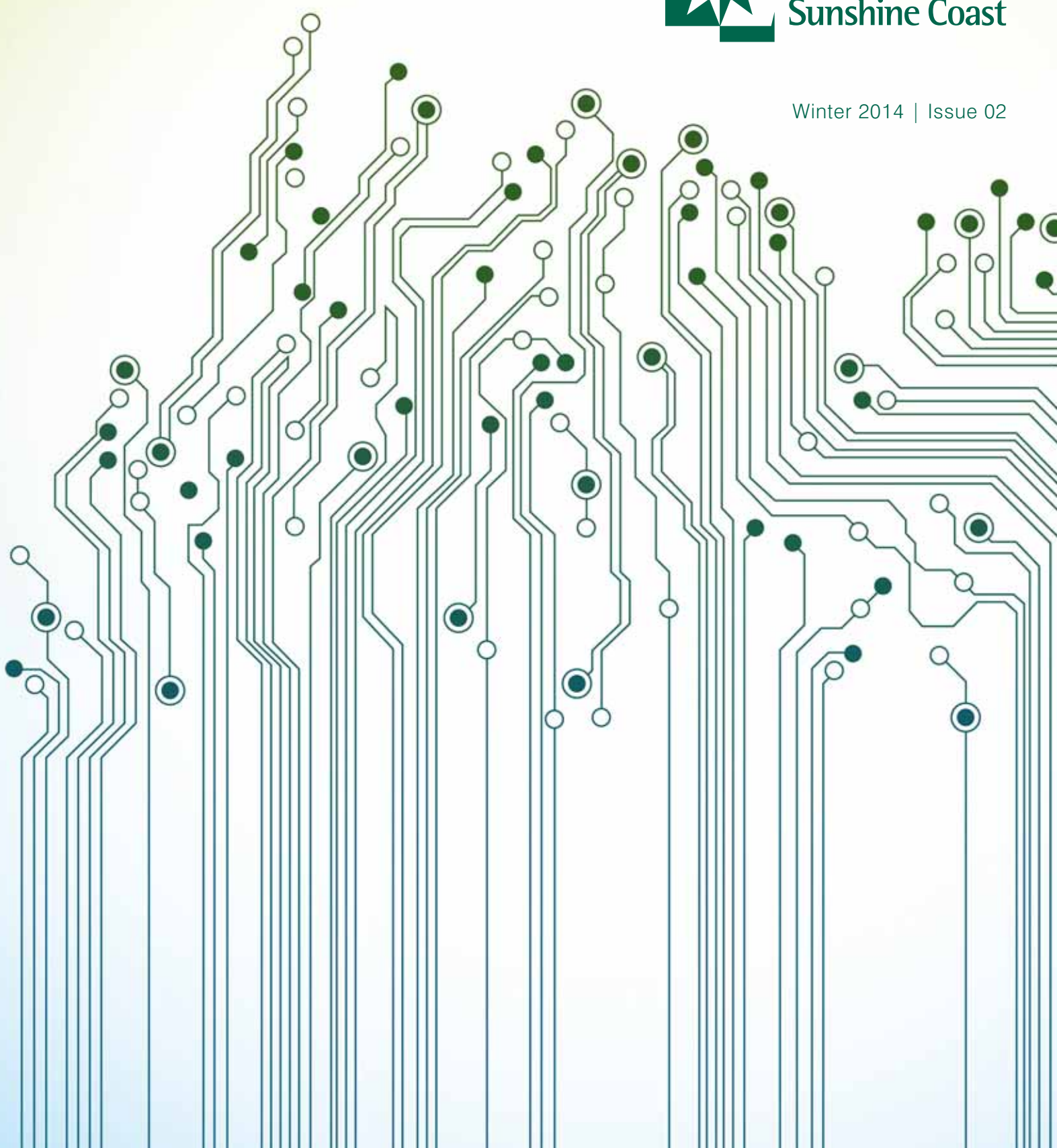


USC Research

B U L L E T I N



Winter 2014 | Issue 02



Welcome from the Pro-Vice Chancellor (Research)

University of the Sunshine Coast (USC) is Australia's youngest and fastest growing University, aspiring to be a great regional University (ie Queensland's equivalent of New South Wales' University of Wollongong embodying niche and world-class research capabilities) in the Australian Higher Education sector.



It is an exciting phase of growth and development at USC

Research at USC is continuing to 'steam ahead' under the impetus of the University's research capacity building strategies. In recent times, we have witnessed the delivery of significant outcomes such as the establishment of Research Centres, Clusters and Emerging Research Themes, appointment of additional top-class USC Research Fellows from around the globe, appointment of several leading research capacity building professors from around Australia, the procurement of new and substantial national competitive research grants in USC's fields of strength, entering the Group of Universities possessing significant research intensity by exceeding the Threshold 2 of the Sustainable Research Excellence (SRE) scheme of the Federal Government, a significant increase in higher degree by research enrolments and a substantial boost in the University's research publications. Accordingly, it is very pleasing to note that the University Research Centres, Clusters and Emerging Research Themes are going from strength to strength, and 'kicking huge goals' on behalf of the research community at USC.

With regard to the quality and impact of research at USC, it is very pleasing to report that Professor Bill Carter (SRC researcher) received two Sahak Metrey Medals from the Cambodian Government for outstanding assistance with sustainable tourism development and outstanding achievement in advocating sustainable tourism in Cambodia's coastal zone; Associate Professor Paul Salmon (USCAR researcher) won the national Peter Vulcan Award for Best Research Paper at the 2013 Australasian Road Safety Research, Policing and Education Conference for his on-road study of cyclist behaviour and situation awareness; Dr Claudia Baldwin (SRC researcher) and PhD student Caroline Osborne, with Phil Smith of design firm Deicke Richards, won the 2013 Australasian Core Values Award for Participatory Research from the International Association of Public Participation (Australasian Division); Dr Bridie Scott-Parker (USCAR researcher) was recognised by the Australian Academy of Science as a rising research star and became one of 10 *Science Stars of Tomorrow*; Dr David Schoeman had three seminal papers published in *Nature Climate Change*, *Nature* and *Science* on studies into the effects of climate change on ecological systems, as a key member of significant international consortia; and Professor Abigail Elizur had a seminal paper on the impacts of the Deepwater Horizon crude oil losses on pelagic fish published in the *Proceedings of the National Academy of Science* (PNAS). Furthermore, Professors Abigail Elizur and Roland De Marco each won European Commission International Researcher Exchange Scheme (EU IRSES) grants that will bring world leading European researchers to USC, and Professor Hank Harlow of the University of Wyoming was winner of yet another Australian-American Fulbright Commission Senior Specialist Award for a USA academic to visit USC.

With planning well underway for the Excellence in Research for Australia (ERA) 2015 research assessment exercise, present indications demonstrate that USC will score at world standard or above in the focus areas of its research Centres, Clusters and Emerging Research Themes, demonstrating that the broad research capacity building initiatives of the University are working exceedingly well.

What is most pleasing about the aforesaid research successes is how they demonstrate a maturation in the University's research agenda, and how USC is competing wonderfully well on the world stage, which is absolutely critical for success in a fiercely and globally competitive research environment.

It is a dynamic, fascinating and exciting stage of USC's research development, and it is wonderful to be a part of the ever burgeoning 'research machine' at USC. Accordingly, I feel privileged, honored and proud as the Pro Vice-Chancellor (Research) of the University.

Professor Roland De Marco
ProVice-Chancellor (Research)



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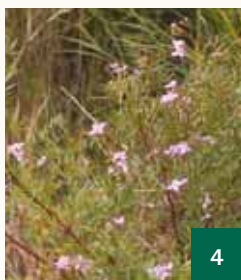
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USC Research B U L L E T I N

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DNA barcoding South-East Queensland rainforest

Associate Professor in Vegetation and Plant Ecology, and member of USC's GeneCology Research Centre, Alison Shapcott, was awarded a Queensland-Government-Smithsonian Fellowship in 2012 to spend half the year in the Smithsonian Institution's laboratories at the National Museum of Natural History (NMNH) in Washington DC.

Her collaborative project, with the Queensland Herbarium and the research team of Dr John Kress from the Smithsonian Institution (NMNH) in the United States of America, is to create DNA barcodes for all 870 species of South-East Queensland's rainforest trees, shrubs, vines and herbs. A potential benefit to this task is not only identifying plants when identification was previously difficult, but also substantially reducing the time it takes to identify unknown plants and plant by-products.

Working with Dr John Kress, a world leader in rainforest DNA barcoding, will enable this project to put the diversity of the south-east Queensland rainforest in an international context.

"I was able to achieve a lot in a short time by working alongside the Smithsonian researchers who have perfected the extraction and sequencing of plant DNA barcodes and Queensland Herbarium botanists who are experts on the state's flora," Associate Professor Shapcott said.

The successful collaboration has resulted in generating a unique, three-gene DNA barcode for most species, which will be uploaded onto global DNA barcoding databases.

The USC researcher has published widely in international journals and is recognised worldwide for her contribution to researching the population genetics and ecology of rainforest plants, with a particular interest in the evolution and maintenance of biodiversity in this field.

Associate Professor Shapcott has so far produced high quality DNA barcodes for 750 species in south-east Queensland. The remaining approximate 120 species will be completed this year.

The results have revealed that South-East Queensland's rainforest contains much more biodiversity than might be expected, based on the number of species compared to rainforests globally as most rainforest families are represented. Results have shown the Burringbar-Conondale Ranges and the Scenic Rim subregions have the highest rainforest diversity. Their composition is consistent with rainforest refugia, while the Stanthorpe and



Associate Professor Alison Shapcott inspects a flowering Boronia plant in the compensatory habitat at USC.

Tenterfield plateaus were considerably less diverse but still quite distinct.

Associate Professor Shapcott has consolidated her collaborations with Professor Darren Crayn from James Cook University. They plan to combine north Queensland rainforest and south-east Queensland rainforest DNA barcodes to investigate biodiversity of the entire Queensland rainforest. The USC plant researcher has also established a partnership with Professor Dan Faith, a world leader in mathematical analysis of Phylogenetic diversity, from the Australian Museum. As a team they are developing novel applications of Biodiversity analysis using the DNA barcoded library, especially for conservation assessment and planning applications. The project has been attracting considerable interest and is set to expand and develop into a new field of research.

Queensland's Minister for Science, Information Technology, Innovation and the Arts, Ian Walker, has praised the value and progress of Associate Professor Shapcott's research, culminating in her being the recipient of a Queensland-Government-Smithsonian Fellowship.

"DNA barcodes will help quarantine officers, forensic investigators, land owners and others who need to quickly and accurately identify unknown plants and plant parts that may be poisonous, prohibited or legally protected," Minister Walker said. "This is great work that demonstrates Queensland's science capabilities and strengths, and confirms the value of international collaborations."

International collaboration on Climate Change Science

Research undertaken by USC Associate Professor in Biostatistics, Dr David Schoeman, has achieved international recognition by being published as part of a multi-authored collaborative paper in the scientific journal *Nature Climate Change*. Testament to Dr Schoeman's work, *Nature Climate Change* publishes only the most significant and cutting-edge research on the science of climate change, its impacts, and its wider implications for the economy, for society and for policy.



Dr Schoeman is a marine climate-change ecologist with 10 years experience in this field, and an additional seven years experience in coastal ecology and fisheries science. Since joining USC in the middle of 2012, Dr Schoeman's research has focused on identifying and quantifying ecological consequences of climate change at scales from the very local to global, and on designing strategies to minimise the loss of ecosystem services.

Dr Schoeman played a key role in the major international study that led to the paper in *Nature Climate Change*. This article details the findings of an extensive, three-year research project led by marine ecologists Dr Elvira Poloczanska and Associate Professor Anthony Richardson of the CSIRO Climate Adaptation Flagship (the latter also affiliated with the University of Queensland).

"This is the first global meta-analysis of marine ecological impacts of climate change, and will set the standard for work to come," Dr Schoeman said.

USC academic Dr Schoeman was one of 19 researchers from Australia, the United States of America, Canada, the United Kingdom, Europe and South Africa involved in the international study. Dr Schoeman was a member of the core team that conceptualised, conducted, illustrated and provided explanatory text for the numerical analyses underpinning the study, using a database of 1,735 marine biological responses to climate change compiled after a thorough review of the published peer-reviewed literature. For each paper considered, the team determined whether the authors had considered global climate change as a driver of ecological change, and also whether the authors considered this change to be consistent with what would be expected under climate change.

"These sorts of studies that rely on literature reviews are sometimes criticised because it is generally considered easier to publish surprising, rather than mundane, results," Dr Schoeman said.

"But we are fairly confident that we had accounted for this possibility because most studies of marine systems focus on multiple species simultaneously, and each of these species will have a different response to climate change. As a result, almost a quarter of the observations in our database showed no change at all in response to climate change. However, of those organisms found to be responding to climate change, 83% were responding in ways consistent with what would be expected under climate change," Dr Schoeman said.

The team found that warming oceans are impacting the distribution of marine life, effectively re-arranging the broader marine landscape. Importantly, the work demonstrated that in response to climate change, marine life is moving much faster towards the earth's poles than is land-based life. Changes in seasonal activities, like breeding, are also shifting earlier in Spring and later in Autumn, although in this respect the contrast between organisms living in the sea and on land is less pronounced.

"We found that, on average, marine organisms are moving several times faster than land-based organisms," Dr Schoeman said. "They are moving at a rate of 30-72 km per decade, compared with estimates of 6-16 km per decade for land-based species."

"We also found that the timing of seasonal events, like breeding and blooming, is changing faster in the ocean than on land, although only slightly," Dr Schoeman said.

USC's Associate Professor in Biostatistics David Schoeman, right, with Professor Michael Burrows of the Scottish Marine Institute.

Dr Schoeman, who moved to USC from the University of Ulster in Coleraine, Northern Ireland, in mid-2012 as a Fellow under the Collaborative Research Networks (CRN) program, said he was proud to have been involved in such a significant study that began at the National Center for Ecological Analysis and Synthesis in the United States. He continues to contribute to several international collaborations with the aim of developing numerical methods for predicting the rearrangement of marine ecological communities under climate change, and for including this knowledge into marine conservation planning initiatives. Dr Schoeman recently served as a contributing author to Chapter 30 (Open Oceans) of Working Group II's contribution to the Intergovernmental Panel on Climate Change Fifth Assessment Report that was recently published.

Dr Schoeman also helped conceptualise, conduct and illustrate numerical analyses for a subsequent climate change study published in the prestigious scientific journal *Nature* called 'Geographical limits to species-range shifts are suggested by climate velocity'.

Led by Professor Michael Burrows of the Scottish Marine Institute and involving researchers from Australia, the United Kingdom, the United States, Canada, Germany, Spain and Saudi Arabia, the researchers comprehensively mapped how the natural world is likely to respond to global warming due to climate change.

Cambodian sustainable tourism awards for USC Researcher

USC Professor in Heritage Resource Management Bill Carter has been presented with two prestigious awards from the Cambodian Government at a special ceremony late last year in Sihanoukville.



Dr Bill Carter (centre) with Mr Sokhom Thok from the Ministry of Tourism (left) and the Governor of Sihanoukville HE Mr Sarath Sbond (right) in Sihanoukville, Cambodia.

The Associate Director of the University of the Sunshine Coast's Sustainability Research Centre received two Sahak Metrey Medals. The first medal was the equivalent of a gold medal, the highest Order the Cambodian Government can give to a foreigner. Dr Carter was nominated by Cambodia's Minister of Tourism for outstanding assistance with the sustainable tourism development of the country. The second award the USC researcher received was the equivalent of a bronze medal. This nomination was made by the Governor of Preah Sihanouk, on behalf of four coastal provincial governors, for outstanding achievement in advocating sustainable tourism in Cambodia's coastal zone.

Cambodia's Prime Minister also acknowledged the broader contributions of USC in his speech read to the audience by the Minister of Tourism.

USC Sustainability Research Centre Director Professor Tim Smith said, "These are very significant awards for USC's service to Cambodia, and an excellent reflection of the impact of Bill's research in the region."

Dr Carter and a team of USC staff and students have spent four years working with Cambodia, including preparing, researching and producing the new report, 'Strategic Guidelines for Sustainable Tourism on the Khmer Coast'.

"These strategic guidelines provide clear direction for tourism planning, development and management in the coastal zone. They incorporate the vision and policies of the Royal Government of Cambodia and can form the basis for action by my Ministry and the Provincial Governments," Cambodia's Minister of Tourism Dr Thong Khon said.

The past four years have included Dr Carter taking nine students and two staff to visit the four provinces that were addressed in the report, Preah Sihanouk, Kep, Kampot and Koh Kong. The purpose of the trip was to gather data and interview officials responsible for environmental protection, fisheries management, planning and public health. Collectively the USC delegation aimed to present the role that tourism can play in integrated coastal management. It involves infrastructure development, such as power, water and sewerage, and investigating potential tourism products and services.

"Rapid tourism growth in Cambodia is driving the need for sustainable planning and development in the coastal areas, to protect environmental values while enhancing economic growth," Dr Carter said.

The student travel was part of USC's Global Opportunities (GO) Program. Assistance with travel and research was supported by the Asia Pacific Network for Global Change Research and the Australian Government.





Stretching the research dollar further

Building research capacity in a regional University can be a challenge, however challenges often result in creative solutions. When presented with an opportunity, the University of the Sunshine Coast chose to leverage a Collaborative Research Network (CRN) placement in marine biotechnology and turn that into a team of 3 within the space of twelve months, with the help of an ARC DECRA award.

The story of Dr Tomer Ventura, originally from Israel, is somewhat of a fairy tale story in the land of research funding. Dr Ventura was head hunted by Professor Abigail Elizur, Director of the GeneCology Research Center at the University of the Sunshine Coast (USC), and awarded a CRN Fellowship in August 2012.

While awaiting approval for his family's application for permanent residency, Dr Ventura developed and submitted his application for an ARC Discovery Early Career Research Award (DECRA).

Pro Vice-Chancellor (Research) at USC, Professor Roland De Marco, described the ARC DECRA proposal as one of the finest proposals by a young researcher that he had ever seen throughout his career.

Shortly after arriving in Australia with his wife, Dr Ventura was awarded the ARC DECRA. Further project funding was subsequently awarded by USC as leverage, and the CRN Fellowship funding was re-allocated within the project. Twelve months later there is now a team of three with a significant project budget of \$260,000 over 3 years devoted to the exploration of androgenic glands of crustaceans.

Coming from a team environment in Israel, Dr Ventura could have chosen from any number of offers, however he chose a regional University in Australia and continued to maintain links with Israel. He subsequently also developed strong links with the University of Tasmania, working alongside A/Prof Stephen Battaglene, and with Colorado (USA).

What has been described as a model of 'responsible progression' of research funding by Dr Ventura is also described by others as an example of entrepreneurial research management, in a world of competitive funding.

Dr Ventura's research is highly deserving of the rapid funding progression, as his discoveries are enabling greater increases in global commercial yields of fresh water prawns and other crustaceans.

The commercial production of crustaceans has been steadily increasing in volume over the past 15 years, however it was the isolation and subsequent manipulation of the androgenic gland hormone that transformed the aquaculture industry.

The doubling and then tripling of commercial production in some species such as crayfish in recent years creates similar opportunities for the farming of other crustaceans, including lobsters.

Further research will help create better management techniques in this growing field.

While the commercial application of this research is obvious, there are also environmental and biodiversity implications, including the opportunity to eradicate invasive species via the manipulation of reproduction mechanisms.

■ Sustainability Research Centre

SRC's research focuses on societal responses to emergent local and global change forces in sustainability. It adopts a transdisciplinary collaborative approach broadly aligned with human geography, embracing the disciplines of social, behavioural, economic and management sciences.

■ Forest Industries Research Centre

Focusing on issues relating to the forestry value chain, economic and environmental sustainability of forest industries, tropical and sub-tropical forestry through to the processing of novel commercial species.

Research at USC



Engage
Research
Cluster

Sustainability
Research Centre

Forest
Industries
Research
Centre

Indigenous
Studies

USC Accident
Research

■ GeneCology Research Centre

Focused on areas of genetics, ecology, genomics and physiology. Researching sustainable production of aquaculture, horticulture and forestry systems, biodiversity conservation and sustainable urban forestry and horticulture.

Research Centres

Research Clusters



GeneCology Research Centre

Cluster for Health Improvement

Inflammation and Healing Research Cluster

■ Engage Research Cluster

Concentrating on finding collaborative solutions to challenging social problems through innovative digital technologies. This includes computer games, Smartphone / tablet applications, social networks and interactive media and artwork.

■ Cluster for Health Improvement

Focusing on health care sustainability, nutrition, quality of life and wellbeing, as well as health care training and education. To be spearheaded by the new Skills, Academic and Research Centre (SARC) within the new Sunshine Coast University Hospital opening in 2016.

■ Inflammation and Healing Research Cluster

Focusing on easing human suffering and the significant burden of health care costs by investigating the molecular, immunological and physiological mechanisms underlying dysfunctional inflammatory responses leading to common chronic and autoimmune diseases.



Emerging Research Themes

■ Indigenous Studies

Focusing on the inter-disciplinary area of Indigenous studies including land/territory, social, historical and place-based aspects of identity as well as socio-cultural practices, knowledge and institutional systems that advance the aspirations of Indigenous peoples.

■ USC Accident Research

Developing a leading capability in accident and safety-related research with a core focus on human factors and system performance in order to improve safety and remove threats to public health.

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Research profiles

USC is one of the youngest universities in Australia however is rapidly increasing its research capacity, while being located on the beautiful Sunshine Coast. The geographical location, strong research teams and research capabilities enables USC to attract new and outstanding academics to join the ranks of its teaching and research staff. Here we profile three very different academics, fresh to USC, but highly experienced in their chosen fields.

Early career researcher: Science star of tomorrow

Dr Bridie Scott-Parker joined USC on a 1 year Research Fellowship before being awarded a 5-year Fellowship in June last year. She has big dreams and is dedicated to developing higher degree graduates.

As part of a holistic approach to understanding young driver road safety, Dr Scott-Parker is engaged in a number of projects that consider the influence of, and interactions between, key players in the young driver road safety sphere.

Some interesting projects include:

- How are teenage driver behaviours influenced by parental supervision and the presence of passengers in their cars?
- What are young driver's experiences with police, and how does this influence their perceptions regarding enforcement and the police in general?
- What actually happens during a learner lesson? Cameras are being used to film inside the vehicle during a lesson taught by a professional driving instructor, and surveys and focus groups will help shed light on this little-understood experience.

What were your personal motivators for entering your chosen academic field?

I have always had to know how and why—I could sit in a shopping centre and observe people then chat with them all day! Being a researcher allows me to find out how and why. Being a higher degree research student supervisor allows me to guide the next generation in knowing how and why.

I have also always been driven by my family's philosophy of 'leave the world a better place than when you entered it'. This is the message my husband and I constantly send our children also.

What better way to do this than to improve young driver road safety, which will also mean improved road safety for all users (pedestrians, other drivers, passengers and motor/pedal cyclists) as they share



the road with them? I can positively impact upon the world, and I cannot think of a better legacy.

Why did you choose to come to USC?

After completing my PhD in 2012, I was considering my employment options in Australia and overseas. I had heard through colleagues that Associate Professor Paul Salmon was creating a new accident research team. I had heard that he too looked at problems from a different perspective.

I was also interested in the opportunity to assist in the creation of the University of the Sunshine Coast Accident Research (USCAR), and this seemed like the ideal place to look at the young driver problem from a different perspective.

My children were also won over by the kangaroos and the ducks on campus!

What are your biggest career achievements to date?

- Being awarded a USC Fellowship.
- Invited to be a member of the United States Transportation Research Board of the National Academies Operator Education and Regulation Committee whilst a doctoral candidate.
- Invited to present as 1 of 10 Australian early and mid-career researchers whose work is interesting and innovative by the Australian Academy of Science in the 2014 speaker series, Science Stars of Tomorrow (May 2014).

Who would you most like to collaborate with and on what type of project?

I envision developing and leading an outstanding international collaborative young driver research project, and as such would collaborate with the leading researchers in Australasia, the Americas, and Europe, while supporting researchers in less-developed nations such as Africa.

Mid career researcher: Researching the silent killer

Dr David McMillan comes to USC as a Senior Research Fellow for 5 years. He is part of a research team called 'The Molecular Genetics and Disease Group' and Dr McMillan is focused on the bacterium *Streptococcus pyogenes* which kill up to half a million people each year.

At USC Dr McMillan is using a combination of bioinformatics, molecular genetics and immunology to try and come up with an affordable novel vaccine that will protect people from infection.

How did your journey commence that led you to your current research area?

I have always been interested in science from an early age. I used to watch the Curiosity Show, Dr Who and Great Mysteries of the World. I had one of the first home computers, a Dick Smith VZ200, that had 4k (yes 4k) of RAM, and used a tape recorder as its drive.

When enrolling for university, I was initially going to enroll in an accounting degree as this was a safe career option. Fortunately, the night before university enrolments closed I changed to a science degree.

The great thing about being a research scientist is that as part of your job description you have to go out and discover something that nobody has known before. Ever! I then have to tell people about it. And to do all this you may have to travel Australia and the world!

What professional ambitions do you hope to achieve at USC?

The name of my research team at USC, 'The Molecular Genetics and Disease Group', gives a good idea of the direction of my research. My goal is to lead a research team that answers fundamental and applied questions regarding how bacteria cause disease in humans and other animals. Using this knowledge I hope to develop new therapeutics that will ultimately reduce rates of infectious disease.

Why did you choose to come to USC?

It's an exciting time to come to USC, as the University is expanding its research base. My five year position will give me an opportunity to build a strong and productive research team that has expertise in molecular microbiology, immunology and bioinformatics, and apply these techniques to infectious disease problems.

The partnering with Sunshine Coast Hospital through the Skills, Academic and Research Centre (SARC) will also enable collaborations with clinicians on new projects that may potentially bring more immediate benefits to the community.

What is your biggest career achievement to date?

Being awarded an Alexander Von Humboldt Fellowship is one of my proudest achievements. These fellowships are internationally competitive. Gaining it enabled me to study in Germany for two years. The fellowships also enable you to return on a semi-regular basis so that you can maintain contact with your collaborators and international network.

What are your future career aspirations?

USC has several internationally renowned academics on its books. It would be great to raise the profile of USC's microbiological research across the country and internationally.





Late career researcher: Internationally renowned Koala researcher joins USC

Professor Peter Timms joins USC after a 25 year career at QUT, with a focus on understanding why animals and humans get similar versions of the same disease, such as Chlamydia.

The infection rate for Chlamydia in koalas is high in many areas of Australia, and for humans, the rate of chlamydial STIs is continuing to rise, despite extensive educational campaigns. Professor Timms is world renowned for recognising the importance of these problems and his team is developing vaccines for both humans and koalas. In the case of human chlamydial infections, where current educational approaches are not working as well as they should, he has recently collaborated with creative industries professionals to promote a modern and fresh approach to try and combat the increasing infection rates.



What were your personal motivators for entering your chosen academic field?

I have always been interested in biology, especially microbiology—Why do people get sick? How is beer made? My curiosity in microbiology started when I was in high school.

What professional ambitions do you hope to achieve at USC?

I am interested in establishing an institute concentrating on 'One Health'. It will focus on animal and human diseases, and the environment and how these all interact. One health also looks at why animals get diseases from humans and why humans get diseases from animals. My vision for a 'One Health Institute' is to provide a well rounded research and educational pathway, to mentor USC students and researchers, and be a successful recipient of funding applications to be used to provide an increase in higher levels of USC scientific research achievements.

How did your journey commence that led you to your current research/teaching area?

I worked for the Queensland Department of Primary Industries and was responsible for the daily production of the tick fever vaccine. An opportunity at the Queensland University of Technology came up and I have worked there for the past 25 years, prior to my commencing at USC this year.

Why did you choose to come to USC?

For the opportunity to extend my research in a fresh and innovative environment. Already being a local Sunshine Coast resident gives me the chance to give something back to my local community.

What advice do you have for someone who would like to enter a similar academic position to yourself?

You need to find an area of study that gets you excited. Be a little entrepreneurial, have a broad range of skills and become a multi-faceted individual. It is important to be a good communicator as you need to effectively communicate with funding organisations, researchers and students.

What are your future career aspirations?

To use my experience to mentor young and upcoming researchers. I aspire to make major contributions to addressing Chlamydia in humans.

Who would you most like to collaborate with and on what type of project?

I would like to work with the Fred Hollow's Foundation to assist in developing a vaccine to solve trachoma (the blinding eye disease) in all affected people, but particularly in Australian indigenous communities. It would be extremely satisfying if my scientific knowledge and experience could make a significant difference to improve people's lives.



High powered computing capabilities for bioinformatics

Members of the Genecology Research Centre and Information Technology Services have come together to procure, build and secure a high-powered computing server. The server has been designed specifically for bioinformatics applications for the analysis of next-generation genetic sequencing data, a methodology heavily reliant upon for cutting-edge 'omics' research. Hosting 64 cores, 1 terabyte of RAM and operating in the Linux environment, the server is powerful enough to run most of the popular applications used in this field of research.

Scientific Officer at the Genecology Research Centre, Mr Daniel Powell said that traditionally, work involving such a resource for USC staff and students was outsourced to service providers or done via remote or cloud computing.

"Locating a server on campus has given researchers flexibility, security and time savings in the analysis of large genetic sequence datasets," Mr Powell said.

Having this new server online has brought invaluable support to a number of USC's research projects, including those funded by the Australian Research Council (ARC), Discovery Early Career Researcher Award (DECRA), Fisheries

Research and Development Corporation (FRDC), Seafood Cooperative Research Centre, Australian Centre for International Agricultural Research (ACIAR) and Collaborative Research Networks (CRN), which are using this resource extensively.

"Another advantage of the server is that it will provide highly sort-after bioinformatics skills training for USC Honours and Higher Degree Research students," Mr Powell said.

Complementing the high-powered computing server is the recent acquisition of an Illumina MiSeq next-generation desktop sequencer. This instrument can produce large datasets, providing researchers with the ability to take

their experiments from the lab bench through to final computational analysis, without setting foot off campus. Funding for the server and contributions to the MiSeq were provided by USC's Faculty of Science, Health, Education and Engineering and the Genecology Research Centre.

A collaborative approach with the Queensland University of Technology (QUT) will foster shared access to sequencing machines, giving USC researchers access to QUT's Ion Proton and Ion PGM sequencers.

This new server will also underpin a large portion of the analysis undertaken by the Consortium to sequence the genome of the Sydney Rock Oyster, which includes partnering between USC, Macquarie University and the Department of Primary Industries, NSW.

Further future collaborations from the strategic appointment of a bioinformatics expert in a joint project with the University of Queensland will strengthen USC's capacity to produce world class research in this field. Also, by expansion of the connectivity of USC to the research network and via USC's developing partnership with the Queensland Cyber Infrastructure Foundation (QCIF), the University will expand substantially its research capabilities in bioinformatics.

**COMMUNICATE
COLLABORATE
CELEBRATE**

**RESEARCH THAT
MATTERS**

**University of the
Sunshine Coast**

UNIVERSITY RESEARCH WEEK

14-18 JULY 2014

Research Week 2014 | Every year the University of the Sunshine Coast celebrates researchers and their findings in what has become known as Research Week. Held in July, the theme for 2014 is Communicate Collaborate Celebrate—Research that Matters. Keynote presentations, public seminars, research showcases and the opportunity for students to better understand career opportunities in research result in a fun-filled action-packed week long of activities.

STUDENT CORNER

Researchers fired up by Awards



Brett Parker.

Two University of the Sunshine Coast students have caught the attention of state and national environmental bodies for their fire management and ecology research.

Final-year Science students Brett Parker, 28, of Sippy Downs, and Ross Waldron, 36, of Alexandra Headland, were recently recognised for their separate studies into the effects of fire mapping and management on the Sunshine Coast.

Brett, who will start his Honours degree in 2014, received a highly commended and runner-up award from Australia's peak body for spatial scientists, the Surveying and Spatial Sciences Institute Australia. He said he was thrilled to have his research acknowledged by the organisation and was looking forward to further investigating fire ecology.

"My research used state-of-the-art remote sensing techniques to map and study burnt land in the Currimundi Lake Conservation Park," Brett said.

"Remote sensing helps to provide an accurate geographical outline and profile of the burnt area, including the impact on inhabitants (animal and human).

"These techniques analysed ecological factors such as the intensity, frequency, seasonality and patchiness of the burn including whether the fire was naturally started or deliberately lit."

He also received a special commendation and \$1,500 towards his Honours from the South-East Queensland Fire and Biodiversity Consortium.

Ross was awarded a full scholarship valued at \$2,500 from the same consortium for his research on the effects of enforced fire regimes over a period of 30 years. He also plans to complete his Honours degree at USC in 2014 and said research into the complexity of fire management was critical for the Sunshine Coast.

"Much of the region's vegetation is highly reliant on fire. However, it also is located closely to properties and key infrastructure," Ross said.

"If we can examine how fire management strategies contribute to or help to avoid losses of species as well as property, it could make a big difference to the overall impact fire has on the Sunshine Coast."

Brett's supervisor at USC, Lecturer in Geospatial Analysis Dr Sanjeev Kumar Srivastava congratulated both students on their awards.

To have both their research projects recognised by such highly respected and accredited organisations while studying as undergraduate students is a significant achievement," Dr Srivastava said.



Research to reveal rock oyster's genetic secrets

A research collaboration involving the University of the Sunshine Coast has launched a project aiming to ensure the sustainability of the iconic Sydney rock oyster and its lucrative aquaculture industry along Australia's east coast.

Scientists from Macquarie University, USC, the New South Wales Department of Primary Industries and the Sydney Institute of Marine Science have formed a consortium to sequence the entire genome of the oyster, *Saccostrea glomerata*.

Sydney rock oysters are a crucial species in estuaries and rivers along Australia's temperate east coast and anchored the ecology of many coastal ecosystems. In often hostile environments, oyster beds provide refuges for a broad range of other species, and oysters are an important prey item for fish and crabs.

The ability of Sydney rock oysters to respond to environmental change will become increasingly important to the sustainability of Australia's estuarine ecosystems, particularly on the highly urbanised eastern seaboard.

Commercial farming of Sydney rock oysters is the biggest aquaculture industry in New South Wales and produces about half of the edible oysters sold in Australia.

USC Professor in Aquaculture Biotechnology Abigail Elizur said the project aimed to build knowledge about the ecologically and economically vital oyster, which can be found as far north as the Sunshine Coast.

"By sequencing its complete genome, we will develop a vast genetic resource that can be used to test crucial questions such as the ability of oysters to respond to environmental stress, as well as understand its reproductive cues and requirements," she said.

"It will also help us with the discovery of genes controlling beneficial traits, such as resilience to environmental contamination and disease resistance."

Wayne O'Connor, Principal Research Scientist at the NSW Department of Primary Industries, said: "Our team expects the sequencing to take about a year and then we will see how the research can be applied."

Dr O'Connor, who is based at Port Stephens Fisheries Institute, is also an Adjunct Professor at the University of the Sunshine Coast.



Professor Abigail Elizur, Co-Director of USC Genecology Research Centre.

Forest Research Partnership Success

Professor of Forestry Operations at USC and Director of the Australian Forest Operations Research Alliance (AFORA) Mark Brown re-signed the AFORA agreement in June 2013 for a further period of two years. AFORA is an industry alliance with Australian forest industry stakeholders that was established in 2012 within USC. It consists of 18 partners, made up from 15 forest growers/managers, 2 university research centres and 1 bioenergy producer. In the area of forest operations AFORA aims to improve cost management and value recovery, improve biomass recovery and utilisation, and improve logistics planning and execution.



Professor Mark Brown.



The objectives of AFORA are to deliver a collaborative applied research development implementation program to improve the understanding, management and control of forest operational costs for existing, evolving and new harvest systems.

Furthermore it aims to improve the planning and management of value recovery within harvest operations and for the application of optimisation to supply chain efficiency planning and management.

"AFORA's role in this process is essential as it has created and continues to develop a dossier of industry relevant information, which is independent and scientifically sound," said Professor Brown.

Working together with the alliance participants AFORA has, and continues to develop, practical tools and industry reports through participation in projects, studies and research.

"Having access to local highly skilled scientists with a background in harvesting and transport logistics is essential for the Australian Forestry Industry to continuously improve our practices and remain cost effective and efficient," said Sandra Hetherington of Norske Skog, an AFORA industry alliance member.

"Gunns Limited has continued with supporting the AFORA program, as there is a great opportunity to collaboratively work with the research scientists at USC, to assist in identifying innovative ways to address long standing fibre logistics inefficiencies.

In a globally competitive market place, innovation and efficiency will be an integral part of the success of any forestry company into the future."

*AFORA industry alliance member
Darren Herd, Wood Procurement Manager,
Gunns Limited*

Recent examples of collaborative applied research programs are:

Exploring the productivity and utilisation of an in-field chipping harvest system in an unmanaged blue gum coppice stand in Western Australia.

➔ Lower cost operations

Studying the natural drying process of logs and harvest residues to better understand how the moisture content of harvest residues varies when stored at the roadside for a period of 12 months.

➔ Higher value realisation

Comparing the performance of five different flail chains operating in blue gum plantations in terms of wear, fuel use per chain type, percentage of bark in the woodchips, productivity of the chains and the costs associated with using each of the 5 flail chains.

➔ Smarter operations

Developing a new productivity and cost-prediction model for decentralised chipping operations.

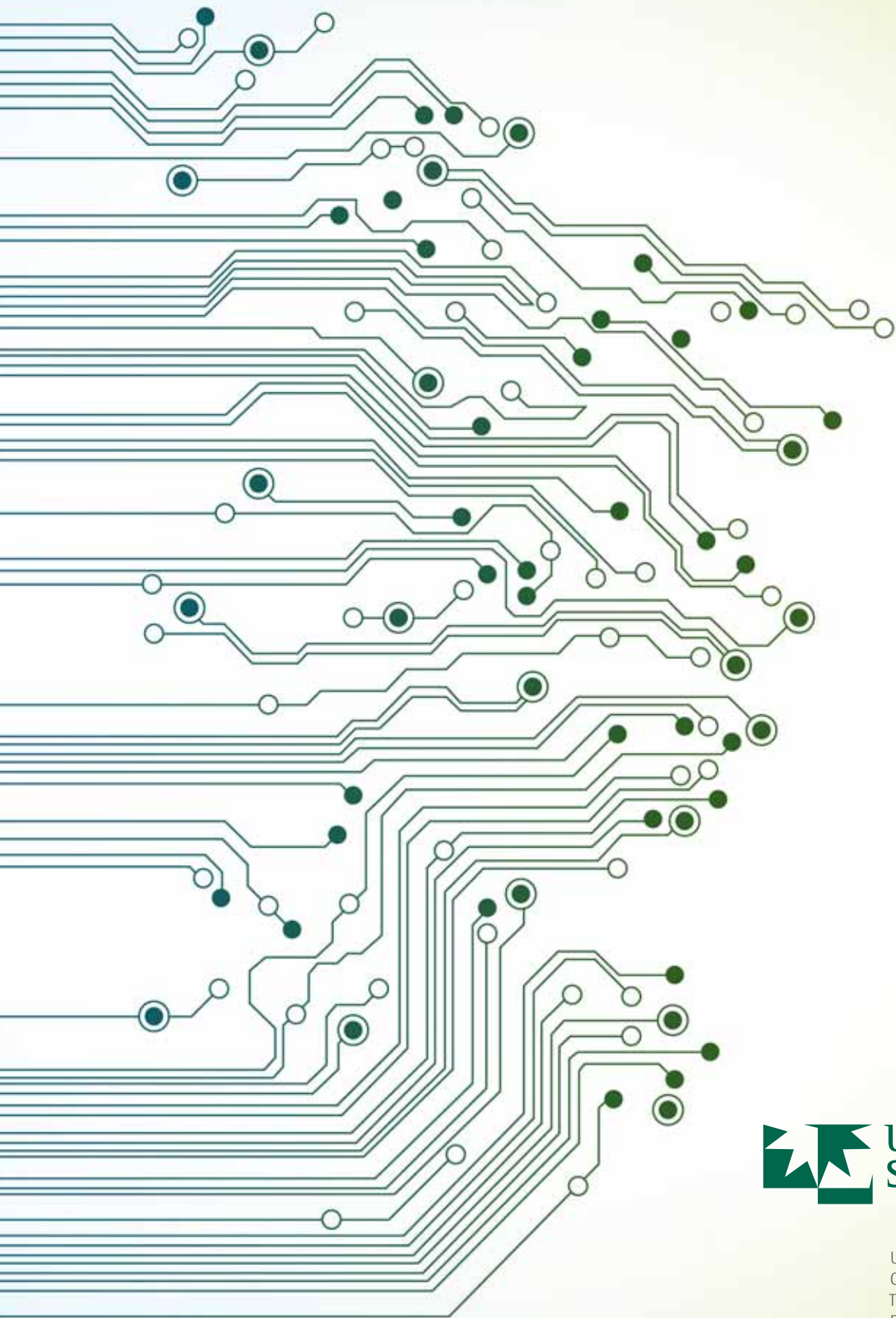
➔ Better planning

Reporting on a study in a Eucalyptus nitens (shining gum) plantation comparing the quantity of bark retained on logs at roadside following harvest and infield drying for a range of times, then processing and infield extraction by two harvesting methods.

➔ Future markets



AFORA has provided and will continue to provide the Australian forest industry with the means and tools with which to develop and implement future innovative ideas.



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