Annual Report 2013
School of Biological, Earth and Environmental Sciences
Never Stand Still
Faculty of Science
Biological, Earth and Environmental Sciences
## CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3 HEAD OF SCHOOL INTRODUCTION</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5 SCHOOL MANAGEMENT</strong></td>
<td>5</td>
</tr>
<tr>
<td>Head of School Advisory Committee</td>
<td></td>
</tr>
<tr>
<td>Visiting Committee</td>
<td></td>
</tr>
<tr>
<td>Teaching and Learning</td>
<td></td>
</tr>
<tr>
<td>Research</td>
<td></td>
</tr>
<tr>
<td>Postgraduate Higher Degree Research (HDR)</td>
<td></td>
</tr>
<tr>
<td>Work Health and Safety</td>
<td></td>
</tr>
<tr>
<td>Space Committee</td>
<td></td>
</tr>
<tr>
<td>Research Centre Directors</td>
<td></td>
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<tr>
<td>Website</td>
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<tr>
<td>Student Ethics Officer</td>
<td></td>
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<tr>
<td>Grievance Officer</td>
<td></td>
</tr>
<tr>
<td><strong>6 HEAD OF SCHOOL ADVISORY COMMITTEE</strong></td>
<td></td>
</tr>
<tr>
<td><strong>7 VISITING COMMITTEE</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5 TEACHING AND LEARNING</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5 RESEARCH</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5 POSTGRADUATE HIGHER DEGREE RESEARCH (HDR)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5 WORK HEALTH AND SAFETY</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5 SPACE COMMITTEE</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5 RESEARCH CENTRE DIRECTORS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5 WEBSITE</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5 STUDENT ETHICS OFFICER</strong></td>
<td></td>
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<tr>
<td><strong>5 GRIEVANCE OFFICER</strong></td>
<td></td>
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<tr>
<td><strong>5 IT</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5 SEMINARS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>7 SCHOOL STAFF</strong></td>
<td></td>
</tr>
<tr>
<td><strong>13 STRATEGIC PLAN</strong></td>
<td>13</td>
</tr>
<tr>
<td>The School Identity</td>
<td></td>
</tr>
<tr>
<td>Performance Targets</td>
<td></td>
</tr>
<tr>
<td><strong>17 LEARNING AND TEACHING</strong></td>
<td></td>
</tr>
<tr>
<td>Undergraduate Degrees</td>
<td></td>
</tr>
<tr>
<td>Honours Program</td>
<td></td>
</tr>
<tr>
<td>Postgraduate Coursework</td>
<td></td>
</tr>
<tr>
<td>Postgraduate Research Studies</td>
<td></td>
</tr>
<tr>
<td><strong>21 RESEARCH</strong></td>
<td>21</td>
</tr>
<tr>
<td>Areas of Research</td>
<td></td>
</tr>
<tr>
<td>Research Performance</td>
<td></td>
</tr>
<tr>
<td>BEES Centres</td>
<td></td>
</tr>
<tr>
<td>Research Facilities</td>
<td></td>
</tr>
<tr>
<td>Facilities and Equipment</td>
<td></td>
</tr>
<tr>
<td>Field Stations</td>
<td></td>
</tr>
<tr>
<td>Molecular Ecology and Evolution Facility</td>
<td></td>
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<tr>
<td>The Mark Wainwright Analytical Centre</td>
<td></td>
</tr>
<tr>
<td>Sydney Institute of Marine Science (SIMS)</td>
<td></td>
</tr>
<tr>
<td><strong>28 SPATIAL INFORMATION SYSTEMS</strong></td>
<td>28</td>
</tr>
<tr>
<td><strong>28 ENVIRONMENTAL AND GEOCHEMICAL RESEARCH LAB</strong></td>
<td></td>
</tr>
<tr>
<td><strong>28 BOAT AND SCUBA FACILITY</strong></td>
<td></td>
</tr>
<tr>
<td><strong>28 GLASSHOUSE</strong></td>
<td></td>
</tr>
<tr>
<td><strong>28 JOHN T. WATERHOUSE HERBARIUM</strong></td>
<td></td>
</tr>
<tr>
<td><strong>28 FOWLER’S GAP</strong></td>
<td></td>
</tr>
<tr>
<td><strong>31 AWARDS AND PRIZES</strong></td>
<td></td>
</tr>
<tr>
<td><strong>35 SELECTED RESEARCH PROJECTS</strong></td>
<td>35</td>
</tr>
<tr>
<td>A legacy of potential disasters – learning more about New Zealand’s far field tsunamis</td>
<td></td>
</tr>
<tr>
<td>Subtidal Ecology and Ecotoxicology Lab</td>
<td></td>
</tr>
<tr>
<td>A sustainable energy system for Australia</td>
<td></td>
</tr>
<tr>
<td>Rapid evolution in introduced species: will weeds in Australia eventually be accepted as unique native taxa?</td>
<td></td>
</tr>
<tr>
<td>Digital soil mapping using remote and proximal sensed soil data for 2-D and 3-D modelling of soil variation</td>
<td></td>
</tr>
<tr>
<td>Archean-Proterozoic Geobiology</td>
<td></td>
</tr>
<tr>
<td><strong>45 SCHOOL OF BEES SEMINAR SERIES</strong></td>
<td>45</td>
</tr>
<tr>
<td><strong>51 LIST OF PUBLICATIONS</strong></td>
<td>51</td>
</tr>
<tr>
<td>Journal Articles</td>
<td></td>
</tr>
<tr>
<td>Book Chapters</td>
<td></td>
</tr>
<tr>
<td>Books</td>
<td></td>
</tr>
<tr>
<td>Patents</td>
<td></td>
</tr>
<tr>
<td>Major Report</td>
<td></td>
</tr>
<tr>
<td>Conference Papers</td>
<td></td>
</tr>
<tr>
<td><strong>73 PHD STUDENTS AND COMPLETIONS</strong></td>
<td>73</td>
</tr>
<tr>
<td><strong>77 ACTIVE RESEARCH PROJECTS (VALUE $5,000+)</strong></td>
<td>77</td>
</tr>
<tr>
<td><strong>91 COURSE ENROLMENTS</strong></td>
<td>91</td>
</tr>
<tr>
<td><strong>94 CONTACT INFORMATION</strong></td>
<td>94</td>
</tr>
</tbody>
</table>
I am pleased to present the 2013 report highlighting various aspects of the School of Biological, Earth and Environmental Sciences (BEES). As in recent years, the School has continued to improve its performance in research, teaching and community engagement.

With the addition of the Climate Change Research Centre, bringing with it a large team of high-impact researchers, and other new appointments, staff numbers in the School have risen to around 105 academics and 35 administration and technical support staff. BEES is now larger than some Faculties at UNSW.

Research continues to span a wide range of disciplines – from the Earth’s crust to the atmosphere and deep time to the present. Our research is regularly featured in the media and scarcely a week passes without staff or students being interviewed for radio or TV on some hot topic. In terms of raw metrics, the year was very productive, with the School generating over 630 refereed research publications and in excess of $13M in research funding.

While postgraduate research and honours numbers increased this year, there was lower demand for undergraduate courses, especially in the biological sciences. Despite the recession in the mineral exploration industry, our geology number grew. BEES now hosts one of the largest PhD cohorts at UNSW, which both enlivens the place and helps drive our research. The new honours program has shifted to 100% research with even greater emphasis on research training and preparation for professional practice.

In December the UNSW Council approved the next step in the redevelopment of the Biosciences Precinct, incorporating a new building on the existing Biosciences Theatres site, followed by the complete refit of the existing building to deliver nearly 31,000m² of high quality research, teaching and office space for the biological and earth sciences. This will allow us to co-locate all groups in the one building complex. Various capital upgrades were completed at the Fowler's Gap Research Station, whereas we have discontinued research activities at the Cowan Field Station.

There have been a number of positional changes, with Tracey Rogers taking over as research postgraduate coordinator and I had my term as HOS extended to 2017. In addition to a substantial amount of new ARC funding, BEES staff have won a number of awards in 2013. This included the very prestigious Fenner Prize for Life Sciences that was presented to Angela Moles at Federal Parliament House in October, the AAS Dorothy Hill Prize to Lisa Alexander and Eureka Prizes to Rob Brander, Rob Brooks and Mike Letnic.

A/Professor David Cohen
Head of School and Deputy President of the Academic Board
SCHOOL MANAGEMENT

Head of School Advisory Committee
- A/Prof David Cohen (Chair)
- Prof Andy Baker
- Prof Robert Brooks
- Ms Francine Gregory
- Prof Emma Johnston
- Prof Richard Kingsford
- Prof Graciela Metternicht
- A/Prof Alistair Poore
- A/Prof Tracey Rogers
- Prof William Sherwin
- Prof Steve Sherwood
- Prof Iain Suthers
- Prof Peter Steinberg
- Dr John Triantafilis
- Prof Martin Van Kranendonk

Teaching and Learning
- Dr John Triantafilis (Director of Teaching and FoSEC rep) (Chair)
- A/Prof Rob Brander
- A/Prof Sue Hand
- Prof Emma Johnson
- Dr Scott Mooney (also Presiding Member of the Science Faculty)

Research
- A/Prof Alistair Poore (Director of Research and FRC rep) (Chair)
- A/Prof Russell Bonduriansky
- Prof Rob Brooks
- Prof Gerry Cassis
- A/Prof Mark Diesendorf
- Dr Malte Ebach
- A/Prof Jason Evans
- Dr Ian Graham
- Prof Richard Kingsford
- A/Prof Wendy Shaw

Postgraduate Higher Degree Research (HDR)
- A/Prof Tracey Rogers (HDR Coordinator Semester 2) (Chair)
- Prof Rob Brooks
- A/Prof Darren Curnoe
- A/Prof Dale Dominey-Howes (HDR Coordinator Semester 1)
- Dr Danielle Drozdzewski
- Dr Kim Jenkins
- A/Prof Shawn Laffan
- Dr Terry Ord
- Mr Jonathan Russell (HDR Admin Officer)

Work Health and Safety
- Ms Joanne Wilde (Chair)
- Ms Simone Birrer (from August)
- A/Prof David Cohen
- Dr Malte Ebach
- Ms Penny McCracken
- Mr Chris Myers (minutes secretary)
- Ms Kate Stuart
- Ms Tegan Vanderlaan (until July)

Space Committee
- Prof Bill Sherwin (Chair)
- Dr Ian Graham
- A/Prof Sue Hand
- Dr Adriana Vergés
- Ms Kate Stuart

Research Centre Directors
- Australian Centre for Astrobiology – Prof Martin Van Kranendonk

Visiting Committee
- Prof John Dodson (Chair); Head of ANSTO Institute for Environmental Research
- Prof Anita Andrew; Principal, Environmental Isotopes Pty Ltd
- Mr Mike Smith; Chair, Australian Geoscience Council
- Mr Lee Spencer; CEO, Kula Gold Ltd
- Dr Rebecca Spindler; Manager of Research and Conservation Programs, Taronga Zoo

Website
- Jonathan Russell

Student Ethics Officer
- A/Prof Wendy Shaw

Grievance Officer
- A/Prof Jes Sammut

IT
- A/Prof Shawn Laffan
- A/Prof Bryce Kelly

Seminars
- A/Prof Rob Brander
- Dr Adriana Vergés
SCHOOL STAFF

**Academic**
- Michael Archer
  Professor
- Gabriel Abramowitz
  Senior Lecturer
- Lisa Alexander
  Senior Lecturer
- Andrew Baker
  Professor
- Hayley Bates
  Associate Lecturer
- Jennifer Beer
  Senior Lecturer
- Stephen Bonser
  Associate Professor
- Russell Bonduriansky
  Associate Professor and ARC Future Fellow
- Robert Brander
  Associate Professor
- Robert Brooks
  Professor and ARC Professorial Fellow
- Gerry Cassis
  Professor
- David Cohen
  Associate Professor, Head of School and Deputy President of the Academic Board
- William Cornwell
  Senior Lecturer
- Darren Curnoe
  Associate Professor and ARC Future Fellow
- Mark Diesendorf
  Associate Professor
- Danielle Drozdzewski
  Lecturer
- David Edwards
  Associate Lecturer
- David Eldridge
  Professor

**Matthew England**
Professor and ARC Laureate Fellow

**Jason Evans**
Associate Professor and ARC Australian Research Fellow

**Habacuc Flores Moreno**
Associate Lecturer

**James Goff**
Professor

**Ian Graham**
Senior Lecturer

**Donna Green**
Senior Lecturer

**Suzanne Hand**
Associate Professor

**Kim Jenkins**
Senior Lecturer

**Emma Johnston**
Professor and ARC Australian Research Fellow

**Michael Kasumovic**
Lecturer and ARC DECRA Fellow

**Bryce Kelly**
Associate Professor

**David Keith**
Professor

**Richard Kingsford**
Professor

**Shawn Laffan**
Associate Professor

**Keith Leggett**
Senior Lecturer and Director of FGRS

**Michael Letnic**
ARC Future Fellow

**Richard Lucas**
Professor

**Ben McNeill**
Senior Lecturer and ARC QEII Fellow

---

**Male Academic Staff**

**Female Academic Staff**

**Research and Teaching Academic Staff**

**Research only Academic Staff**
Katherine Dafforn  
Research Associate

Alejandro Di Luca  
Research Associate

Barnaby Dixson  
Research Associate

Malte Ebach  
ARC Future Fellow

Jason Everett  
Research Associate

Mark Decker  
ARC Post-Doctoral Research Fellow

Eden Duthie  
Research Officer

Judith Field  
Senior Research Associate

Christopher Fogwill  
ARC Future Fellow

Michael Garratt  
Research Associate

Mattias Hagman  
VC Post-Doctoral Research Fellow

Ross Hill  
VC Post-Doctoral Research Fellow

Catherine Jex  
Research Fellow

Mitchell Lyons  
Research Fellow

Hannah Mathews  
Research Assistant

Mariana Mayer Pinto  
Research Associate

Ander Maysounave  
Post-Doctoral Fellow

Rajat Mazumder  
Post-Doctoral Fellow

Shayne McGregor  
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Post-Doctoral Fellow

Jonathan Palmer  
Post-Doctoral Fellow

Clara Pang  
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Sarah Perkins  
Post-Doctoral Fellow

Gabriel Rau  
Post-Doctoral Research Fellow

Amelia Roberts  
Research Associate

Hamid Roshan  
Post-Doctoral Research Fellow

Agus Santoso  
Senior Research Associate

Jennifer Saunders  
Research Officer

Erik Van Sebille  
ARC DECRA Fellow

Deborah Shearman  
Research Associate

Willem Slip  
ARC Research Fellow

James Smith  
Post-Doctoral Research Fellow

John Spence  
Post-Doctoral Fellow

Celia Symonds  
Research Assistant

Andrea Taschetto  
ARC Post-Doctoral Research Fellow

Joy Trirovich  
Post-Doctoral Research Fellow

Heather Try  
Research Assistant

Stephanie Waterman  
ARC Post-Doctoral Res Fellow

Professional and Technical Staff

Rosa Ascencio  
Senior Technical Officer

Vera Banskichkoff  
Administrative Assistant

Vilia Co  
CCRC Finance Officer

Firoza Cooper  
Administrative Officer

Lauren Cornish  
Technical Officer

Michael De Mol  
Senior Technical Officer

Anna Gillespie  
Technical Officer

Stephen Gray  
Administration Manager

Francine Gregory  
School Manager

David Hair  
Laboratory Manager

Frank Hemmings  
Herbarium Manager

Matthew Hunt  
Administrative Officer

Evan Jensen  
Technical Officer

Rochelle Johnston  
Diving Officer

Jasmin Lawes  
Technical Officer

Penelope McCracken  
Boating Officer

Geoffrey McDonnell  
Technical Officer

Alana McHattan  
Student Administrator (BSB Office)

Dayna McGeeaney  
Technical Officer

Susan Midgley  
IES Executive Assistant

Christopher Myers  
Health and Safety Manager

Troy Myers  
Technical Officer

Donald Pagé  
Technical Officer

Elizabeth Power  
Administrative Assistant – Finance

Jonathan Pritchard  
Administrative Officer

Jonathan Russell  
Administrative Officer

Sharon Ryall  
CES Manager

Bronwen Smith  
Administrative Assistant

Kathryn Stuart  
Technical Services Manager

Shinoo Swapnil  
Technical Officer

Joanna Tjojatmodjo  
Administrative Officer (BSB Office)

Richard Wege  
Technical Officer

Joanne Wilde  
Senior Technical Officer

Antonio Woo  
CWI Manager

Jia Wu  
Administrative Assistant – Finance

Academic Visitors

Paul Adam  
Honorary Associate Professor

Shane Ahydong  
Adjunct Senior Lecturer
Penelope Ajani
Adjunct Lecturer
Alberto Albani
Adjunct Associate Professor
Anita Andrew
Adjunct Professor
Anne Ashford
Professorial Visiting Fellow
Hans Bahlburg
Professorial Visiting Fellow
Peter Banks
Senior Visiting Fellow
Barbara Barron
Visiting Fellow
Lawrence Barron
Senior Visiting Fellow
Michel Beal
Senior Visiting Fellow
Philip Borchard
Visiting Fellow
Timothy Bralower
Adjunct Professor
Paul Brown
Honorary Associate Professor
Geoff Burton
Senior Visiting Fellow
Anthony Chariton
Adjunct Associate Professor
Bruce Chessman
Senior Visiting Fellow
Rosie Cooney
Visiting Fellow
Philip Creaser
Adjunct Senior Lecturer
David Croft
Visiting Fellow
Derrick Cruz
Visiting Fellow
Mark Cuthbert
Visiting Fellow
Diana Day
Senior Visiting Fellow
Christopher Dean
Visiting Fellow
Sevilla Dionisio-Cendon
Senior Visiting Fellow
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Adjunct Lecturer
Patrick Driver
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David Durney
Adjunct Lecturer
Margaret Eby
Adjunct Senior Lecturer
Mehreen Faruqi
Senior Visiting Fellow
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Adjunct Associate Lecturer
Adrian Fisher
Visiting Fellow
Barry Fox
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Honorary Professor
Robert Gale
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Rudiger Gerdes
Visiting Fellow
Philip Gibbs
Senior Visiting Fellow
Anthony Gilchrist
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Hendrick Godthelp
Visiting Fellow
Nicholas Golledge
Visiting Fellow
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Adjunct Associate Lecturer
Daniel Graham
Adjunct Professor
Thomas Grant
Visiting Fellow
John Grehan
Visiting Fellow
Simon Griffith
Senior Visiting Fellow
Lila Gurba
Senior Visiting Fellow
Yamila Gurovich
Visiting Fellow
Helen Harding
Senior Visiting Fellow
Dr Luke Hedge
Adjunct Associate Lecturer
Ann Henderson-Sellers
Honorary Professor
Catherine Herbert
Visiting Fellow
<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
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<td>John Sved</td>
<td>Honorary Senior Lecturer</td>
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<td>Matthew Taylor</td>
<td>Visiting Fellow</td>
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<td>Geoffrey Taylor</td>
<td>Honorary Associate Professor</td>
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<td>Rachael Thomas</td>
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<td>Brian Timms</td>
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<td>Caroline Ummenhofer</td>
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<td>Colin Ward</td>
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<td>Haydn Washington</td>
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<td>Stephanie Waterman</td>
<td>Adjunct Lecturer</td>
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<td>Laura Wilson</td>
<td>Visiting Fellow</td>
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<td>Jing Zhang</td>
<td>Visiting Fellow</td>
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Since its formation in 2001, BEES has continued to evolve as a school that deliberately spans the biological sciences, the geosciences and related cross-disciplinary areas in research and teaching.

Research is the core activity of the School, the principal consideration in the appointment of staff and allocation of resources, and the platform for the teaching program. Research projects and themes range across the “pure” to “applied” spectrum, covering aspects of the origin, behaviour and future of the natural world, and human interactions with that world. Research focal areas are supported through research centres and groups within the School and links with other organisations.

The growing status of the School is derived from the international reputation of its staff, the quality and quantity of its research, the calibre of its graduates, an increasing capacity to attract research funds from diverse sources, expanding collaborations with various external organisations, and the culture of research being developed in the School.

The provision of proper resources, high quality and engaging teaching is also crucial to the School. Teaching provides a means of transferring knowledge derived from our research and scholarship to the next generation of scientists, recruitment of future research students and a major source of operating funds. The emphasis of that teaching, especially at upper levels, is derived from the School’s areas of research focus.

Other important activities of the School are service to the University and professions, and interaction with the community.

The School itself provides a physical home for staff, administrative and logistical support. The School is the entity through which courses
are formally delivered. The School is the primary organisational unit through which staff are represented and make contributions at Faculty and University levels. The School supports a portion of the research centres and field station operations. The centres and research groups, hosted or partly hosted within the School, are the research homes for staff and postgraduates. They provide specific research facilities, research mentoring and training, and the primary source of collaborative research. The centres and groups are fundamental to building the research culture.

While maintaining a core of biological and earth science research, teaching and consulting capabilities related to the focus areas of the School, various research opportunities are being pursued as the disciplines evolve, new areas of discovery and theory emerge and linkages develop within UNSW and beyond.

Performance Targets

The 2010-2014 School Strategic Plan sets out a number of targets relating to research and teaching performance, and other operational and organisational aspects of the school. These targets are consistent with those of the Science Faculty and the University as a whole.

<table>
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<tr>
<th>Target</th>
<th>Performance</th>
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<tr>
<td>Growth in Cat 1 funding higher than equivalent Go8 Schools.</td>
<td>Research funding for BEES has grown from under $2m in 2004 to over $10M in 2013. With 3.1% of the UNSW academic staff, BEES generated nearly 5.2% of the total UNSW research income in 2013.</td>
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<td>Increase to 120 HDR students in the school with established permanent academic staff supervising at least 3 FTE HDRs.</td>
<td>This target has been met, following growth in the earth science student numbers.</td>
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<td>Attain and maintain 100% research active status for eligible staff.</td>
<td>This has been achieved and supported through the staff Performance Review and Management processes in the School.</td>
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<td>Increase the number of publications per FTE staff.</td>
<td>There has been strong growth in publications in the school, from less than 100 in 2002 to over 600 in 2013.</td>
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<td>Reconstruction of undergraduate programs.</td>
<td>Major revisions to the BEES honours program have been agreed. Further reductions in low-enrolment programs and courses (especially at first year) are proceeding.</td>
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<td>Minimum 500 EFTSU coursework load taught by BEES.</td>
<td>This has been exceeded and the School achieved a taught load of 730 EFTSU in 2013.</td>
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<td>Courses to have overall CATEI rating above 4.8.</td>
<td>The current average is just over 4.9, with 31 out of the 38 courses surveyed in 2012/13 exceeding this benchmark. The average of all of Science is 4.85.</td>
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Undergraduate Degrees

BACHELOR OF SCIENCE 3970
The Bachelor of Science degree gives the widest range of options for study in more than 30 fields of science, allowing students the flexibility and choice as well as insights into different scientific fields. BEES is primarily responsible for delivery of the following majors: Biology, Ecology, Geography, Earth Science and Marine Science. This program can be undertaken concurrently with a number of other programs, including the BA, BCom and BE.

BACHELOR OF ADVANCED SCIENCE 3972
The Advanced Science program is designed to challenge talented students, providing an early window into the thinking and practice of research. BEES is primarily responsible for delivery of the following majors: Archaeology and Palaeoenvironments, Biological Science, Ecology, Earth Science, Geochemistry, Geography (Human and Physical), Climate Systems Science (including Climate Dynamics), Marine and Coastal Science. This program can be undertaken concurrently with a number of other programs, including the BA, BCom and BE.

BACHELOR OF SCIENCE (INTERNATIONAL) 3987
The Bachelor of Science (International) degree offers flexibility and choice with more than 26 fields of study combined with a study exchange to an overseas partner institution. Majors are derived from the 3970 program.

BACHELOR OF ENVIRONMENTAL SCIENCE 3988
The Environmental Science program is a four year specialist program focusing on environmental science and the economic, legal, social and scientific aspects of environmental issues. BEES coordinates this program and students can specialise in Biology, Chemistry, Earth Science, Geography, Marine Biology, Microbiology and Oceanography.
Honours Program

The Honours program provides a final undergraduate year that is a very different experience to earlier years. There are fewer formal classes and more individual work. The Honours year provides an opportunity to specialise in an area of particular interest. It is designed to develop a range of skills that are widely applicable outside the particular research specialty, for example: conducting literature searches, critical evaluation of the literature, and written and oral communication. Honours can be taken in BEES in the following disciplines: Biological Science, Botany, Ecology, Geography, Geology, Marine Science and Zoology.

2013 is yet another outstanding year for the BEES Honours program. A total of 52 students completed their Honours year (11 in June and 41 in November) with 37 students being awarded first class Honours. Nathan Burke and Laura Watts were successfully nominated for University Medals which they will be awarded in April 2014.

The revised Honours program was endorsed by the Faculty of Science and transitional implementation of the new program commenced in Session Two. Under the revised program, there is a greater focus on the research elements of the Honours year along with important professional skills training. Honours students are no longer required to take any elective courses during their Honours year and much of the coursework elements of the Honours program are completed as a series of workshops at the start of session, thus freeing up more time for students to devote to their research projects.

A successful alumni panel evening was organised by UNSW Careers and Employment in conjunction with the BEES Honours program. Past graduates including Simon Davies, Kate Carroll, Jenna Bytheway, Jason Ruszczyk and Matthew Ward participated in an informative discussion about life after Honours.

Postgraduate Coursework

MASTER OF MARINE SCIENCE AND MANAGEMENT 8270

This Masters program takes an innovative approach to marine science and management education. It is taught under the framework of the Sydney Institute of Marine Science (SIMS) as a partnership between four major Australian universities; UNSW (The University of New South Wales), Macquarie University, University of Sydney, and the University of Technology Sydney. It combines each institute’s strengths in marine science research and education to provide a truly multidisciplinary learning environment.

MASTER OF ENVIRONMENTAL MANAGEMENT 8619

The MEM is designed to provide students with the basis for the critical appreciation of environmental management frameworks and environmental literacy in key disciplinary areas that are commonly involved in environmental matters. It is built upon a solid foundation of core and fundamental knowledge courses. The nested Graduate Diploma and Graduate Certificate programs are fully articulated with the Master of Environmental Management.

Postgraduate Research Studies

Three separate research degree programs are offered by UNSW within the School of BEES, including the Master of Philosophy (MPhil), Master of Science (MSc) and Doctor of Philosophy (PhD). These programs are offered within the disciplines of Applied Geology, Climate Science, Environmental Management, Geography, and Biological Science. These programs encourage initiative and originality in research. Research students should make significant contribution to knowledge in their respective field.
RESEARCH

Areas of Research

The School of Biological, Earth and Environmental Sciences has an outstanding reputation for quality research both within Australia and internationally. Research within BEES is clustered within four general thematic areas:

- Ecology and Evolutionary Biology
- Climate Science
- Environmental Change, Sustainability and Resources
- Palaeoenvironments and Earth History

Within these themes there are a number of focal points for research:

Environmental Management Policy

In the 21st century, environmental concerns and more broadly sustainability are providing both greater constraints and greater opportunities for businesses, governments and NGOs.

Current interdisciplinary research areas include: ecologically sustainable and socially just development; environmental assessment and management, sustainable land use management, natural resources, energy and urban transportation: technology assessment, policies and strategies for implementation; indigenous and local/traditional ecological knowledge; and biodiversity.

Evolutionary Ecology, Genetics and Behaviour

The School of BEES hosts an important research cluster in evolutionary ecology, genetics, and behavioural ecology. Research systems include a range of terrestrial and marine invertebrates, vertebrates and plants. The Evolution & Ecology Research Centre comprises a number of academic staff members from BEES, as well as other schools within the UNSW.

Terrestrial and Marine Conservation and Ecology

There are major strengths in various aspects of terrestrial and marine ecosystems and our research involved both fundamental studies in ecology through to conservation and management. Part of this research involves understanding the effects of environmental change on ecosystems and implications for their sustainability.

Natural Resources and Environments

This broad area of research in the school ranges from mineral deposit studies through to water resources, coastal resource management and natural hazards. Research includes both the physical and the human aspects of resource use and interaction. The group within BEES is perhaps unique within Australia in its integrated, multidisciplinary focus on interactions at the soil/plant/water interface and related human processes.

Palaeosciences

The biological aspects of this area of research spans the first appearance of life through to hominin evolution, with a focus on the Australian megafauna. The physical aspects include analysis of the extent and effect of climatic changes in the Archaean at one extreme and the Quaternary at the other.

Spatial Information Systems

Apart from some fundamental studies on both remote sensing and GIS techniques, this area supports much of the research undertaken elsewhere in the School. Current research areas of research include radar methods and mapping changes in biological diversity at local, regional and global scales.
Research Performance

BEES Centres

Centre for Ecosystem Science

In late 2013, we changed the name of the centre to the Centre for Ecosystem Science, from the Australian Wetlands, Rivers and Landscapes Centre. This was following a long discussion within the centre and its members about our current expertise and future direction. This reflected the considerable expertise that we had beyond the realm of freshwater ecosystems, as well as recognising that aspects of our work applied to freshwater ecosystems were more broadly relevant to ecosystem management. The Centre for Ecosystem Science has four main themes: Rivers and Wetlands, Terrestrial Ecosystems, Landscape Synthesis and Conservation Practice.

The three year external review of the centre was highly positive, noting that we had met all of our objectives, were supported by the School of Biological, Earth and Environmental Sciences and had established a good operating culture with commitment to working with government and community on high quality research and advice. We were successful in attracting funding for three ARC Linkage Projects led by centre researchers: Red Listing of Ecosystems (Professor David Keith), Prey Naiveté (Dr Mike Letnic) and Remote Sensing of Environmental Flows (Dr Mirela Tulbure). Associate Professor Jes Sammut established a major program on sustainable rice-shrimp farming on the Mekong Delta. We also continued to attract government funding for wetland and river research and mapping of vegetation. Postdoc Dr Mitchell Lyons joined us to work with the New South Wales Office of Environment and Heritage on analysis of mapped vegetation communities across New South Wales. In October, Professor Lucas with expertise in remote sensing and vegetation dynamics joined the centre supported by special purpose funding (SPF01) from the University. Professors Lucas and Keith were appointed as Deputy Directors of the centre.

We have continued to develop our postgraduate programs to ensure that emerging scientists benefit from our ability to increase their skill levels in particular areas critical to their future scientific career. We offered two courses in 2013: a plant identification course and scientific writing workshop. The plant identification course was also open to the public (30 attendees). We also initiated the first full course of statistics for postgraduates and staff, taught by staff from the School of Mathematics and Statistics and the School of Biological, Earth and Environmental Science. We aim to make this an annual course. We are also actively involved with the Postgraduate Forum, coordinating the Great Debate in June (“Pure Science is better than Applied Science”), a light-hearted approach to the subject. Dr Mike Letnic successfully coordinated the Australian Mammal Society Conference at UNSW.

Our researchers were recognised with awards including David Keith receiving the Australian Ecology Research Award from the Ecological Society of Australia; Mike Letnic receiving a Eureka Prize, Sam Dawson receiving the Peter Cullen Scholarship and Rachel Blakey the first prize for a postgraduate at the Australian Limnological Society.
Conference. Staff in the Centre contributed across undergraduate teaching and also to projects such as Science without Borders.

We continue to have a strong focus on providing expert advice to governments on a range of key issues including the long term monitoring of waterbirds and wetlands, the management of the Murray-Darling Basin, Lake Eyre Basin, Environmental Flows and management of river red gum forests. Our collaborative projects with governments, particularly the NSW Government, continue to grow. We also expanded our terrestrial research projects focused on trophic cascades and vegetation. We are also strongly committed to outreach of research activities and outcomes to the community. This is achieved through the media and also workshops with communities, including a workshop held for government and community in the Macquarie Marshes and a conference on the future of the Lake Eyre Basin.

**Centre of Excellence for Climate System Science**

The Centre of Excellence for Climate System Science is a major initiative funded by the Australian Research Council. The Centre is an international research consortium of five Australian universities and a suite of outstanding national and international Partner Organizations. It will build on and improve existing understanding of the modeling of regional climates to enable enhanced adaptation to and management of climate change, particularly in the Australian region.

The Centre was established in 2011 with extensive investment from the Australian Research Council, UNSW, the Federal Department of the Environment, New South Wales Government, Monash University, the Australian National University, the University of Melbourne, and the University of Tasmania. It has strong links with the Australian Community Climate and Earth System Simulator (ACCESS) initiative and works in partnership with the National Computational Infrastructure (NCI) Facility.

The Centre’s focus, Climate System Science, is the quantitative study of the climate system designed to enable modeling of the future of the climate system. It is built on a core of the sciences of the atmosphere, ocean, cryosphere and land surface. It includes the physics, dynamics and biology of these systems, and the flow of energy, water and chemicals between them. Climate System Science builds mathematical models of these systems based on observations. It describes these observations, and the underlying physics of the system, in computer codes. These computer codes are known as a “climate model” and utilize very large super computers.

2013 was an outstanding year for the Centre with multiple successes measured by publications, capacity building (especially in the computational area), new graduate training initiatives, enhanced national and international collaboration, and media impact. It is extremely pleasing to see how quickly we have transitioned from a scale of a series of projects to one where outcomes reflect the scale and integration of a true Centre of Excellence. We are now seeing outcomes of many of our outstanding cross-centre activities, the emergence of leadership from early career researchers and the rapid expansion of our graduate program. These are demonstrably benefiting from our strengthening national and international partnerships and from enhanced training programs we have established.

**Centre for Marine Bio-Innovation (CMB)**

The Centre for Marine Bio-Innovation (CMB) is an international focal point for interdisciplinary basic and applied research into chemically mediated interactions between organisms. It drives research excellence in a number of platforms, including microbial biofilms and bacterial signaling, marine chemical ecology and prokaryote-eukaryote interactions, environmental and microbial genomics, colonization biology of marine sessile organisms, novel antifouling technologies, bioremediation, inter-kingdom signaling and the bridge between environmental microbiology and engineering.

These research platforms are based on understanding, in a mechanistic fashion, how chemical signals mediate the ecology, physiology and molecular biology of organisms, and the subsequent application of this knowledge to novel biotechnologies across environmental, industrial and medical settings. Based at UNSW in Sydney, Australia, the CMB integrates research across microbiology, marine chemical ecology, biodiversity, ecological theory, chemistry, andorganism and community genomics. The interdisciplinary nature of the Centre is made possible through its organisation and the collaboration between its home Schools of Biological, Earth and Environmental Sciences, Biotechnology and Biomolecular Sciences, and Chemistry.

The CMB had a successful 2013. CMB personnel received over $3.5 M in new grant funding in, across the Centre’s full range of research areas. Grants awarded included 6 ARC grants and a major grant from the Moore Foundation for research on sponge symbiosis. In February of 2013 the CMB led the first Summer Course in Marine Microbial
Ecology at the Sydney Institute for Marine Science (SIMS). The 2-week course targeted postgraduate and postdoctoral scientists, providing participants with an intense training in many areas of microbial ecology including, experimental design, statistical analysis, microscopy, phylogenetic and (meta) genomic analysis and statistical analysis. The course attracted students from local and interstate Universities, and international students and will run again in 2014.

From its inception, the CMB has been keen to develop its science into practical applications, and three technologies are currently in play. A novel antibacterial technology consisting of compounds derived from seaweed natural products which inhibit bacterial cell-cell signalling, or quorum sensing, has been acquired by Unilever, one of the world’s largest consumer products companies, who are progressing it. In addition, the CMB discovered, patented and developed the mechanism, chemistry and delivery of nitric oxide (NO) as a signaling molecule that regulates dispersal of bacterial biofilms. A phase 1 clinical trial demonstrating clearance of pathogenic bacterial biofilms and improved lung function of cystic fibrosis patients receiving NO gas has been completed, and UNSW has entered an agreement with Antabio for the development of NO based antimicrobial therapies.

Finally, we recently filed a new patent on the use of wax antifouling coatings for use in restoration of coral reefs. Applying the paints to the substrata on which corals are attached prevents fouling by algae and its subsequent overgrowth of the juvenile corals.

**Connected Waters Initiative Research Centre (CWI)**

The Connected Waters Initiative Research Centre (CWI) is UNSW’s Groundwater Research Centre. The CWI is a cross-faculty research grouping, with staff based in the Schools of Civil and Environmental Engineering; Biological, Earth and Environmental Sciences; Mining Engineering; Law and the Mark Wainwright Analytical Centre, and UNSW Law. As a cross-faculty centre, the CWI rotates between presiding faculties, and at the end of 2013 the Centre rotated from Engineering to Science Faculties.

Our research highlight was the successful completion of the Groundwater Education Investment Fund (GEIF) infrastructure program. Funded by the Federal Government through its Super Science initiative, the CWI managed the investment of $15M of groundwater infrastructure over the period 2010 to 2013 for the establishment of long term monitoring sites for groundwater research. These sites in four states monitor a range of environmental parameters relevant to groundwater, including river and ground water levels and automatic weather stations, as well as a range of state-of-art analytical facilities, mostly hosted here at UNSW. Within NSW, research infrastructure is concentrated at the UNSW Wellington and Fowlers Gap Field Stations and in the Namoi Valley. Within the latter, the Mountain Front Hydrological Observatory was made fully operational in by CWI staff coordinated by Dr Martin Andersen with the help of Marie Curie Fellow Dr Mark Cuthbert. The observatory, funded by the Groundwater Education Investment Fund, is remotely collecting stream and recharge data from flow events in the ephemeral Middle Creek. The data will establish the importance of stream recharge in semi-arid environments. Data from all sites can be accessed via the CWI website (click on Groundwater EIF). The successful completion of the GEIF was followed by the successful award of CRIS and NCRIS funding from the Federal Government to maintain the groundwater infrastructure. A further ~ $750,000 of investment secures the maintenance of the infrastructure sites through until the end of 2015.

In 2013 the CWI continued to play a major role within the National Centre for Groundwater Research and Training, an Australian Research Council and National Water Commission co-funded Centre of Excellence. In 2013 we remained at full staffing capacity, and we focused on delivering conference presentations on our research, and the submission of research papers. Our NCGRT research was well represented at the International Association of Hydrogeology Annual Congress in Perth, with three keynotes presented by Gabriel Rau, Ian Acworth and Andy Baker, and many other presentations by the CWI team. An aquitard session was convened at IAH with a keynote by Prof Jim Hendry, our NCGRT international scholar, and showcasing many aspects of CWI aquitards research. The CWI team was also well represented at the world’s largest geoscience conference, the American Geophysical Union Fall Meeting in San Francisco.

In 2013 we celebrated the award of the 2013 Andrei Borisovich Vistelius Research Award of the International Association for Mathematical Geosciences to Gregoire Mariethoz. Gregoire was invited to collect his award and give a keynote presentation at the IAMG conference. One paper published last year by CWI researchers Adam Hartland, Wendy Timms and Andy Baker was highlighted as Editor’s Choice in Environmental Research Letters. CWI media releases in 2013 include the use of heat as a tracer, on aquitards, and on caves as observatories.

As 2013 came to an end, the CWI team was focussing on the commencement of several new
major projects. Bryce Kelly is leading a major project to establish baseline water quality data in future coal seam gas development areas, funded by the Cotton RDC. Andy Baker and Martin Andersen held the first project meetings for their new ARC Linkage Project which investigates the effects of fire on karst landscapes. Andy Baker and Wendy Timms were commencing the procurement process for their ARC LIEF grant to support an organic isotope mass spectrometry facility to be housed at the Mark Wainwright Analytical Centre, and Cameron Holley was celebrating the successful award of an ARC DECRAs.

**Evolution and Ecology Research Centre (EERC)**

UNSW’s research strength in Evolutionary Ecology is underpinned by the Evolution & Ecology Research Centre (E&ERC). The Centre was established in 2007 with nearly $1 million in funding from the Vice Chancellor’s Strategic Priorities Fund. The E&ERC continues to strengthen the Evolution-Ecology interface by integrating and building the diverse strengths that exist in three schools (BEES, Biotechnology & Biomolecular Sciences and Mathematics & Statistics).

The Centre’s purpose is to build capacity for and quality of research, including postgraduate research and supervision. To do so, we provide seed funding for innovative new research collaborations, recognize excellence in research, learning and supervision, run an innovative Graduate Program in Evolution & Ecology, and engage in public outreach relating to evolution and ecology.

Since the inception of the E&ERC in 2007, centre members have been awarded 49 NCGP grants worth a combined total of $21.3 million (growing from $1.5 million in 2007 to $3.8 million in 2013), not including industry partner contributions. Non-NCGP funding has grown from under $0.6M in 2007 to over $0.9 per annum in 2013. E&ERC members publish an average of 90 papers per year and their current Fellows are 1 APF, 3 QEII, 1 ARF, 4 Future Fellows and 3 DECRAs. PhD enrolments have risen from 26 in 2007 to 49 in 2013. Most students complete within 4 years. There have also been 70 HDR student completions since the centre’s formation in 2007 and currently there are 57 HDR enrolments.

**Institute of Environmental Studies (IES)**

The Institute of Environmental Studies (IES) was established in 1992 to support and to help coordinate environmental activities at UNSW. Since its inception, general interest in environmental studies has increased notably, as has its relevance in the public and private sectors. Concurrently the IES has developed into a multi-faceted institution with a reputation for excellence in research, strong student relationships and high quality learning outcomes.

The IES aims to provide students with innovative research opportunities, excellent interdisciplinary teaching in environmental studies and expert environmental services. The Institute of Environmental Studies co-ordinates six post graduate programs in Environmental Management:

- Graduate Certificate
- Graduate Diploma
- Master of Environmental Management (MEM)
- Master of Science (Research)
- Masters of Philosophy by Research
- PhD in Environmental Policy and Management

It contributes to heightening general awareness of environmental issues through the regular organisation of events such as seminars, public lectures and the Jack Beale Lecture

**Climate Change Research Centre (CCRC)**

UNSW CCRC is a multi-disciplinary research group comprising one of the largest university research facilities of its kind in Australia. CCRC houses research expertise in the key areas of Earth’s climate: atmospheric, oceanic and terrestrial processes. They apply basic scientific principles to pressing questions on climate dynamics, global climate change, and extremes of weather and climate. The Centre’s atmosphere research includes studies of large scale dynamics, convection, radiation, climate feedbacks, and factors controlling precipitation changes and other meteorological impacts. Their oceanographic research focuses on the ocean’s role in the climate system: including large-scale physical oceanography, coupled climate modes and regional ocean circulation, palaeoclimate dynamics, the ocean’s thermohaline circulation, and global biogeochemical cycles.

On the land surface, CCRC focuses on modelling terrestrial processes in climate models, to develop an understanding of the effects of carbon dynamics, hydrology and vegetation processes on climate. Scientists at CCRC employ a variety of research tools including global and regional models of the atmosphere, ocean and land
surface, coastal domain simulations and process models. They also use a great variety of data collected from satellites, weather stations, ships, eddy-flux towers and aircraft from regions as diverse as the Great Barrier Reef, the tropics, urban surfaces, the Tasman Sea and Antarctica.

The CCRC is the lead institution in ARC Centre of Excellence for Climate System Science, a multi-university initiative to advance fundamental climate sciences in Australia.

The Centre is made up of 11 tenured academic staff, 24 post doctoral fellows, 28 PhD students and a small team of professional staff shared with the Centre of Excellence.

Research Facilities

Facilities and Equipment

The School of BEES has a range of excellent facilities and equipment to support its research activities, as well as access to a number of central research facilities on campus. UNSW’s strategic research plan states that UNSW intends to continue to invest in areas in which it has a strong track record, including Evolutionary and Environmental Sciences, plus Next Generation Technologies.

Field Stations

Field Stations play an integral role in the teaching and research activities of the School supporting our strong orientation towards field research. BEES directly manages two field stations: Cowan field station and Smiths Lake field station, and plays a prominent role in the management and research activities of Fowlers Gap Arid Zone Research Station, and Sydney Harbour Institute of Marine Science (SIMS). SIMS is a partnership with UTS, Macquarie University and University of Sydney, based at a former Royal Australian Navy site at Chowder Bay on Sydney Harbour. It offers safe and convenient access to marine habitats in one of the most spectacular and intensively used ports in the world. Key research areas are the ecology of ports and harbours; coastal oceanography and geomorphology; biotechnology and bio-prospecting; and urban fisheries science.
Molecular Ecology and Evolution Facility

This brand new facility is the home for all molecular biology lab work in the school, and is well equipped with equipment for DNA extraction, amplification and visualisation. We are also building a facility for extraction of ancient DNA. Members of the school also have access to the Clive and Vera Ramaciotti Centre for Gene Function Analysis which includes a DNA sequencing facility.

The Mark Wainwright Analytical Centre

The Mark Wainwright Analytical Centre houses the major research instrumentation at UNSW. It consists of five major research facilities:

The electron microscope unit, bioanalytical mass spectrometry facility, biomedical imaging facility, nuclear magnetic resonance facility, and the solid state and elemental analysis unit. The Centre also provides access to preparation laboratories, smaller instruments and computing facilities. The Centre is available to all staff at UNSW, and provides technical support and training to researchers accessing the facilities. The Data Centre is a key component of the Analytical Centre and provides up to 10 TB of data storage for UNSW staff that can be used to store, back up and archive critical data. It can be accessed through the internet from anywhere in the world. Centre staff are also developing archiving solutions for massive data sets.

Sydney Institute of Marine Science (SIMS)

SIMS is NSW’s leading multidisciplinary marine institute, formed through a collaboration of its founding partners and shareholders, the four major Sydney-based universities (University of Sydney, Macquarie University, University of Technology Sydney). Membership of UNSW in SIMS is managed through the Faculty of Science and BEES. The Director, Professor Peter Steinberg, is a member of BEES.

SIMS was established in 2005 and is based at Chowder Bay, Mosman, on Sydney Harbour. A grant of $19.5 million from the Federal Education Investment Fund in 2009, together with grants of $600,000 from both The Ian Potter Foundation and the NSW Government, provided the money to establish the current state of the art facilities at the Institute. The collaborative structure of SIMS now includes six NSW universities (the founding members plus the Universities of Wollongong and Western Sydney), and the NSW State Government’s Department of Primary Industry (Fisheries) and Office of Environment and Heritage. SIMS has over 100 scientists and graduate students associated with the Institute, representing a broad diversity of skills in marine science. A primary aim of SIMS is to use the collective strength and expertise of these scientists to generate collaborative, emergent research programs.

SIMS had a number of substantial achievements in 2013. SIMS, in partnership with the NCCARF Facility ACCARNSI, was awarded the contract for the Coastal Processes Node of the NSW Government Adaptation Research Hub in order to investigate the consequences of environmental change on coastal dynamics, beaches, estuaries and coastal development. The Sydney Harbour Research Program (SHRP) of SIMS, directed by Professor Emma Johnston of BEES, was awarded a ca. $1 M ARC Linkage Grant to investigate the impact of multiple contaminants on Sydney Harbour. SIMS entered into a partnership agreement with NSW DPI (Fisheries) which has resulted in 16 Fisheries’ scientists co-locating at SIMS. SIMS and DPI are as a consequence developing a series of collaborative programs in the area of fish ecology and resource management. Finally, SIMS in 2013 has partnered with the marine operations company Riverside Marine to develop outreach and interpretive.
Spatial Information Systems

BEEs has access to a suite of modern geospatial analysis packages, including ArcGIS, ENVI, Erdas Imagine, MOVE and LeapFrog3D. Remote sensing research is also supported by a FieldSpec near infrared Spectrometer.

Environmental and Geochemical Research Lab

This research lab is dedicated to general soil analysis and paleoenvironmental and geochemical research. It has a wide range of equipment for the physical, chemical and microfossil analysis of soils and sediments including a Malvern Mastersizer 2000, a IPC-4 chamber oxygen plasma asher, fume cupboards, balances, sieves, ovens, furnaces, waterbaths, centrifuges, shaking equipment, and equipment for pH/EC determinations, acid digests, mineral magnetism and pollen slide production. The lab also houses several research microscopes and an extensive collection of pollen reference slides. This lab is also supported by other facilities housed elsewhere, including: an ICP mass spectrometer and ICP atomic emission spectrometer, X-ray diffraction and fluorescence equipment and a LECO carbon-sulfur-nitrogen analyser.

Boat and Scuba Facility

BEEs maintains three research boats and 6 tinnies. Two of the boats (Eddy and Gus) are surveyed to operate off the coast out to 15nm. The third boat (The Lord Faraday) has been purpose built for electrofishing on inland waterways. The tinnies are primarily used for training undergraduate students in field techniques but are also used for geological research. Whereas the boats are located in Randwick, most of the tinnies are permanently kept at Smiths Lake Field Station. In addition to the boats and tinnies, BEEs maintains a wide range of boat related sampling equipment such as sediment grabs, water quality meters, cameras, nets, and more. The Dive Room is maintained by the University Dive Officer, who is responsible for H&S, training and checkout dives of between 15-20 research scuba divers. The School owns 10 air tanks and a number of regulators and buoyancy compensators.

Glasshouse

BEEs run a large glasshouse, located atop the adjoining Samuels building. The glasshouse is temperature controlled and is divided into four chambers including a quarantine chamber suitable for research on invasive and genetically modified organisms. The glasshouse facility includes preparation lab space adjacent to the main chambers, and controlled environment chambers on the ground floor of the Samuels Building.

John T. Waterhouse Herbarium

An internationally registered herbarium administered by BEEs. It was established in 1956 and is housed on the 4th floor of the Biological Sciences Building. The herbarium now has some 53,000 specimens, including about 11,000 fungal specimens.

Fowlers Gap

Fowlers Gap Arid Zone Research Station is located 112 km north of Broken Hill, New South Wales. It is a 40,000 ha pastoral property that has been part of the university since 1967. The land has been monitored and data collected continuously, in some cases for over 40 years. The mission of the Station is to understand how the arid zone of western New South Wales functions, incorporating the ecological, sociological and pastoral activities of the region, through research, teaching, interpretation and knowledge diffusion. It is the only research station in the winter rainfall zone of arid western New South Wales. In addition to its research and teaching function, Fowlers Gap also functions as a commercial sheep station, with the sheep population being maintained between 4,000-4,500 animals.
<table>
<thead>
<tr>
<th>Name</th>
<th>Award</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Lisa Alexander</td>
<td>Australian Academy of Science Dorothy Hill Award</td>
</tr>
<tr>
<td>Dr Robin Beck</td>
<td>National winners in Fresh Science</td>
</tr>
<tr>
<td>Simone Birrer</td>
<td>Runner up in the Science Education category and Winter School in Mathematical and Computational Biology Student Travel Bursary</td>
</tr>
<tr>
<td>Sean Blamires</td>
<td>ARC Discovery Early Career Researcher Award</td>
</tr>
<tr>
<td>Philip Booth</td>
<td>EIANZ award for Best academic record in the MEM core courses</td>
</tr>
<tr>
<td>Prof Rob Brooks</td>
<td>Australian Museum Eureka Prizes for Promoting Understanding of Australian Science Research</td>
</tr>
<tr>
<td>Claire Budden</td>
<td>EIANZ award for Best academic record in the MEM core courses</td>
</tr>
<tr>
<td>Nathan Burke</td>
<td>University Medal Ecology</td>
</tr>
<tr>
<td>Sichong Chen</td>
<td>Second place for best student presentation at EcoTas13, the joint conference of the New Zealand Ecological Society and the Ecological Society of Australia</td>
</tr>
<tr>
<td>A/Prof David Cohen</td>
<td>Excellence in Senior Leadership at UNSW</td>
</tr>
<tr>
<td>Dr Angela Crean</td>
<td>National winners in Fresh Science</td>
</tr>
<tr>
<td>Rebecca Cross</td>
<td>Institute of Australian Geographers Outstanding Postgraduate Presentation Award at the IAG conference</td>
</tr>
<tr>
<td>A/Prof Darren Curnoe</td>
<td>Discovery of the Red Deer Cave people named top archaeological research finding in the world for 2011-2012 at the inaugural Shanghai Archaeological Forum</td>
</tr>
<tr>
<td>Rhiannon Dalrymple</td>
<td>Special Mention in the Women in Science category</td>
</tr>
<tr>
<td>Katelyn Edge</td>
<td>Best PhD Thesis in BEES and Best PhD student research poster in Risk Assessment and Environmental Monitoring at SETAC Melbourne</td>
</tr>
<tr>
<td>Suzanne Evans</td>
<td>Sydney Aquarium Sea Life Conservation Fund/Australian Marine Sciences Association Student Award</td>
</tr>
<tr>
<td>Prof James Goff</td>
<td>Isaac Manasseh Meyer Fellowship, National University of Singapore and Erskine Fellowship, University of Canterbury, New Zealand</td>
</tr>
<tr>
<td>Stephen Gray</td>
<td>UNSW Staff Excellence Award for People Management</td>
</tr>
<tr>
<td>Stephen Harris</td>
<td>FC Loughnan Prize for First Year Geology</td>
</tr>
<tr>
<td>Daniel Helm</td>
<td>Harding/Orica Award</td>
</tr>
<tr>
<td>Julie James</td>
<td>FC Loughnan Prize in Applied Geology</td>
</tr>
<tr>
<td>Shimona Kealy</td>
<td>Lorant Eötvös Prize</td>
</tr>
<tr>
<td>Prof David Keith</td>
<td>Ecological Society of Australia - Australian Ecology Research Award</td>
</tr>
<tr>
<td>Angela Lay</td>
<td>Marilyn Fox Environmental Science Prize</td>
</tr>
<tr>
<td>Jasmin Lawes, Dr Grame Clark, Prof Emma Johnston</td>
<td>AMSA Jubilee Ron Kenny Award for Best Poster ‘Contaminant cocktails: effects of multiple stressors in estuaries’</td>
</tr>
<tr>
<td>Dr Mike Letnic</td>
<td>Australian Museum Eureka Prizes for Environmental Research</td>
</tr>
<tr>
<td>Teagan Marzullo</td>
<td>Faculty of Science Postgraduate Research Competition Winner of the Cutting-edge Discovery category</td>
</tr>
<tr>
<td>Name</td>
<td>Award Description</td>
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<tr>
<td>Dr Shayne McGregor</td>
<td>State Finalist for ‘Fresh Science’</td>
</tr>
<tr>
<td>Prof Angela Moles</td>
<td>Frank Fenner Prize for Life Scientist of the Year</td>
</tr>
<tr>
<td>Rebecca Neumann</td>
<td>‘Best student oral presentation’ award at the 10th International Temperate Reef Symposum in Perth</td>
</tr>
<tr>
<td>Deniz Ortac</td>
<td>Harding/Orica Award</td>
</tr>
<tr>
<td>Dr Sarah Perkins</td>
<td>NSW representative, Fresh Science and NSW Tall Poppy Science Award</td>
</tr>
<tr>
<td>Philemoon Poon</td>
<td>JJ Frankel Memorial Prize</td>
</tr>
<tr>
<td>A/Prof Alistair Poore</td>
<td>Citation for Outstanding Contributions to Student Learning from the Federal Government’s Office of Learning and Teaching Species named after him - Paragrubia apoorei</td>
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<tr>
<td>Rohan Stocker</td>
<td>Structural Geology Field Prize</td>
</tr>
<tr>
<td>Nahid Sultana</td>
<td>GRS Postgraduate Research Student Support Scheme Award</td>
</tr>
<tr>
<td>Melanie Sun</td>
<td>UNSW Science and Engineering Photo Competition – Science on the Job category</td>
</tr>
<tr>
<td>Prof Chris Turney</td>
<td>Bragg UNSW Press Science Writing Awards article on Scott of Antarctica</td>
</tr>
<tr>
<td>Laura Watts</td>
<td>Jack Mabbutt Medal and University Medal (Geography)</td>
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The 2011 Tohoku-oki tsunami in Japan once again raised people’s awareness of tsunami hazards in the Pacific. Perhaps of more immediate concern to the east coast of Australia are tsunamis generated from other distant Pacific sources such as those off the coasts of North and South America. Tsunamis from these source areas are more likely to create problems for the east coast, especially since the largest historically-documented event in NSW was caused by the 1960 Chilean Tsunami. While recent work has vastly improved our understanding of past tsunamis around Australia’s coastline, we still need a better understanding of how big and how often these occur. This is where New Zealand comes in. In essence, New Zealand stands as a barrier between these far field events and our coastline. In other words, these tsunamis are bigger there than they are here and so if we can learn more about them in New Zealand, this will help us better understand the smaller sized – and yet still potentially catastrophic – events that have struck and will strike eastern Australia. Our work has focused around the Christchurch and Bank Peninsula area, where numerous far field sourced tsunamis have been recorded in both historical and geological records. A broad overview of past tsunamis affecting the Christchurch area identified several key sites for further work with a particular focus on understanding not only the nature of the sediments left behind (Okains Bay, Lavericks Bay, Birdlings Flat) but also the effects on Lyttelton Harbour and the full inland extent of the water inundation – beyond the sedimentary evidence.

The latter work is vitally important for identifying the extent of relatively small, and yet potentially catastrophic, tsunamis that may leave little or no sedimentary evidence behind – just the type of events we are likely to have experienced along the eastern shores of Australia. This work entails research undertaken by both PhD and Honours students and it continues to significantly improve our understanding of the tsunami hazard for both New Zealand and Australia.
Estuaries are diverse and productive ecosystems that are subject to high levels of disturbance from multiple human stressors. Chemical contaminants and nutrients from urban and industrial activities are released into estuaries and accumulate in bottom sediments where they may impact resident animals. Effects of multiple stressors are predicted to be synergistic, but there has been limited experimental work examining how such interactions might amplify impacts. To assess the ecological health of sediment animals, the common chemical contaminant stressors are usually targeted (e.g. the metals, PAHs and pesticides with guideline values), but fewer studies consider the influence of nutrient enrichment as well as contaminants. A large collaborative effort bringing together SEE researchers **Dr Katherine Dafforn** and PhD Students **Melanie Sun, Jaz Lawes and Simone Birrer** with Southern Cross University, CSIRO and OEH scientists aims to address this gap, and investigate the ecological relevance of toxic and enriching contaminants to help develop more targeted sampling programs. Using manipulative experiments that deployed sediments with varying levels of metal contamination and added fertilizer in benthic recruitment containers their experiments have identified consequences on benthic estuarine communities from organic enrichment and metal contamination from industrial practices. This project combines cutting edge 'omic technologies (metagenomics, metatranscriptomics, metaproteomics) with conventional biomonitoring approaches to establish the direct and indirect effects of storm water constituents on ecosystem structure and function and is being conducted in parallel in Singapore and Sydney.

Stormwater is not just a cocktail of contaminants and plastics are an emerging threat in urban runoff. Since mass production began in the 1940s, plastics have become a ubiquitous part of everyday life. Their low cost and ease of manufacture have been driving forces behind their popularity, but their persistence in the environment and increasing awareness of associated ecological impacts have raised concern. Plastics comprise around 90% of floating debris with "macroplastics" receiving much of the media attention, while "microplastics" remain relatively
poorly investigated. Microplastics result from mechanical (e.g., abrasion) and chemical (e.g., UV) weathering that degrades larger pieces of plastics. The little knowledge we have about microplastic distributions comes primarily from water column sampling, but the deposition of these particles in sedimentary environments may have wide-reaching consequences for benthic organisms. PhD Student Vivian Sim has completed a pilot study of microplastic distributions in Sydney Harbour and found that microplastic density increases towards the heads, but the distribution of microplastics is not associated with metal contamination or organic enrichment.

Research interests in the lab also extend offshore and recent graduate Dr Katelyn Edge completed a placement in Norway to assess the impacts of offshore deep sea oil drilling using biomarker tools developed during her PhD. Biomarkers are suborganismal responses to stress, that have been touted as a rapid and cost-effective way of assessing contaminant exposure. They are increasingly used by ecotoxicologists as ‘early warning’ signs of pollution, and signal the onset of harmful effects at cellular and sub-cellular levels. Dr Katelyn Edge’s research using native oysters in NSW and deep sea sponges in Norway has identified lysosomal membrane stability as a useful indicator of ecological health in estuarine systems.

To understand these impacts it is also important to identify how we use our estuaries and Dr Luke Hedge together with collaborators from University of Sydney, Macquarie University and the University of Technology, Sydney is currently undertaking the first human use survey to ever be conducted in Sydney Harbour. Records from Transport NSW have documented 17,000 recreational and 1800 commercial vessels plying the waters of Sydney Harbour every year and Luke’s research will document their movements and activities in relation to different habitat types around the harbour.

More than 50% of the coastline in Sydney is modified by coastal armouring and boating infrastructure. The construction of artificial structures (such as pilings and pontoons) provides a novel habitat resource that favours non-indigenous species over native species. A team of PhD and honours students led by Dr Mariana Mayer-Pinto begins sampling of artificial structures around Sydney Harbour this year. PhD student Natalie Rivero will investigate the consequences of the urbanisation of our estuaries for both the structure and function of sessile invertebrate communities. This will be the initial phase of a large-scale ‘green’ engineering project that aims to design artificial structures to mitigate their impacts by enhancing biodiversity and deterring invasion.

Global warming and invasive species represent two of the greatest threats to the world’s biodiversity. These invasive, introduced species can displace natives, disrupt community structure and food webs, and alter fundamental processes, such as nutrient cycling. With climate change we might expect the rate of biological invasions to increase due to shifts in species ranges and increased temperatures may enhance the growth and development of some non-indigenous species. PhD students James Lavender and Sally Bracewell are undertaking large-scale field experiments along the coastline from Port Douglas to Hobart to investigate latitudinal variation in the abundance and species richness of fouling species, and test hypotheses about disturbance recovery and biotic pressure.
A SUSTAINABLE ENERGY SYSTEM FOR AUSTRALIA
Mark Diesendorf

Most people would agree that an ecologically sustainable, everlasting, energy system is desirable for Australia and the whole planet.

It would substitute for fossil fuels, the principal source of greenhouse gas emissions and a substantial source of air and water pollution and land degradation. It would last as long as our Sun lasts, for billions of years. Unlike nuclear fission, sustainable energy would neither increase the threat of nuclear war, nor expose people to the risk of rare but devastating accidents, nor leave behind dangerous wastes. A truly sustainable energy system is one based on the efficient use of renewable energy (RE).

Sustainable energy technologies already exist on a small scale in many countries, but countries or large regions with major sustainable energy systems are rare – quite good examples are Norway, Sweden and Denmark. In addition, significant progress has been made in Germany, Spain, Portugal, Scotland, California and New Zealand.

As solar and wind energy become cheaper and begin to disrupt the business models of conventional energy utilities, the media has filled with the voices of RE deniers, many of whom are also deniers of climate science. “You can’t run an industrial society on renewable energy”, they claim. “Renewable energy is intermittent, too unreliable, and cannot provide base-load power. And even if it could, it’s too expensive!”.

To test these claims, an interdisciplinary research group from the Institute of Environmental Studies and the Centre for Energy and Environmental Markets has been performing hourly computer simulations of electricity demand.
and supply in the Australian National Electricity Market (NEM) in 2010, with supply coming entirely from commercially available RE technologies. The simulation balances actual hourly demand with hourly solar and wind energy, backed up with existing hydro and gas turbines fuelled on liquid and gaseous biofuels. In performing economic optimisations, the group uses projected technology and fuel costs for 2030 published by the Bureau of Resources and Energy Economics. All the simulations are constrained to meet the NEM reliability criterion: a shortfall of less than 0.2 per cent in annual electricity generation.

The first result is that RE can reliably supply base-load demand – that is, the minimum demand stretched out over 24-hour periods – in both summer and winter, even when two-thirds of the energy is provided by the variable or ‘intermittent’ sources of wind and solar photovoltaics (PV). The myth that base-load power stations are needed to supply base-load demand is busted.

However, it is more challenging to supply the demand peaks in winter evenings, especially after overcast, calm days. In these cases the flexible, ‘dispatchable’ renewable energy technologies – hydro, biofuelled gas turbines and concentrated solar thermal (CST) power with thermal storage – fill most of the gaps, the short periods when supply fails to meet demand. However, even with a few unfilled gaps, which also occur in fossil fuelled electricity supply, the supply system still meets the reliability criterion. We find that the shortfalls could be eliminated almost entirely by small reductions in the winter demand peaks in a future ‘smart’ grid.

The optimal economic mix of the 100% RE system has about half the annual electricity generation coming from wind, 15-20% from each of PV and CST, and the remainder from existing hydro and biofuelled gas turbines. We have compared the economics of this system with four fossil fuelled systems: (i) an ‘efficient’ fossil system with base-load coal and peak-load hydro and gas turbines; (ii) an all gas system; (iii) a hypothetical system based on the unproven technology of coal with carbon capture and storage (CCS) plus peak-load gas; and (iv) a hypothetical all gas system with CCS.

Fossil system (i) is very high in greenhouse gas emissions and becomes more expensive than the 100% RE system when the carbon price is $50-100 per tonne of CO₂. In the absence of a carbon price, 100% RE would still be cheaper if the subsidies currently received by all fossil fuels (over $10 billion per year) were transferred to RE. Fossil system (ii) is high in emissions and becomes more expensive than 100% RE when the gas price nears current export prices – it is currently rising rapidly. For fossil systems (iii) and (iv) we considered a wide range of costs for the unproven CCS technologies, gas prices and carbon prices, and found that only under rare combinations of costs could these fossil systems compete with 100% RE. Thus, in a climate constrained energy system there may be no future for coal-fired or gas-fired base-load power stations.
CLAIRE BRANDENBURGER (PhD student in the Big Ecology Lab) pollinating Arctotheca populifolia plants to determine whether they may be evolving into new native species.

Introduced species are often cited as the second biggest threat to native biodiversity, and as causing enormous environmental and economic impact. However, in the Big Ecology Lab, we see introduced species as a fantastic opportunity to study evolution in action.

Introducing species to a new environment creates excellent conditions for evolution. The species is released from its native enemies. It is also exposed to a new suite of biotic pressures from herbivores, pollinators, pathogens and competitors, and a new suite of abiotic pressures such as different rainfall, temperature, disturbance regime, soil fertility.

Joanna Buswell (an MSc student in the Big Ecology Lab) led work with herbarium specimens collected over the last 150 years, and has shown that 65% of the short-lived, sexually reproducing plant species introduced to Australia and 33% of the species introduced to New Zealand have undergone significant morphological change in at least one trait since their introduction. Her paper describing this research was among the ten most highly cited papers published in the Journal of Ecology in 2011.

Lee Ann Rollins (a postdoc in the Big Ecology Lab) led work that used microsatellites to locate the exact source population for two species that have shown significant morphological changes since arriving in Australia, Arctotheca populifolia and Petrorhagia nanteuilii. We then collected seeds from the source and introduced populations from each of these species, and Claire Brandenburger (PhD student) has begun growing the plants together in a common garden experiment in the glasshouse at UNSW. Preliminary results suggest that these species may have undergone striking evolutionary change since their arrival in Australia. Claire’s next step will be to determine whether the introduced and source populations of these introduced species are becoming reproductively isolated.

As gene flow between introduced populations and their source populations is extremely limited, the selective pressures involved are very strong, and our chances of eradicating most introduced species are slim at best, Angela Moles has argued (e.g. in her TEDxSydney presentation http://www.youtube.com/watch?v=5EV3ZTzSzZE) that it is inevitable that introduced species will eventually evolve to become unique new taxa that do not occur anywhere else in the world. At this point, we will have to decide whether to accept them as new native species, or continue to try to exterminate them. While most ecologists don’t like the idea yet, Angela argues that acceptance of introduced species is just a matter of time.

RAPID EVOLUTION IN INTRODUCED SPECIES: WILL WEEDS IN AUSTRALIA EVENTUALLY BE ACCEPTED AS UNIQUE NATIVE TAXA?

Angela Moles
Digital soil mapping is the process where ancillary data is used as either a surrogate for or to add value to limited soil morphological, chemical and/or physical soil data. The reason digital soil mapping has taken off within the soil science literature is that this approach is proving invaluable in reducing the time consuming nature and expense of soil sampling and laboratory analysis. This is because the ancillary data is usually much easier and cheaper to acquire. Two of the most popular ancillary data sets being used in Australia include gamma-ray spectrometry and electromagnetic (EM) induction.

With respect to the gamma-ray spectrometry, large amounts of the Australian continent have been mapped. Primarily the data was collected in order to provide a surface snapshot of the geochemical make-up of the continent. Because the nature of the measurement is to do with detecting and measuring concentrations of radio-elements (unstable isotopes) of potassium, uranium and thorium the information is useful because these radioelements can indicate the presence of rocks and thereby differences in soil type. In order to use this data Dr Triantafilis and one of his honours students numerically clustered this data and by comparing the results with the known geology and geomorphology of the lower Namoi valley were able to generate a map which matched soil patterns.

From a theoretical standpoint the results could also be described in terms of the development of secondary clay minerals as a function of the five soil forming factors (climate, organisms, parent material, relief and time). From a soil management perspective the digital soil map will allow agronomists and consultants to identify where results achieved at either of the two major research stations associated with wheat breeding (University of Sydney’s IA Watson Wheat Research Centre) and cotton agronomy (NSW Department of Primary Industries Australian Cotton Research Institute) can best be extended. In the figures below, this is indicated in the areas delineated by the light blue shaded area, which coincides with the location of the highly productive Vertosols used extensively to grow dryland wheat crops in rotation with irrigated cotton production. The
research was published in Geoderma (IF: 2.9) in 2013 and is in the top 20 most downloaded articles.

Whilst the gamma-ray data is useful for providing information across a large area and very quickly the results are not readily interpretable beyond a depth of 0.40 m. This is because the gamma-rays are absorbed within the soil at depths greater than this. In this regard the use of EM instruments is more appropriate because EM instruments can measure soils apparent electrical conductivity (ECa) to various depths and as a function of the spacing of the coils in the instrument and the frequency of operation. One of the limitations in the use of these instruments to provide information about soil variation with depth is the fact that the instruments were constrained by manufacturer design (limited to one fixed spacing). To overcome this, an instrument called the DUALEM-421 was developed. This instrument is the state of the art in EM instruments.

The advantage of this instrument is that it allows a user to acquire 6 measurements of soil ECa at the same time and without the need for multiple instruments and multiple passes. However, on its own the instrument is almost useless without the use of EM inversion software (EM4Soil). In collaboration with Professor Fernando Monteiro Santos, Dr Triantafilis and various honours students have been generating cutting edge and world first research in the area of mapping and modelling soil variation in 2-d (along transects) and 3d (multiple transects) using the DUALEM-421 and EM4Soil. The 3-d model shown below was generated from inverting DUALEM-421 data collected along tightly spaced transects at Astrolabe Park in Daceyville, Sydney and using EM4Soil. The 3-d models shown below indicate the location of estimates of the true electrical conductivity ($\sigma$) consistent with the conductivity of a leachate plume. The results therefore provide a model whereby inferences of the likely source of the leachate plume can be made from beneath the park and associated with a municipal landfill which was decommissioned in the mid-1970’s. This research was published in the Vadose Zone Journal (IF: 1.888).
This busy year was highlighted by my first experience in formally running a university course (GEOS 2171: Earth Structures), my first supervision of Honours and post-graduate students (7 in total), becoming co-director of the Australian Centre for Astrobiology (BEES), and continuing to do research on a number of topics, as listed below.

Geological fieldwork commenced in January, 2013 with a trip to the upper Hunter Valley of NSW to commence investigation into the Paleozoic New England Orogen, with Honours student Bernadette Phu. In February, I travelled to the Pilbara region of Western Australia to undertake a heritage survey of a region where my colleague from the IPGP in France and I proposed to undertake a scientific drilling program across the transition from early Earth, with an anoxic, warm atmosphere, to more modern Earth, with a partly oxygenated environment and cool climatic conditions including glacial epochs, around 2.5 billion years ago. This involved taking three members of the local indigenous community and an anthropologist from Perth along proposed trackworks and drillrig sites for each of three drilling sites to determine whether ground disturbance would affect any aboriginal heritage sites. Although some artefacts were discovered along the routes (stone tools, grinding stones), they required only slight deviations of tracks and no major sites were discovered, so that drilling could proceed. Drilling commenced in May and was completed successfully over three weeks, retrieving three diamond drillcores from three different intervals across the rise in atmospheric oxygen.

Throughout June-July-August, I travelled to and from Western Australia to undertake field studies related to five separate student projects in four different areas. My involvement was for a week at the start and a week at the end of each student project, each of which involved mapping for 4 weeks. Despite unusually heavy winter rains, all projects were completed successfully, with no undue delays or mishaps. Exciting discoveries were made from all projects. In addition, I participated in, and co-led part of the Grand Tour, a ten-day fieldtrip organised by Prof Malcolm Walter of the ACA.
### SCHOOL OF BEES SEMINAR SERIES

**Coordinated by A/Prof Rob Brander**

<table>
<thead>
<tr>
<th>DATE</th>
<th>SPEAKER</th>
<th>SEMINAR TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 March</td>
<td>Dr Joe Miller, CSIRO</td>
<td>The natural history of Acacia</td>
</tr>
<tr>
<td>15 March</td>
<td>Prof Lisbeth Louderback, University of Washington, Seattle</td>
<td>Seeds of Change: The impacts of climate change on dietary choice and human occupation patterns in early Holocene North America</td>
</tr>
<tr>
<td>12 April</td>
<td>Dr Paul Lennox, UNSW</td>
<td>Understanding deep time geology over a short time</td>
</tr>
<tr>
<td>26 April</td>
<td>A/Prof Dale Dominey-Howes, UNSW</td>
<td>Queering disasters – on the need to account for LBGTIQ experiences in natural disasters</td>
</tr>
<tr>
<td>10 May</td>
<td>Prof Ross McMurtrie, UNSW</td>
<td>'I think that I shall never see a poem lovely as a tree.' The mathematical beauty of trees</td>
</tr>
<tr>
<td>24 May</td>
<td>Dr James Smith, UNSW</td>
<td>Urbanising the sea: can artificial reefs increase marine production?</td>
</tr>
<tr>
<td>7 June</td>
<td>Dr Alessandro Communian, UNSW</td>
<td>Multiple-point statistics: a powerful tool for the characterisation of heterogeneity in space and time</td>
</tr>
<tr>
<td>9 August</td>
<td>Dr Malika Virah-Sawmy, UNSW</td>
<td>Measuring conservation outcomes: a debate on socio-ecological metric!</td>
</tr>
<tr>
<td>12 August</td>
<td>Andrey Giljov, Saint Petersburg State University</td>
<td>Lefties and righties in the marsupial world</td>
</tr>
<tr>
<td>15 August</td>
<td>Dr Kazuhiso Goto, Tohoku University</td>
<td>Tsunami geology and the future tsunami risk assessment in Japan</td>
</tr>
<tr>
<td>23 August</td>
<td>Dr Chris Fogwill, UNSW</td>
<td>Abrupt Holocene shifts in Antarctic ice stream direction</td>
</tr>
<tr>
<td>2 September</td>
<td>Dr Gerrit Neef, UNSW</td>
<td>The Cenozoic Geology of the Northern Wairarapa, North Island, New Zealand</td>
</tr>
<tr>
<td>6 September</td>
<td>Prof Bill Sherwin, UNSW</td>
<td>So you think you know what biodiversity is? Evolution and measurement of biodiversity, from genes to landscapes</td>
</tr>
<tr>
<td>20 September</td>
<td>Prof Felisa Smith, University of New Mexico</td>
<td>How megafauna influence climate (and are not just influenced by it)</td>
</tr>
<tr>
<td>11 October</td>
<td>Prof Iain Suthers, UNSW</td>
<td>Ecology, evolution and climate! – all in the armpit of the east Australian current</td>
</tr>
<tr>
<td>25 October</td>
<td>Dr Danielle Drozdzewski, UNSW</td>
<td>Escape to the country? Exploring the motivations, outcomes and consequences of moving from urban to regional Australia</td>
</tr>
<tr>
<td>8 November</td>
<td>Dr Eric Grunsky, Geological Survey of Canada</td>
<td>Successes and challenges in the application of multivariate statistics to multi- element geochemical data</td>
</tr>
</tbody>
</table>
## Evolution and Ecology Research Centre Seminar Series

Co-ordinated by Dr Adriana Vergés

<table>
<thead>
<tr>
<th>DATE</th>
<th>SPEAKER</th>
<th>SEMINAR TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 March</td>
<td>Prof Emma Johnston</td>
<td>Stress ecology and why everybody’s doing it</td>
</tr>
<tr>
<td></td>
<td>UNSW</td>
<td></td>
</tr>
<tr>
<td>22 March</td>
<td>Dr Robert L. Stephenson</td>
<td>Auditing human activities in the ocean</td>
</tr>
<tr>
<td></td>
<td>University of New Brunswick</td>
<td></td>
</tr>
<tr>
<td>19 April</td>
<td>Prof Angela Moles</td>
<td>Global patterns in plant defence: are tropical plants nastier?</td>
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<td>3 May</td>
<td>Dr Darrell Kemp</td>
<td>The many colourful ways to stimulate a fly</td>
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<td>17 May</td>
<td>Dr Renata Ferrari</td>
<td>Spatial ecology of a 3D underwater world: incorporating three-dimensionality into marine research</td>
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<td>University of Sydney</td>
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<td>31 May</td>
<td>Dr Julieta Rosell</td>
<td>The ecology and evolution of bark</td>
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<td>14 June</td>
<td>Dr Peter Jonason</td>
<td>Quantitative, evolutionary, and comparative analyses of the role, function, and acts associated with uncommitted sexual relationships</td>
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<td>University of Western Sydney</td>
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<td>21 June</td>
<td>Prof Hugh Possingham</td>
<td>The mathematics of conservation decisions</td>
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<td>The University of Queensland</td>
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<td>2 August</td>
<td>Dr Graeme Clark</td>
<td>Light-driven tipping points in polar ecosystems</td>
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<td>16 August</td>
<td>A/Prof Steve Bonser</td>
<td>50 shades of green: plant sex on stress gradients</td>
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<td>26 August</td>
<td>Dr Christian Rutz</td>
<td>Investigating tool-use behaviour in wild New Caledonian crows</td>
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<td>13 September</td>
<td>Dr Marian Wong</td>
<td>Conflict and cooperation in fishes: Insights from coral reefs and great lakes</td>
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<td>Prof Terrie Williams</td>
<td>The truth about cats and dogs: Physiological tipping points as survival indicators for large mammalian predators</td>
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<td>University of California Santa Cruz</td>
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<td>20 September</td>
<td>Prof Felisa Smith</td>
<td>How big should a mammal be? The role of body mass in coping with varying environmental conditions.</td>
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<td>University of New Mexico</td>
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<td>27 September</td>
<td>Dr Will Cornwell</td>
<td>A geographic mosaic of climate change impacts: which areas are most at risk?</td>
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<td>18 October</td>
<td>Dr Elizabeth Madin</td>
<td>Monitoring coral reef health from space</td>
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<tr>
<td>1 November</td>
<td>Dr Melinda Coleman</td>
<td>Connectivity of Australian seaweeds and implications for conservation</td>
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<td>NSW DPI - Marine Parks</td>
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## Institute of Environmental Studies Seminars

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<thead>
<tr>
<th>DATE</th>
<th>SPEAKER</th>
<th>SEMINAR TITLE</th>
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<tbody>
<tr>
<td>10 April</td>
<td>Dr Rosie Cooney</td>
<td>Biodiversity Policy</td>
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<tr>
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<td>IUCN</td>
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<td>24 April</td>
<td>Dr Graham Matheson</td>
<td>Access and benefit sharing agreements and commercialisation of traditional regenerative remedies</td>
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<td>UNSW</td>
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<td>29 May</td>
<td>Prof John Black</td>
<td>Transport, society, environment: evidence-based analysis of the economic heartland of Japan</td>
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<td>19 June</td>
<td>Dr Adam Lucas</td>
<td>Carbon-captured: Australia, climate change and the coal industry</td>
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<td>University of Wollongong</td>
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<td>25 July</td>
<td>Geoff Burton</td>
<td>Winners and losers: Implementing the Nagoya Protocol</td>
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<td>United Nations University</td>
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<td>9 August</td>
<td>Dr Malika Virah-Sawmy</td>
<td>Measuring conservation outcomes: a debate on socio-ecological metric</td>
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<td>21 September</td>
<td>Dr David Suzuki</td>
<td>Imagining a sustainable future, foresight over hindsight</td>
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<td>David Suzuki Foundation</td>
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<td>2 October</td>
<td>Joachim Golo Pilz</td>
<td>India One: Solar thermal electricity for India</td>
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<td>Department of Renewable Energy, BKWSU</td>
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<td>21 October</td>
<td>Ben Elliston</td>
<td>Mitigating global climate change with sustainable energy</td>
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<td>23 October</td>
<td>Dr Rebecca Cross</td>
<td>Stories of farming hope: Agri-cultural change and the farming ‘eco-innovator’</td>
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<td>13 November</td>
<td>Prof Paul Brown</td>
<td>The continuing saga of Hexachlorobenzene (HCB) waste at Orica’s Botany site</td>
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<td>27 November</td>
<td>Prof Andy Sterling</td>
<td>Risk and the precautionary principle</td>
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<td>University of Sussex</td>
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<td>18 December</td>
<td>Cassidy Rankine</td>
<td>Merging ecology with cutting-edge technology</td>
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<td>EOSL, University of Alberta Canada</td>
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</tbody>
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Climate Change Research Centre Seminars

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<th>DATE</th>
<th>SPEAKER</th>
<th>SEMINAR TITLE</th>
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<tbody>
<tr>
<td>21 January</td>
<td>Dr Ashok Karumuri</td>
<td>ENSOs and the changing background: cocktailing towards more flavours?</td>
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<td>Indian Institute of Tropical Meteorology</td>
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<td>24 January</td>
<td>Prof Peter Cox</td>
<td>Will the Amazon rainforest dieback under global warming: the answer is in the noise</td>
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<td>University of Exeter</td>
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<td>25 January</td>
<td>Dr Peter Stott</td>
<td>Attributing extreme weather to climate variability and change</td>
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<td>UK Met Office</td>
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<td>30 January</td>
<td>Prof Ross Bradstock</td>
<td>Managing fire risk: present and future</td>
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<td>University of Wollongong</td>
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<tr>
<td>7 February</td>
<td>Dr Angela Maharaj</td>
<td>Global ocean chlorophyll in a changing climate</td>
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<td>22 February</td>
<td>Prof Jonathan Gregory</td>
<td>Twentieth-century global-mean sea-level rise: is the whole greater than the sum of the parts?</td>
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<td>University of Exeter / MetOffice</td>
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<td>25 February</td>
<td>Prof David Thompson</td>
<td>Towards understanding the response of the atmospheric circulation to climate change</td>
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<td>Colorado State University</td>
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<tr>
<td>4 March</td>
<td>Prof Mojib Latif</td>
<td>Internal Southern Ocean centennial variability: dynamics impacts and implications for global warming</td>
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<td>Helmholtz Centre for Ocean Research Kiel and Kiel University</td>
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<tr>
<td>6 March</td>
<td>Dr George Nurser</td>
<td>The impact of small-scale topography on the dynamical balance of the ocean</td>
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<td>National Oceanography Centre, Southampton</td>
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<tr>
<td>7 March</td>
<td>Dr Ben McNeil</td>
<td>A paradigm shift in the ocean: Detecting the new non-steady-state CO2 outgassing signal</td>
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<td>15 March</td>
<td>Michael Eby</td>
<td>The response of the global carbon cycle to climate change: results from new model intercomparison projects</td>
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<td>University of Victoria</td>
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<td>19 March</td>
<td>Scott Wales</td>
<td>Using the unified model in the CoE</td>
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<td>University of Melbourne</td>
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<td>20 March</td>
<td>Acacia Pepler</td>
<td>Bureau of Meteorology</td>
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<td>Prof. Jane McAdam</td>
<td>UNSW</td>
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<td>What’s up with the East Coast? Climate variability on the eastern seaboard of Australia</td>
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<td>22 March</td>
<td>A/Prof. Jason Evans</td>
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<td>Climate change and forced migration: The limits of International Law</td>
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<tr>
<td>4 April</td>
<td>Prof. Herbert Huppert</td>
<td>UNSW and Cambridge University</td>
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<td>There was movement at the grounding line for the word had passed around: the flow of ice sheets into the oceans.</td>
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<tr>
<td>17 April</td>
<td>Dr. Ines Hessler</td>
<td>Macquarie University</td>
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<td>Masked millennial-scale climate fluctuations in SW African during the last glacial</td>
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<tr>
<td>1 May</td>
<td>Dr. Remi Tailleux</td>
<td>University of Reading</td>
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<td>Controversy and confusions in ocean energetics and the driving mechanisms of the Atlantic meridional overturning circulation</td>
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<tr>
<td>2 May</td>
<td>Dr. Donna Green</td>
<td>UNSW</td>
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<tr>
<td></td>
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<td>Climate change and human health in indigenous northern Australia</td>
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<tr>
<td>7 May</td>
<td>Dr. Michael Bates</td>
<td>MIT</td>
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<td>Towards a physically based parameterisation for the eddy diffusivity in coarse resolution ocean models</td>
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<tr>
<td>7 May</td>
<td>Emily Shaw</td>
<td>UNSW</td>
</tr>
<tr>
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<td>Coral Reef Ocean Acidification: A highly variable high CO2 Future</td>
</tr>
<tr>
<td>14 May</td>
<td>Sjoerd Groeskamp</td>
<td>CSIRO Marine &amp; Atmospheric Research</td>
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<td>A thermohaline inverse method for estimating the thermohaline circulation and mixing</td>
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<tr>
<td>15 May</td>
<td>Dr. Will Hobbs</td>
<td>University of Tasmania</td>
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<td>Can we detect long-term global change from sparse 135-year-old ocean data?</td>
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<tr>
<td>22 May</td>
<td>Dr. Nick Golledge</td>
<td>Victoria University, Wellington</td>
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<td>High-resolution modelling of the Antarctic ice sheet dynamics using the parallel ice sheet model</td>
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<tr>
<td>23 May</td>
<td>Dr. Lluis Fita Borrell</td>
<td>UNSW</td>
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<td>18 months of science in the CCRC: NARCiM &amp; global mslp</td>
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<tr>
<td>27 May</td>
<td>Dr. William Kessler</td>
<td>University of Washington</td>
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<td>Circulation through the Solomon Sea: Origins and consequences</td>
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<tr>
<td>5 June</td>
<td>Prof. Jonathan Overpeck</td>
<td>University of Arizona</td>
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<td>Assessing future drought and megadrought risk</td>
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<tr>
<td>6 June</td>
<td>Prof. Steve Sherwood</td>
<td>UNSW</td>
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<td>Explaining cloud feedbacks and climate sensitivity</td>
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<tr>
<td>28 June</td>
<td>Dr. Sushil Dash</td>
<td>Indian Institute of Technology Delhi</td>
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<td>Indian summer monsoon and extreme weather events: Observed changes and future projections</td>
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<tr>
<td>3 July</td>
<td>Dr. Alejandro Di Luca</td>
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<td>Potential for small scale added value of RCM’s downscaled climate change signal</td>
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<td>17 July</td>
<td>Dr. Jeff Exbrayat</td>
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<td>Soil carbon and microbial decomposition in the land component of climate models</td>
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<td>1 August</td>
<td>Dr. Lisa Alexander</td>
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<td>Climate extremes: an analysis of uncertainties in observations and models</td>
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<td>5 August</td>
<td>Dr. Yi Ming</td>
<td>NOAA/Geophysical Fluid Dynamics Laboratory</td>
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<td>A top-down framework for understanding regional climate change</td>
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<td>7 August</td>
<td>Danny Kennedy</td>
<td>Sungevity</td>
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<td>The Sunny Country: What Australia can learn from California’s solar transformation</td>
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<tr>
<td>14 August</td>
<td>Dr. Katy Sheen</td>
<td>National Oceanography Centre, Southampton UK</td>
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<td>What determines the spatial and temporal variability of Southern Ocean turbulent mixing?</td>
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<td>Dr. Karsten Peters</td>
<td>Monash University</td>
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<td>Using shipping emissions over global oceans to highlight difficulties in quantifying aerosol indirect effects in observations and model data</td>
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<td>26 August</td>
<td>Kaitlin Alexander</td>
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<td>Dr Andrew G. Marshall Centre for Australian Weather and Climate Research</td>
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<td>11 September</td>
<td>Alvin Stone</td>
<td>ARC Centre of Excellence for Climate System Science</td>
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<tr>
<td>16 September</td>
<td>Dr Christopher Chambers University of Melbourne</td>
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<tr>
<td>25 September</td>
<td>Dr Helen McGregor</td>
<td>University of Wollongong</td>
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<tr>
<td>2 October</td>
<td>Dr Kurz Polzin</td>
<td>Woods Hole Oceanographic Institution</td>
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<td>3 October</td>
<td>Dr Erik van Sebille</td>
<td>UNSW</td>
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<td>Prof Steve Sherwood</td>
<td>UNSW</td>
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<tr>
<td>16 October</td>
<td>Dr Robert Dunn</td>
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<tr>
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<td>Prof Iain Suthers</td>
<td>UNSW</td>
</tr>
<tr>
<td>6 November</td>
<td>Tristan Sasse</td>
<td>UNSW</td>
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<td>7 November</td>
<td>Dr Melissa Hart</td>
<td>UNSW</td>
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<tr>
<td>18 November</td>
<td>Prof Chris Folland</td>
<td>Met Office Hadley Centre</td>
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<tr>
<td>20 November</td>
<td>Prof Jayajit Chakrabarty</td>
<td>University of South Florida</td>
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<td>21 November</td>
<td>Dr Michael Raupach</td>
<td>CSIRO</td>
</tr>
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<td>27 November</td>
<td>Dr Andrew Glikson</td>
<td>ANU/University of Queensland</td>
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<tr>
<td>28 November</td>
<td>Dr Kial Stewart</td>
<td>John Hopkins University</td>
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<td>Dr Robin Robertson</td>
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<td>Prof Chris Field</td>
<td>Carnegie Institution of Science</td>
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<td>Dr Simon Boriace</td>
<td>CSIRO</td>
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<td>UNSW</td>
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<tr>
<td>16 December</td>
<td>Dr Rodrigo Caballero</td>
<td>Stockholm University</td>
</tr>
<tr>
<td>18 December</td>
<td>Prof Sonia Seneviratne</td>
<td>ETH Zurich</td>
</tr>
</tbody>
</table>
**List of Publications**

**Journal Articles**


Adler, M., Bonduriansky, R., 2013. ‘Paternity Effects on Offspring Fitness Reflect Father’s Social Environment’, Evolutionary Biology, 40, 288–292.


Bain, KF., Vergès, A., Poore, AGB., 2013. ‘Using near infrared reflectance spectroscopy (NIRS) to quantify tissue composition in the seagrass Posidonia australis’, Aquatic Botany, 111, 66–70.


Bartle, K, Moles, AT, Bonser, SP, 2013. ‘No evidence for rapid evolution of seed dispersal ability in range edge populations of the invasive species Senecio madagascariensis’, Austral Ecology, 38, 915–920.


Bowl, MA, Eldridge, DJ, Val, J, Soliveres, S, 2013. ‘Hydrology in a patterned landscape is co-engineered by soil-disturbing animals and biological crusts’, Soil Biology and Biochemistry, 61, 14–22.


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Hall, M, Medlyn, B, Abramowitz, G, Franklin, O, Rantors, M, Linder, S, Wallin, G, 2013. ‘Which are the most important parameters for modelling carbon assimilation in boreal Norway spruce under elevated [CO2] and temperature conditions?’, Tree Physiology, 33, 1156–1176.

Hall, MD, Lailvaux, SP Brooks, RC, 2013. ‘Sex-specific evolutionary potential of pre-And postcopulatory reproductive interactions in the field cricket, tegeleryulus commodus’, Evolution, 67, 1831–1837.


Harris, RB, Cooney, R, Leader-Williams, N, 2013. Application of the anthropogenic allele effect model to trophy hunting as a
conservation tool’, Conservation Biology, 27, 945–951.


Heikila, Phipps, SJ, Smith, AM, 2013. ‘10Be in last deglacial climate simulated by ECHAM5-HAM Part 1: Climatological influences on 10Be deposition’, Climate of the Past Discussions, 9, 3681–3709.

Heikila, U, Smith, AM, Phipps, SJ, 2013. ‘10Be in last deglacial climate simulated by ecmä-ham &ndash; Part 1: Climatological influences on Be deposition’, Climate of the Past, 9, 2641–2649.


Keith, D, Rodriguez, JP, Rodriguez-Clark, KM, Nicholson, E, Aapala, K, Alonso, AA, Asmussen,


Kolomyjec, SH, Johnson, CN, Blair, D, Grant, TR, 2013. ‘Regional population structuring and conservation units in the platypus (Ornithorhynchus anatinus)’,


Maxwell, EE, Wilson, LAB, 2013. ‘Regionalization of the axial skeleton in the ‘ambush predator’ guild–are there developmental rules underlying body shape evolution in ray-finned fishes?’, BMC Evolutionary Biology, 13, 265.


Mcgregor, HV, Fischer, Gagan, M, Woodroffe, CD, Fink, D, Phipps, SJ, 2013. ‘Regionalization of the axial skeleton in the ‘ambush predator’ guild–are there developmental rules underlying body shape evolution in ray-finned fishes?’, BMC Evolutionary Biology, 13, 265.


McDuie-Ra, D, Robinson, DF, Kaemwanahan, J, 2013. ‘Palaeoecological evidence for Holocene environmental change from the Virunga volcanoes in the Albertine Rift, central Africa’, Quaternary Science Reviews, 61, 32–46.


Semmens, JM, Payne, NL, Huveneers, C, Sims, DW, Bruce, BD, 2013. ‘Feeding requirements of white sharks may be higher than originally thought’, Scientific Reports, 3, 1471.
Speer, MS, 2013. ‘Dust storm frequency and impact over Eastern Australia determined by state of Pacific climate system’, Weather and Climate Extremes, 2, 16–21.
Southern Oscillation’, Nature Geoscience, 6, 540–544.
Sun, MY, Daftorn, KA, Johnston, EL, Brown, MV, 2013. ‘Core sediment bacteria drive community response to anthropogenic contamination over multiple environmental gradients’, Environmental Microbiology, 15, 2517–2531.
Taylor, MD, Baker, J, Suthers, IM, 2013. ‘Tidal currents, sampling effort and bailed remote underwater video (BRUV) surveys: Are we drawing the right conclusions?’, Fisheries Research, 140, 96–104.
Travers, JK, Beck, RMD, Hand, SJ, Archer, M, 2013. The oldest fossil record of baccumts (Marsupialia; Peramelemorphia) from the late Oligocene of Australia’, Palaeontology Electronica, article number: 16.2.13A.


Lawes J, Clark G, Johnston E, ‘Contaminant cocktails examining the effects of multiple stressors on the recruitment and mortality of invertebrate communities’, WSW, Oxnard, CA, USA, 7-10 November, 2013.

Lawes J, Clark G, Johnston E, ‘Cop it sweet or sweeten the deal? Investigating the effects of two common contaminants on marine bacteria and sessile invertebrates’, ECSA, Shanghai, China, 13-17 October, 2013.


Metternicht G, ‘To green skill or not to green skill: the role of tertiary institutions, business and government to realise the skills necessary for future innovative and sustainable workforce’, Australian Sustainability Conference, Melbourne, Australia, 10 October, 2013.


PHD STUDENTS AND COMPLETIONS

Candidates

2013 MPhil Students
Ksenia Chistyakova
Oliver Delves
Tara Djokic
Mark Healey
Jing Huang
Bok Khoo
Wendy Kinsella
Justin Narimbi
Edward Piatt
Samira Schaedler
Pratistha Tamrakar

2013 Masters by Research Students
Sindy Luu
Erin Macartney
Katherine Reeds
Shinjiro Ushiami
Caitlin Young

2013 PhD Students
Esteban Abellan
Cristina Acasuso
Tempe Adams
Md. Edris Alam
Hatim Albasri
Witold Bagniewski
Keryn Bain
Naysa Balcazar-Cabrera
Alice Barthel
Hayley Bates
Douglas Beattie
Thomas Beaudoin
Simone Birrer
Rachel Blakey
Raymond Blick
Ceridwen Boel
Damon Bolton
Sally Bracewell
Claire Brandenburger
Stephanie Brodie
Geoffrey Brown
Christopher Bull
Dane Burkett
Hugh Burley
Cameron Cairns
Kristan Carlyon
Ting Chan
Sichong Chen
Marina Cheng
Hamish Clarke
Nadine Constantinou
Timothy Cowan
Rebecca Cross
Rhiannon Dalrymple
Samantha Dawson
Annika Dean
Laurence Delina
Giovanni Di Virgilio
Edwards David
Nigel Edwards
Michael Elias
Suzanna Evans
Fatih Fazlioglu
David Fuchs
Ruan Gannon
Alyssa Gibson
James Glasier
Amany Gouda-Vossos
Jacinta Green
Joshua Griffiths
Alicia Guerrero
Chang Han
Benjamin Harris
Ned Haughton
Sylvia Hay
Natasha Henschke
Annette Hirsch
Mark Hocking
Willem Huiskamp
Daniel Hunter
David Hutchinson
Agnieszka Imielska
Claire Kain
Aleksandra Kalinowski
Helen Karathomas
Jacqueline Karras
Krystle Keller
Mohammadreza Keshavarzi
Andrew King
Darren King
Danielle Klomp
Karin Kvale
James Lavender
Jasmin Lawes
Viyanna Leo
Andrew Letten
Rachel Levin
Ian Macadam
Berin Mackenzie
Brian Mackness
Nicola Maher
Penelope Maher
Oliver Manlik
Monika Markowska
Lennard Martin
Teagan Marzullo
Shafaq Masud
Robert McCarroll
Luke McPhan
Kylie McQualter
Rachel Melrose
Lindsay Menday
Floret Meredith
Franziska Mey
Indrie Miller
Jason Mumbulla
Ali Namazi
Rebecca Neumann
Jacqueline Nguyen
Niklas Sarah
Ocock Joanne
Ceiwien Pease
Acacia Pepler
Tamsin Peters
Thanh Pham
Bayu Priyambodo
Xuorong Qin
Zhiguang Qiu
Gabriella Radnan
Thelma Raman
Nina Ridder
Natalie Rivero
Jessica Roe
Natalie Rogers
Susan Rutherford
Atry Samiee
Christopher Setio
Vivian Sim
Irja Simbiak
Graham Simpkins
Melissa Sinclair
Eve Slavich
Michael Stein
Jerom Stocks
Olivia Stone
Nahid Sultana
Melanie Sun
Carol Tadros
Tarunamulia
Rachael Thomas
Marlee Tucker
Mira Van Der Ley
Dylan Van Der Meulen
Benjamin Van Leeuwen
Sandra Vogel
Melissa Vogt
Todd Walton
Justin Wan

Bevan Warren
Hazel Watson
Evan Webster
Wirastuti Widyatmanti
Laila Wijaya
Peta Wolifson
William Woodward
Jie (Jack) Yan

Completions

2013 MPhil Completions
Elizabeth Cassidy
Adrian Di Qual
Courtney Morgans
Mailie Gall

2013 Masters by Research Completions
Ratnawati Hazali
Yue Li
Jessica Lyons

2013 PhD Completions
Margo Adler
Marie Attard
Kathryn Bormann
Stefani Daryanto
Katelyn Edge
Chang Han
Luke Hedge
Jacqueline Hicks
Thomas Mullaney
Anna Namiatova
Dean Portelli
Alexander Pursche
Tristan Sasse
Emily Shaw
Celine Steinfeld
Carol Sukhn
Cameron Tarbotton
Jan Tebben
ACTIVE RESEARCH PROJECTS (VALUE $5,000+)

Antarctic Logistics & Expeditions LLC (USA)
Dr Christopher Fogwill
Integrating past ice sheet dynamics with Palaeoclimate in the Weddell Sea Sector to evaluate current and future change in Antarctica - $75,000 over 3 years

Arid Recovery Trust
Dr Michael Letnic
Tackling prey naïveté in Australia’s threatened mammals - $98,700 over 3 years

Australian Centre for International Agricultural Research
A/Prof Jesmond Sammut
Increasing production from inland aquaculture in Papua New Guinea for food and income security - $1,700,010 over 3 years

Australian Centre for International Agricultural Research
A/Prof Jesmond Sammut
Development and management of fisheries projects in Papua New Guinea - $64,645 over 2.5 years

Australian Centre for International Agricultural Research
A/Prof Jesmond Sammut
Improving the sustainability of rice-shrimp farming systems in the Mekong Delta Vietnam SMCN/2010/083 - $1,519,566 over 4 years

Australian Geographic Society/Seed Grant
Little Penguin (Eudyptula minor) conservation genetics and demography in NSW - awarded to Sandra Vogel - $3,000 over 1 year

Australian Institute of Nuclear Science and Engineering (AINSE)
Dr Ian Graham
Surface waters groundwaters geology and water-rock interactions in the Lawn Hill region of far NW Queensland. Post Graduate Award for Ms Mira Van Der Ley - $46,416 over 3 years

Australian Institute of Nuclear Science and Engineering (AINSE)
Professor James Goff
Applying C-14 (AMS) and ITRAX to inform New Zealand’s pre-written tsunami history - $11,188 over 1 year

Australian Institute of Nuclear Science and Engineering (AINSE)
Dr Catherine Chagué-Goff
Honours Scholarship for student Karina Judd - $5,000 over 1 year

Australian Institute of Nuclear Science and Engineering (AINSE)
Dr Gabriel Rau
Honours scholarship for student Jonathan Frecker - $5,000 over 1 year

Australian Institute of Nuclear Science and Engineering (AINSE)
Dr Wendy Timms
Hidden terrestrial stores of organic carbon: Are groundwater aquitards a globally significant carbon sink? - $22,800 over 1 year

Australian Museum/ARC Linkage Project Industry Partner Contribution(**)
Dr Daniel Ramp
Innovative approaches to identifying regional responses of biodiversity to climate change - $90,000 over 3 years

Australian National University/Temperate Highland Peat Swamps on Sandstone Research Program Joint Venture
Professor David Keith
Delivering a sustainable long term ecosystem research network for Australia - $760,000 over 2.5 years

Australian National University/Temperate Highland Peat Swamps on Sandstone Research Program Joint Venture
Professor David Keith
Vegetation biogeography and conservation status of temperate highland swamps - $223,730 over 3 years

Australian National University/Temperate Highland Peat Swamps on Sandstone Research Program Joint Venture
Dr Scott Mooney
The environmental history of temperate highland sandstone swamps with a focus on climatic variability and fire - $163,800 over 3 years

Australian National University/Temperate Highland Peat Swamps on Sandstone Research Program Joint Venture
Dr Scott Mooney
The environmental history of temperate highland sandstone swamps: testate amoebae as a palaeoenvironmental proxy - $100,000 over 3 years
Australian Nuclear Science & Technology Organisation (ANSTO)

Professor Andrew Baker
To what extent does fire affect karst processes? Burning questions for fire management - $40,000 over 2 years

Australian Nuclear Science & Technology Organisation (ANSTO)

Dr Catherine Chague-Goff
Tsunami Geoscience - $61,432 over 1 year

Australian Research Council

Prof Michael Archer
Uncovering ancient landscapes with emerging technologies: integrating complex geospatial and fossil data to explore late Cenozoic environmental change - $220,000 over 3 years

Australian Research Council

Prof Andrew Baker
To what extent does fire affect karst processes? Burning questions for fire management - $193,150 over 2 years

Australian Research Council

Source - receptor analysis of lignin and lipid macromolecules in karst to quantify stalagmite biomarker proxies of vegetation and temperature change - $320,000 over 3 years

Australian Research Council

Dr Robin Beck
Using ancient fossils and new methods to unravel Australian mammal evolution in deep time - $120,000 over 3 years

Australian Research Council

Dr Robin Beck
Salary: Using ancient fossils and new methods to unravel Australian mammal evolution in deep time - $255,000 over 2 years

Australian Research Council

Dr Karen Black
Limbs and wings: Reconstructing Australian environmental change through innovative analysis of ancient mammal skeletons - $374,823 over 3 years

Australian Research Council

A/Prof Russell Bonduriansky
Evolution’s neglected dimension: The nature and consequences of environmentally-generated phenotypic variation in natural populations - $713,971 over 4 years

Australian Research Council

A/Prof Stephen Bonser
On the importance of sex in plants - $240,000 over 3 years

Australian Research Council

A/Prof Robert Brander
Rip Currents: an evidence based approach to mitigating the greatest beach hazard - $292,000 over 3 years

Australian Research Council

Prof Robert Brooks
Understanding how reproduction and sexual conflict drive sex-dependent longevity and ageing - $525,090 over 4 years

Australian Research Council

Prof Robert Brooks
Understanding how reproduction and sexual conflict drive sex-dependent longevity and ageing - $400,910 over 4 years

Australian Research Council

Prof Robert Brooks
Body size in the 21st century: Integrating evolution economics and culture - $334,000 over 3 years

Australian Research Council

A/Prof Darren Curnoe
Tracking East: Human dispersals and the early peopling of East Asia and Australasia - $800,519 over 4 years

Australian Research Council

Dr Angela Crean
More than meets the egg: Environmental effects on sperm quality sperm competitive success and offspring fitness - $255,000 over 3 years

Australian Research Council

Dr Karen Black
Limbs and wings: Reconstructing Australian environmental change through innovative analysis of ancient mammal skeletons - $374,823 over 3 years

Australian Research Council

Dr Malte Ebach
Comparative biogeography of Australasian biota - $486,400 over 4 years

Australian Research Council

Dr Christopher Fogwill
Integrating Past Ice Sheet Dynamics with Palaeoclimates in the Weddell Sea Sector to evaluate current and future change in Antarctica - $270,000 over 3 years

Australian Research Council

Dr Christopher Fogwill
Understanding the drivers and impacts of long-term Antarctic Ice sheet change: An integrated high-resolution field and modelling approach - $672,342 over 4 years

Australian Research Council

Dr Angela Crean
Salary: More than meets the egg: Environmental effects on sperm quality sperm competitive success, and offspring fitness - $240,000 over 3 years

Australian Research Council

Dr Robert Brooks
Understanding how reproduction and sexual conflict drive sex-dependent longevity and ageing - $525,090 over 4 years

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Australian Research Council

Dr Robert Brooks
Understanding the drivers and impacts of long-term Antarctic Ice sheet change: An integrated high-resolution field and modelling approach - $672,342 over 4 years
Australian Research Council
Dr Judith Field
The dynamics of human environment interactions in late Pleistocene and Holocene highland New Guinea: a study of the Ivane valley - $ 200, 000 over 3 years

Australian Research Council
Dr Marianne Frommer
Sex and the dominant male determiner in Australia's true fruit flies (Diptera: Tephritidae) - $336, 000 over 3 years

Australian Research Council
A/Prof Suzanne Hand
Dark canaries: New multidisciplinary understanding about the origins radiation and response to environmental change of Southern Hemisphere bats - $330, 000 over 3 years

Australian Research Council
Prof David Keith
Red listing ecosystems - testing the new global standard for conservation - $389, 065 over 3 years

Australian Research Council
Prof Emma Johnston
APAI Katelyn Edge - Assessing and understanding ecological changes in highly disturbed estuaries: addressing the complexity of multiple stressors - $91, 490 over 3.5 years

Australian Research Council
Prof Emma Johnston
Bioinvasions: the interactive effects of propagule pressure and pollution - $328, 585 over 4 years

Australian Research Council
Prof Emma Johnston
Bioinvasions: The interactive effects of propagule pressure and pollution - $251, 415 over 4 years

Australian Research Council
Dr Michael Kasumovic
Adaptive plasticity and evolution: linking the genotype and the environment to understand phenotypic evolution and expression - $270, 000 over 3 years

Australian Research Council
Dr Michael Kasumovic
Re-evaluating evolution by examining developmental plasticity in response to the social environment - $120, 000 over 3 years

Australian Research Council
Dr Michael Kasumovic
Salary: Re-evaluating evolution by examining developmental plasticity in response to the social environment - $255, 000 over 3 years

Australian Research Council
Prof David Keith
Revealing how top-predators maintain healthy balanced ecosystems - $97, 537 over 4 years

Australian Research Council
Dr Ebach Malte
Tackling Prey Naïveté in Australia's threatened mammals - $315, 000 over 3 years

Australian Research Council
Prof Angela Moles
How are weeds adapting to life in Australia? Quantifying the rate and direction of evolution in introduced species - $436, 950 over 5 years

Australian Research Council
Prof Angela Moles
QEII - How are weeds adapting to life in Australia? Quantifying the rate and direction of evolution in introduced species - $326, 175 over 5 years

Australian Research Council
Dr Shinichi Nakagawa
Environmentally Induced Non-genetic Effects on ageing and fitness over multi-generations and the evolution of life-history trade-offs - $872, 240 over 3 years

Australian Research Council
Dr Terrance Ord
The evolution of land-dwelling fish: contemporary analogues of a critical step in vertebrate evolution - $300, 000 over 3 years

Australian Research Council
Dr Lisa Schwanz
The battle of the sexes heats up: Climate change and the ecological and evolutionary fate of reptiles when sex is determined by temperature - $252, 627 over 2 years
**Australian Research Council**

**Prof Iain Suthers**

Feeding and breeding: Rainfall effects on connectivity and fidelity of iconic coastal fishes - $369,993 over 4 years

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**Australian Research Council**

**Prof Iain Suthers**

The krill pump: Transferring carbon across a layered ocean in a changing climate - $170,000 over 3 years

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**Australian Research Council**

**Prof Iain Suthers**

The trophic ecosystem of a purpose-built offshore artificial reef: Do coastal currents supply sufficient nutrients for the local production of fish? - $513,617 over 3 years

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**Australian Research Council**

**APAI Cian Foster-Thorpe**

APAI Cian Foster-Thorpe - Feeding and breeding: Rainfall effects on connectivity and fidelity of iconic coastal fishes - $93,342 over 3.5 years

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**Australian Research Council**

**Dr Christopher Turbill**

Oxidative stress as a physiological constraint on the pace of life histories - $120,000 over 3 years

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**Australian Research Council**

**Dr Mirela Tulbure**

A novel approach for assessing environmental flows using satellite data - $414,085 over 3 years

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**Australian Research Council**

**Prof Chris Turney**

Tipping points in records of extreme events in Australasia: Using the past to understand and plan for abrupt future climate change - $400,910 over 4 years

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**Australian Research Council**

**Prof Chris Turney**

Postdoctoral Research Associate (1) - TBA - Tipping points in records of extreme events in Australasia: Using the past to understand and plan for abrupt future climate change - $400,910 over 4.5 years

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**Australian Research Council**

**Prof Chris Turney**

Postdoctoral Research Associate (2) - Jonathan Palmer - Tipping points in records of extreme events in Australasia: Using the past to understand and plan for abrupt future climate change - $106,676 over 4 years

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**Australian Research Council**

**Dr Vera Weisbecker**

Salary: How did mammals evolve large brains? A multidisciplinary view from the pouch - $255,000 over 3 years

---

**Australian Research Council**

**Dr Scott Mooney**

Has Twentieth Century warming changed southeastern Australia’s fire regimes? - $150,000 over 2 years

---

**Australian Research Council**

**Dr Vera Weisbecker**

Salary: How did mammals evolve large brains? A multidisciplinary view from the pouch - $255,000 over 3 years

---

**Australian Research Council**

**Dr Mike Letnic**

Infrastructure component: Linkages between productivity and consistent behavioural traits in fish: implications for harvesting, climate impacts, and selective breeding for aquaculture - $200,000 over 4 years
<table>
<thead>
<tr>
<th>Project Title</th>
<th>Principal Investigator</th>
<th>Sponsor</th>
<th>Funding Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Research Council/ Future Fellowship</td>
<td>Dr Peter Biro</td>
<td>Linkages between productivity and consistent behavioural traits in fish: implications for harvesting, climate impacts, and selective breeding for aquaculture</td>
<td>$486,400 over 4 years</td>
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<td>Australian Research Council/ Future Fellowship</td>
<td>Dr Michael Letnic</td>
<td>Revealing how top predators maintain healthy ecosystems</td>
<td>$612,000 over 4 years</td>
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<tr>
<td>Australian Research Council/ Linkage Project</td>
<td>Dr Daniel Ramp</td>
<td>Innovative approaches to identifying regional responses of biodiversity to climate change</td>
<td>$321,659 over 3 years</td>
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<tr>
<td>Australia and Pacific Science Foundation</td>
<td>Dr Kathryn Raphael</td>
<td>Comparative transcriptome sequencing for identification of Australian pest fruit flies</td>
<td>$44,010 over 3 years</td>
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<tr>
<td>Australian Research Council/ Linkage Project</td>
<td>Andrew Letten</td>
<td>APAI - Andrew Letten - Innovative approaches to identifying regional responses of biodiversity to climate change</td>
<td>$80,007</td>
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<tr>
<td>Australian Research Council/ Linkage Project</td>
<td>Dr Richard Piola</td>
<td>APDI - Predicting the effects of desalination plant discharge in a changing ocean environment</td>
<td>$245,538 over 3 years</td>
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<tr>
<td>Australian Research Council/ Linkage Project</td>
<td>Dr Peter Biro</td>
<td>Can consistent individual differences in metabolic rate explain animal personality? Implications for fish and aquaculture in a warming climate</td>
<td>$216,000 over 3 years</td>
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<tr>
<td>BlueScope Steel</td>
<td>Prof Emma Johnston</td>
<td>Assessing and understanding ecological changes in highly disturbed estuaries: addressing the complexity of multiple stressors</td>
<td>$447,817 over 4 years</td>
</tr>
<tr>
<td>CAB International</td>
<td>A/Prof Wendy Shaw</td>
<td>Coffee green scales in Papua New Guinea: Highland arabica coffee and yield loss</td>
<td>$34,733 over 2.5 years</td>
</tr>
<tr>
<td>Caring for our Country (Australian Government)</td>
<td>Associate Professor John Merson, Peter Ampt, Peter Graham</td>
<td>Box Gum Grassy Woodlands Stewardship Program</td>
<td>$97,000 over 1 year</td>
</tr>
<tr>
<td>Charles Sturt University</td>
<td>Dr Kim Jenkins</td>
<td>Murrumbidgee river system M&amp;E</td>
<td>$97,000 over 1 year</td>
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<tr>
<td>Cooperative Research Centre (CRC) for Low Carbon Living</td>
<td>Dr Alex Baumber</td>
<td>‘Building low carbon communities’ project, coordinated by the Blue Mountains World Heritage Institute (BMWHI)</td>
<td>$82,200 over 2 years</td>
</tr>
<tr>
<td>Cooperative Research Centre (CRC) for Low Carbon Living</td>
<td>Prof Mark Diesendorf</td>
<td>The role of cooperatives and not-for-profit organizations in fostering community renewable energy projects</td>
<td>$102,000 over 3 years</td>
</tr>
<tr>
<td>Cotton Research &amp; Development Corporation (CRDC)</td>
<td>A/Prof Bryce Kelly</td>
<td>Baseline measurements of methane in the groundwater and air throughout the Condamine Catchment (Honours scholarship for Charlotte Iverach)</td>
<td>$5,000 over 1 year</td>
</tr>
<tr>
<td>Cotton Research &amp; Development Corporation (CRDC)</td>
<td>A/Prof Bryce Kelly</td>
<td>Quantifying the uncertainty associated with predicting CSG production impacts</td>
<td>$375,000 over 2 years</td>
</tr>
<tr>
<td>CRC For Bushfire</td>
<td>A/Prof Dale Dominey-Howes</td>
<td>FESASEMC WA Hazards work plan</td>
<td>$30,000 over 1 month</td>
</tr>
</tbody>
</table>
CRC For Low Carbon Living Limited
A/Prof Mark Diesendorf
Opportunities and challenges for the development and implementation of community-scale renewable energy projects Scholarship for Franziska Mey - $102, 250 over 3 years

CRC For Low Carbon Living Limited
A/Prof John Merson
Building Low Carbon Communities - $41, 100 over 2 years

Cronulla Fisheries Research Centre of Excellence
Prof Iain Suthers
The trophic ecosystem of a purpose-built offshore artificial reef: do coastal currents supply sufficient nutrients for the local production of fish? - $513, 617 over 3 years

CSIRO - Commonwealth Scientific and Industrial Research Organisation
A/Prof Shawn Laffan
A spatiotemporal assessment of the link between beta-diversity and maintenance of ecosystem functions under climate change across Eastern Australia - $51, 000 over 3 years

CSIRO - Commonwealth Scientific and Industrial Research Organisation
A/Prof John Merson
Adaptation to the impacts of climate change on coastal zones in Bangladesh. Top Up Scholarship for Nahid Sultana - $28, 330 over 3 years

CSIRO - Commonwealth Scientific and Industrial Research Organisation
Prof Iain Suthers
Movements and ecology of two epipelagic predators Coryphaena hippurus and Seriola lalandi off eastern Australia. Top up scholarship for Stephanie Brodie - $34, 600 over 2.5 years

CSIRO - Commonwealth Scientific and Industrial Research Organisation
Prof Gerry Cassis
Species interaction of Australia database (SIAD - project) - $95, 000 over 2 years

CSIRO - Commonwealth Scientific and Industrial Research Organisation
Prof Emma Johnston
Development of ecogenomics signatures for the assessment of contaminated estuarine benthic environments - Top-Up scholarship for Melanie Sun - $21, 000 over 3 years

CSIRO - Commonwealth Scientific and Industrial Research Organisation
A/Prof Shawn Laffan
Reintroduction of the New Holland Mouse Pseudomys novaehollandiae within its former range. *Scholarship for Mr Jason Mumbulla* - $21, 000 over 3 years

CSIRO - Commonwealth Scientific and Industrial Research Organisation
A/Prof John Merson
Adaptation to the impacts of climate change on coastal zones in Bangladesh. Top Up Scholarship for Nahid Sultana - $28, 330 over 3 years

CSIRO - Commonwealth Scientific and Industrial Research Organisation
Prof Iain Suthers
Movements and ecology of two epipelagic predators Coryphaena hippurus and Seriola lalandi off eastern Australia. Top up scholarship for Stephanie Brodie - $34, 600 over 2.5 years

CSIRO - Commonwealth Scientific and Industrial Research Organisation
Prof Gerry Cassis
Understanding the relationship between krill stocks and fishery catches off eastern Australia. Top-Up Scholarship for student Ben Harris - $29, 928 over 2 years

Department of Climate Change and Energy Efficiency
Prof Richard Kingsford
Adaptive management of Ramsar wetlands - $320, 386 over 1.5 years

Department of the Environment
Prof Gerry Cassis
Systematics phylogenetics biogeography and host plants associations of the Myrtlemiris complex (Heteroptera: Miridae) - Top Up Scholarship - Marina Cheng - $10, 000

Department of the Environment
Prof Gerry Cassis
Five new species of austromirine plant bugs (Heteroptera: Miridae: Orthotylinae: Austromirini) from the Credo Bush Blitz - $5, 000 over 1.5 years

Department of the Environment
Prof Gerry Cassis
Systematics of the Orthotylus complex (Heteroptera: Miridae: Orthotylinae: Austromirini) from the Bush Blitz survey phylogenetics host plants and biogeography - $270, 000 over 3 years

Department of the Environment
Prof Gerry Cassis
Systematics and coevolution of grass-inhabiting lygaeid true bugs (Insecta: Heteroptera) and evolution of host affiliated traits – Top up scholarship for Jacqueline Karras - $30, 000 over 3 years
Department of the Environment
Prof Gerry Cassis
A new family and description of new species of Meschia from Northern Australia - $10, 000 over 1 year

Department of the Environment
Prof Gerry Cassis
Short form services agreement for quantifying bush blitz: Heteroptera - $55, 000 over 1 year

Department of the Environment
Ms Marina Cheng
New genus and five new species of stripped plant bugs (Heteroptera: Miridae: Orthotylinae) from Credo Western Australia - $9, 000 over 1.5 years

Department of the Environment
Prof Richard Kingsford
Lake Eyre Basin rivers Assessment support - trends in waterbirds abundance - $65, 972 over 6 months

Department of the Environment
Prof Richard Kingsford
Aerial survey of waterbirds in Eastern Australia - $30, 000 over 1 year

Department of the Environment (DSEWPAC) and AusAID
Dr Daniel Robinson
Access and Benefit-Sharing Case Studies in the Pacific - $50, 000 for 1 year

Department of the Environment (DSEWPAC) and AusAID
Dr Daniel Robinson
Access and Benefit-Sharing Case Studies in the Pacific - $50, 000 over 1 year

Department of the Environment
Ms Celia Symonds
New genus and new species of Eremophila inhabiting lace bugs (Heteroptera: Tingidae) from Western Australia - $9, 000 over 1.5 years

Department of Foreign Affairs and Trade
Prof Gerry Cassis
Biodiversity capacity building in Papua New Guinea and sustainable development of its primary industries - $741, 760 over 3 years

Department of Industry/ Education Investment Fund
Prof Ian Acworth
Groundwater Education Investment Fund (ElF) Project/ Subproject 6 - North Stradbroke Island - $2, 175, 000 over 4.5 years

Department of Industry/ Education Investment Fund
Prof Ian Acworth
River Namoi Groundwater Investigations - $2, 044, 000 over 4.5 years

Department of Industry/ Education Investment Fund
Prof Ian Acworth
Ti Tree LTER Site - $2, 290, 000 over 4.5 years

Department of Industry/ Education Investment Fund
Prof Ian Acworth
Wiluna Basin LTER Site - $3, 393, 200 over 4.5 years

Department of Industry/ Education Investment Fund
Prof Ian Acworth
Wellington LTER site and co-ordination budget - $4, 142, 024 over 4.5 years

Department of Industry/ Education Investment Fund
Prof Ian Acworth
Social infrastructure services (ANU) - $946, 190 over 4.5 years

Department of Natural Resources and Mines
A/Prof Bryce Kelly
The impact of improved WUE on paddock and catchment health - $30, 000 over 3 years

Department of Primary Industries (Victoria)
Prof Iain Suthers
A responsible eastern king prawn stocking program for Lake Tyers Victoria - $232, 94 over 3 years

Evolution and Ecology Centre
Clark G. Dafforn K. Hedge L. Marzinelli E. Mayer-Pinto M. Johnston
E. Engineering artificial habitats to enhance ecosystem services and mitigate impacts. E&ERC Grants E&ERC Grants - $10, 000

Flinders University
Prof Ian Acworth
ARC/NWC Co-Funded Centre for groundwater research and training (NCGRT) - $381, 481 over 5 years

Flinders University
Dr Martin Andersen
P1C Heat Flow - ARC/NWC Co-Funded Centre for Groundwater Research and Training - $478, 340 over 5 years

Flinders University
Dr Martin Andersen
P3A Losing streams - ARC/NWC Co-Funded Centre for Groundwater Research and Training - $575, 612 over 5 years
Flinders University
Prof Andrew Baker
P1E - ARC/NWC Co-Funded Centre for Groundwater Research & Training (NCGRT) - $469,943 over 5 years

Flinders University
A/Prof Suzanne Hand
Determining the relative roles of dispersal and vicariance in the assembly of the New Zealand Fauna - $15,760 over 2 years

Flinders University
A/Prof Bryce Kelly
P1A 3D Geology - ARC/NWC ARC/NWC Co-Funded Centre for Groundwater Research and Training - $1,126,286 over 5 years

Flinders University
A/Prof Matthew McCabe
P4 Frac Rock - ARC/NWC Co-Funded Centre for Groundwater Research and Training - $902,508 over 5 years

Flinders University
Dr Wendy Timms
P1B Aquitards - ARC/NWC Co-Funded Centre for Groundwater Research and Training - $3,132,790 over 5 years

Gordon & Betty Moore Foundation/Marine Microbiology Initiative
Kjellberg Staffan; Steinberg Peter
Molecular mechanism of bacteria-sponge symbiosis. Have bacteria acquired eukaryotic-like proteins to control their interactions with a host? - USD 1,292,000 over 3 years

Griffith University
Prof Richard Kingsford
Ecological responses to altered flow regimes - $429,000 over 3 years

Griffith University
A/Prof Darren Curnoe
The peopling of east Asia and Australasia - $12,728 over 3 years

Havforskningsinstitutet
Prof Emma Johnston
Vulnerable habitats and species in petroleum resource management: impact of sediment exposure on Arctic sponge grounds (Sedex Sponge) - $15,000 over 3 years

Hermon Slade Foundation
Dr Michael Letnic
partner, university of melbourne and University of technology - $55,000 over 3 years

Hermon Slade Foundation
Dr Michael Letnic
Can excluding toads from water provide biodiversity benefits for arid Australia? - $32,911 over 2 years

Hermon Slade Foundation
Prof Gerry Cassis
Plant hubs plantbugs and lacebugs: coevolution of emu bush and sap-sucking insects - $81,000 over 3 years

Kula Gold Limited
Dr Ian Graham
Geological evolution of the Kumulmadau and Busai deposits Woodlark Island Papua New Guinea - PhD Project Dane Burkett - $24,555 over 2 years

Kurdistan Regional Government
A/Prof David Cohen
Geochemical Atlas of Kurdistan - $5,000

Marsden Fund NZ
Angela Moles Fiona Thomson and Steve Wagstaff
Does investment into seed dispersal alter with plant height and island size? - NZD$300,000

Mazda Foundation
Dr Michael Letnic
Can we stop an endangered goanna from being poisoned by cane toads? - $24,125 over 1.5 years

Ministry for Police and Emergency Services
A/Prof Dale Dominey-Howes
Increasing the resilience of the deaf community in NSW to natural hazards and disasters - $345,939 over 2.5 years

Murray-Darling Basin Authority
Dr Gilad Bino
Analysis of waterbird data for the Basin-wide environmental watering strategy - $40,635 over 1 year
**Murray-Darling Basin Authority**
*Prof Richard Kingsford*
- Waterbird survey of hydrological indicator sites - $373,389 over 1.5 years

**Murray-Darling Basin Authority**
*Prof Richard Kingsford*
- MD2486: Waterbird Survey of targeted environmental assets in the Murray-Darling Basin - $158,490 over 3 months

**Murray-Darling Basin Authority**
*Dr Mirela Tulbure*
- A novel approach for assessing environmental flows using satellite data - $240,000 over 3 years

**National Geographic Society**
*Prof Mike Archer*
- Exploration into remote fossil-rich Cenozoic limestone terrains beyond the Riversleigh World Heritage Area, Queensland - $29,271 over 1 year

**National Geographic Society**
*Prof Goff, Dr Chagué-Goff, Dr Lagos*
- In Search of Eltanin - $18,000 over 1 year

**NSW Department of Industry & Investment**
*Dr Charles Gray*
- Profiling the biology and fishery of Rock Blackfish (Girella elevata) in the Sydney region - Top-up Scholarship for Jerom Stocks - $86,500 over 4 years

**NSW Department of Trade & Investment**
*Mr Cameron Holley*
- Groundwater Infrastructure NSW - $488,250 over 2 years

**NSW Department of Trade & Investment/NSW Research Attraction and Acceleration Program - Collaborative Research Infrastructure Scheme(++)**
*Dr Cameron Holley*
- Groundwater Infrastructure NSW - $20,000 over 2 years

**NSW Environmental Trust/Environmental Research Seeding Program (**)**
*Dr Jennifer Beer*
- Using stable isotopes to understand weed invasion processes - $13,650 over 1 year

**NSW Office of Environment and Heritage (OEH)**
*Dr Katherine Brandis*
- Provision of data quality and assurance services for the 2006-2012 NSW water bird survey - $36,334 over 3 months

**NSW Office of Environment and Heritage (OEH)**
*Prof Richard Kingsford*
- NSW regional native vegetation classification and mapping - $452,948 over 2.5 years

**NSW Roads and Maritime Services (RMS)**
*Professor John Black, Professor Graciela Isabel Metternicht*
- Best practices in community consultation to establish sustainable development of infrastructure $24,000 over 1 year

**NSW Office for Science and Medical Research**
*Prof Ian Acworth*
- ARC/NWC - Centre for Groundwater Research - $989,000 over 5 years

**NSW Office of Water/ARC Linkage Project Industry Partner Contribution**
*Dr Daniel Ramp*
- Innovative approaches to identifying regional responses of biodiversity to climate change - $70,000 over 3 years

**Scientific & Information Technology Consulting Pty Ltd**
*Prof Michael Archer*
- Uncovering ancient landscapes with emerging technologies: integrating complex geospatial and fossil data to explore late Cenozoic environmental change - $44,000 over 3 years

**Sea World Research & Rescue Foundation**
*Prof William Sherwin*
- The genes that matter: Mining the dolphin genome for genes that affect fitness - $20,280 over 3 years

**Sea World Research & Rescue Foundation**
*Dr Matthew Taylor*
- Stingray movements; a step toward revealing the environmental and physiological drivers behind their behaviour - $9,000 over 1 year

**Silver Mines Limited**
*Dr Ian Graham*
- Cowleys Hill prospect research - $19,300 over 1 year
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<td>Designing seawalls to maintain landsea connectivity - $12,500</td>
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<td>To what extent does fire affect karst processes? Burning questions for fire management - $10,000 over 2 years</td>
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UNSW
Dr Michael Letnic
Revealing how top-predators maintain healthy balanced ecosystems - $100,000 over 2 years

UNSW/SJTU-UNSW Collaborative Research & Development Fund
Prof Peter Steinberg
Adaptation evolution and structure vs. function of contrasting marine microbial assemblages - $11,000 over 1 year

UNSW
Prof Iain Suthers
Microbial Centre for sorting and invetagation-investigating the function of living microbes at sea and on inland waterways - $45,000 over 1 year

UNSW
Prof Iain Suthers
A remotely operated underwater vehicle (ROV) to enable marine research at UNSW - $92,604 over 1 year

UNSW
Prof Chris Turney
Tipping points in Records of extreme events in Australasia: Using the past to understand and plan for abrupt future climate change - $995,935 over 5 years

UNSW
Prof Martin Van Kranendonk
Hot rocks warm fluids and the earliest life on Earth: a 4-D reconstruction of the c. 3.5 billion-year-old North Pole Dome Western Australia - $40,000 over 1 year

University of Otago (NZ)
Prof James Goff
Environmental History of Wainono Lagoon - $7,880 over 1 year

University of Queensland
A/Prof Stephen Bonser
Testing the importance of large-scale climate factors to plant community assembly following land-use change - $9,000 over 2 years

University of Sydney
A/Prof Jesmond Sammut
Diversification of smallholder coastal aquaculture in Indonesia. FIS/2007/124 - $65,631 over 3 years

University of Tasmania
Dr Michael Letnic
Keystone effects of Australia’s top predators: dingoes devils and biodiversity - $360,347 over 3 years

University of Technology Sydney (UTS)
Dr Kim Jenkins
Innovative approaches to identifying regional responses of biodiversity to climate change - $67,274 over 1.5 years

University of Technology Sydney (UTS)
Prof Iain Suthers
A transportable containerised laboratory for rapid cell sorting and high-resolution bioimaging of living aquatic microbes in field locations - $580,000 over 1 year

University of Western Australia/Rio Tinto Iron Ore ARC Linkage Partner Contribution
Prof Chris Turney
Climate-related regime shifts in inland semi-arid ecosystems through ecohydrological proxies - $25,000 over 2 years

Viking Global Industries Pty. Ltd.
A/Prof Robert Brander
Rip Buoy - $42,864 over 1 year

Warringah Council
Prof Iain Suthers
Ecosystem Health Assessment of Warringah Lagoons using zooplankton size structure - $21,247 over 2 years

Warringah Council
A/Prof Tracey Rogers
Non-invasive ways to monitor the health of free-swimming great whales - $89,000 over 1.5 years

Western Catchment Management Authority
Prof Richard Kingsford
Flow inundation patterns and vegetation responses in the Paroo and Warrego catchments using remote sensing - $74,100 over 3.5 years

Winifred Violet Scott Estate Trust
A/Prof Jesmond Sammut
Diversification of smallholder coastal aquaculture in Indonesia. FIS/2007/124 - $65,631 over 3 years

Winifred Violet Scott Estate Trust
Prof Iain Suthers
Ecosystem Health Assessment of Warringah Lagoons using zooplankton size structure - $21,247 over 2 years

Winifred Violet Scott Estate Trust
A/Prof Robert Brander
Rip Buoy - $42,864 over 1 year

Winifred Violet Scott Estate Trust
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Climate-related regime shifts in inland semi-arid ecosystems through ecohydrological proxies - $25,000 over 2 years
## Course Enrolments

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### Course Enrolments

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**Postgraduate**

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