts.edu.au/news/2012/07/from-application-to-impact
Land Grabs

Long before the global food crisis began in the late 2000s, communities in developing countries had wondered where their next meal might come from. According to Chancellor’s Postdoctoral Fellow (CPDF) in the School of the Built Environment Dr Franklin Obeng-Odoom, food insecurity is closely linked to the way property rights are managed in developing countries.

Obeng-Odoom, who is using his fellowship to research land rights issues in Africa, says land is often obtained by wealthy individuals, private interests and enterprises based in advanced, developing and newly industrialised nations.

“Since the onset of the so-called food crisis, there’s been interest from economically advanced countries in possessing land in developing nations, either to grow food, develop tourist resorts or invest in the cultivation of biofuels.

“This has an impact on the ability of local people, whose land is being possessed, to grow their own food and otherwise make decisions about the land on which they live.”

A rising star in the world of academia, the Ghanaian-born Obeng-Odoom completed a PhD in political economy at the University of Sydney in less than three years (most are completed in three years or more).

During this time, he published work in some of the leading property rights journals and was invited to review articles submitted to international journals. In 2010, he was one of only 10 doctoral and postdoctoral scholars in the world (an additional 10 recipients were selected from within Israel), to win the prestigious Dan David Prize scholarship.

It was during the course of his PhD that he first became acquainted with his CPDF supervisor, and Head of the UTS Asia-Pacific Centre for Complex Real Property Rights, Professor Spike Boydell. According to Obeng-Odoom, Boydell is “the person’ to work with on the issue of property rights because of his international expertise and previous experience working on property rights issues in Ethiopia.”

A natural synergy between the two brought Obeng-Odoom to UTS for his postdoctoral studies. He is using his research into African land rights to try to determine whether or not local African people are helped or hindered by land grabs.

“Those in favour of land acquisition in developing countries say it helps, that it’s pro-development,” Obeng-Odoom says.

“The argument is these acquisitions will lead to the creation of jobs in Africa, the transfer of technology from developed countries, the modernisation of agriculture and hence an increase in the production of food.

“However, activists tend to say it’s a completely destructive and exploitative process that dispossesses people who live on that land.

“My work is on exploring actual, existing land grabs vis-a-vis the rhetoric and assessing the extent to which proposals to stop land grabs actually work.”

Obeng-Odoom’s research represents a meeting point for his passions and scholarly interests. “Being intellectually curious, being African and seeing the under-representation of scholarship on Africa, it would have been such a disappointment to myself, the continent and my many disciplines if I had concentrated on studying other geographical regions.

“I’d like to come up with a series of methods or approaches to manage land in a way that will contribute to making sure the quality, demand and distribution of food among African populations remains secure.

“Hopefully the fruits of this research will be beneficial to other scholars and policy makers.”

Claire Thompson
Research and Innovation Office
Photographer: Joanne Saad
Comment on this article at newsroom.uts.edu.au/news/2012/07/land-grabs
State and federal legislation is designed to protect the rights of workers sitting at the bottom of supply chains in the road transport, and textile clothing and footwear (TCF) industries. However, “We want to know if the schemes are working,” says Lecturer in the Faculty of Law Dr Michael Rawling.

“We want to know if the workers at the base of the chain are receiving the rights these schemes entitle them to.”

To find out, Rawling is collaborating with colleagues at Griffith University on an Australian Research Council (ARC) Discovery Project. The project is the first of its kind in Australia and aims to examine the application of these schemes to the road transport and TCF industries and their ability to successfully empower workers.

“Those at the base of these supply chains are an exploited group of workers. Due to commercial pressures passed down the supply chain and the nature of the contract they have with their employer, these workers often don’t receive the same working rights of minimum wage, adequate breaks and health and safety provisions that other employees would.

“The effectiveness of these schemes is becoming increasingly important as more often businesses are outsourcing their work, creating more supply chains.”

Though the scheme for each industry is different, Rawling says they all regulate the supply chain for the interest of the worker at the base of the chain. “In the case of the TCF industry, the government scheme regulates working conditions from the top down by requiring the retailer to oversee the supply chain, and from the bottom up by worker’s exercising their legislated rights.

“One advantage the TCF scheme offers workers is the ability to make a pay claim to anyone in the supply chain, except the person at the retailer at the top, giving them greater pay security. “Without regulation these individual workers at the base of the supply chain are vulnerable to exploitation.”

Often workers, especially in the TFC industry, don’t speak up when they are being disadvantaged in the workplace as they fear victimisation.

“Previously we have seen this group paid a piece rate for their work which results in them earning far below the minimum wage. These conditions can also result in inadequate health and safety conditions.”

Rawling says his research will also offer recommendations about possible improvements to the schemes, propose reforms and highlight new supply chains. It’s hoped the findings may assist policymakers and regulators in improving the implementation of the supply chain schemes for the benefit of workers and businesses.

There will be benefits for Rawling’s students too. “For students in my class, the answers to questions aren’t always in the law books, what the statute says or what a judge says; we are increasingly interested in how the law operates in practice, as a discipline.

“I put emphasis on practice-based learning and doing research of this nature feeds directly into my teaching. I can have much more informed and relevant conversations with my students by going beyond what is in the text book.”

Alexandra Berriman
Research and Innovation Office
Photographer: Joanne Saad
Comment on this article at newsroom.uts.edu.au/news/2012/07/chain-reactions
SKIN DEEP

Dr Catherine Burke is developing an understanding of skin-associated microbial communities in diabetic people suffering with chronically infected wounds (see our story on page 13).

This image shows corneocytes, dead skin cells which form a barrier at the top of the epidermis of the skin, which were collected with a skin swab – the most common sampling technique for detecting bacteria on the skin. It was captured with a phase contrast light microscope image taken at 1000x magnification.

Image supplied by: Dr Catherine Burke