

5

Australian and New Zealand participation in IODP

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Australia and New Zealand have been partners in the ANZIC consortium within IODP since the consortium's establishment in 2008 (www.iodp.org.au; www.gns.cri.nz/Geodiscovery/In-the-Ocean/IODP-National). Our scientists (geoscientists and microbiologists) are making important scientific contributions, and coring expeditions in our region and elsewhere have improved and will continue to improve our understanding of global scientific questions. IODP brings our scientists into contact with research teams from around the world, and post-cruise research activities often extend far beyond IODP ventures.

Membership of IODP has helped us maintain our leadership in Southern Hemisphere marine research. Our geography, climate, oceanography and plate tectonics make our region vital when addressing various global science problems. The Australasian region has seen a great deal of ocean drilling since 1968, including five IODP(1) expeditions from 2009 to 2013; more IODP(2) expeditions have occurred and are about to occur in the region from 2015 to 2018. ANZIC scientists gain through shipboard and post-cruise participation, by building partnerships with overseas scientists, by being research proponents and co-chief scientists who can steer programs and scientific emphasis, and by early access to key samples and data.

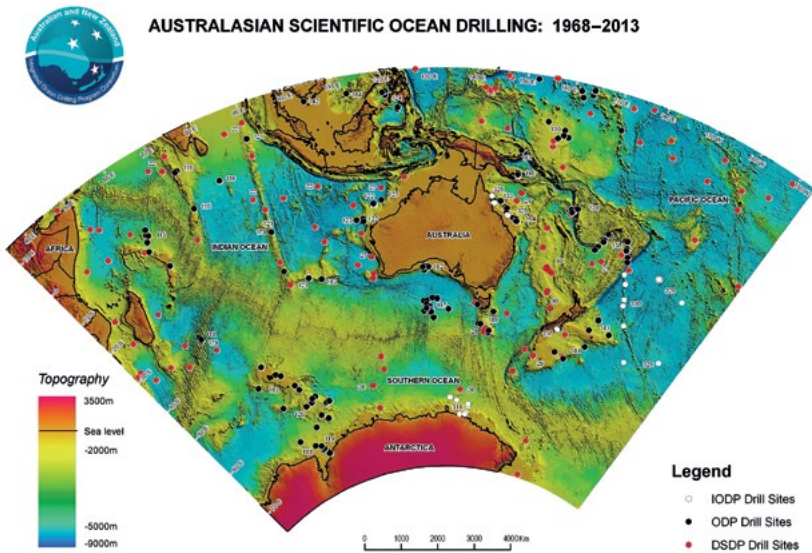


Figure 5.1. Map of Australasian Scientific Ocean Drilling: 1968–2013

Source: Courtesy of Geoscience Australia

Our postdoctoral and doctoral students have an opportunity to train in areas of geoscience and microbiology that cannot be studied in any other way. A new initiative was a Marine Geoscience Masterclass for advanced undergraduate students from all our university partners, held in Perth in late 2013; four more were held by the end of 2016.

We successfully worked toward Australian and New Zealand continuation in the new IODP(2) phase beginning in October 2013, and that was later funded in October 2015 through to 2020. In both countries, this involved using the successes of IODP, and the exciting science outlined in the new Science Plan, to convince scientific and funding institutions that ongoing support is essential.

ANZIC membership

Australia has been the major financial contributor to ANZIC, with benefits being shared between Australia and New Zealand. Australia paid an annual membership fee of US\$1.4 million throughout IODP(1). The members of ANZIC have varied slightly over time, as shown in Table 5.1. Initially, New Zealand was a full national member in the ANZIC consortium, paying its share of ANZIC's IODP Associate

Membership directly to IDOP, but government funding was reduced in 2011, and thereafter New Zealand members paid to join the Australian consortium within ANZIC.

In 2013, the Australian IODP Consortium consisted of 14 universities, four government agencies and one marine geoscience peak body. The New Zealand membership consisted of GNS Science and three universities. Our strength is in our breadth of support in the geoscience community.

Table 5.1. Australian and New Zealand ANZIC members: 2008–2013

Australian Institutions	City	Years of Membership
Australian Institute of Marine Science (AIMS)	Townsville	2008–2013
The Australian National University (ANU)	Canberra	2008–2013
Australian Nuclear Science and Technology Organisation (ANSTO)	Sydney	2008–2013
CSIRO Earth Science and Resource Engineering	Perth	2008–2013
Curtin University	Perth	2009–2013
Geoscience Australia	Canberra	2013
James Cook University	Townsville	2008–2013
Macquarie University	Sydney	2008–2013
Monash University	Melbourne	2008–2013
Queensland University of Technology	Brisbane	2009–2013
University of Adelaide	Adelaide	2008–2012
University of Melbourne	Melbourne	2008–2013
University of Newcastle	Newcastle	2008–2011
University of New England	Armidale	2012–2013
University of Queensland	Brisbane	2008–2013
University of Sydney	Sydney	2008–2013
University of Tasmania	Hobart	2008–2013
University of Technology Sydney	Sydney	2011–2013
University of Western Australia	Perth	2008–2013
University of Wollongong	Wollongong	2008–2013
Marine Geoscience Office (MARGO)	Canberra	2008–2013
New Zealand Institutions	City	Years of Membership
GNS Science	Wellington	2008–2013
University of Auckland	Auckland	2012–2013
University of Otago	Dunedin	2008–2013
Victoria University of Wellington	Wellington	2008–2013

The chief and principal investigators in the ARC/LIEF grant varied somewhat over time, as shown in Table 5.2.

Table 5.2. ANZIC chief and principal investigators: 2008–2013

Investigator	Institution	Period
Richard Arculus	ANU	2008–2013
Mark Barley	University of Western Australia	2008–2013
Jochen Brocks	ANU	2008–2013
Ben Glennell	CSIRO	2008–2013
Alan Cooper	University of Adelaide	2008–2012
Patrick De Deckker	ANU	2008–2013
John Dodson	ANSTO	2008–2013
Russell Drysdale	University of Newcastle/Melbourne	2008–2013
Neville Exon	ANU	2008–2013
Chris Fergusson	University of Wollongong	2008–2013
Janet Hergt	University of Melbourne	2008–2013
Will Howard	University of Tasmania/ANU	2008–2013
Peter Kershaw	Monash University	2008–2013
Campbell McCuaig	University of Western Australia	2008–2013
Dietmar Müller	University of Sydney	2008–2013
Suzanne O'Reilly	Macquarie University	2008–2013
Ian Poiner	AIMS	2008–2013
Paolo Vasconcelos	University of Queensland	2008–2013
Jody Webster	JCU/University of Sydney	2008–2013
Chris Yeats	CSIRO	2008–2013
Lindsay Collins	Curtin University of Technology	2009–2013
Gary Huftile	Queensland University of Technology	2009–2013
Greg Skilbeck	University of Technology Sydney	2011–2013
Mike Coffin	University of Tasmania	2012–2013
James Daniell	James Cook University	2012–2013
Chris Hollis	GNS Science, Wellington	2012–2013
Tim Naish	Victoria University of Wellington	2012–2013
Gary Wilson	University of Otago, Dunedin	2012–2013
Alan Baxter	University of New England	2012–2013
Ingo Pecher	University of Auckland	2013
Andrew Heap	Geoscience Australia	2013

ANZIC Governing Council

ANZIC is controlled by its governing council, a steering committee that directs broad policy. This council provides scientific and financial oversight of Australian activities, including those of the ANZIC IODP Office (AIO) and the Science Committee, in conjunction with the ANU Delegate (Director, Research School of Earth Sciences), as ANU handles the consortium funds and hosts the AIO. Council membership favours the organisations that contributed most in terms of funding; they have permanent places on council. Many of the members were rotated though the council over time (Table 5.3). The ANU Delegate was Professor Brian Kennett in the early years, Professor Andrews Roberts from 2010 to 2012, and Professor Ian Jackson in 2013. All took an active and supportive interest in IODP, and two were members of governing council.

Two excellent chairs have controlled the ANZIC Governing Council. The first chair, Dr Kate Wilson (then Director of CSIRO's Wealth from Oceans Flagship), is a molecular biologist by training and a marine scientist in fact. She helped establish a firm organisational structure for ANZIC, enabling us to run smoothly remarkably quickly. She continued in this role until 2010. Dr Geoff Garrett (former Chief Executive of CSIRO, then Chief Scientist of the Queensland Government) succeeded Dr Wilson and continued to steer ANZIC down what was by then a reasonably well-defined path. New Zealander Dr Chris Hollis of GNS Science in Wellington was a vital part of the ANZIC leadership throughout. By the end of 2013, meetings of the

governing council had been held in all cities with IODP members, except Adelaide and Newcastle.



Figure 5.2. Dr Kate Wilson, ANZIC Chair until mid-2010

Source: Kate Wilson

The major crisis that faced ANZIC under Dr Kate Wilson's leadership was the 2009 collapse in the Australian exchange rate against the American dollar, which was exceedingly serious given that a large part of our budget went to pay our membership in American dollars (at one stage AU\$1 was worth 55 US cents). Fortunately, both ARC and our members stepped in with additional funds to cover the shortfall. Because the Australian and New Zealand dollars rallied soon afterward, we had a substantial budget surplus by 2012, and greatly reduced our membership contributions in 2013.

Dr Geoff Garrett took over from Kate as ANZIC Chair in mid-2010. He had been an important member of a major US Triennial Review of the IODP program earlier in that year, so came to the role very well informed. This review helped revise the structure and planning of the first phase of IODP to improve efficiency. In the years from 2010, Geoff worked to more widely publicise IODP and the benefits for ANZIC scientists of being involved in this great global scientific program. Geoff stepped down as Chair of the governing council at the end of 2016 and was replaced by the eminent marine scientist Ian Poiner. We owe Geoff a huge debt of gratitude.

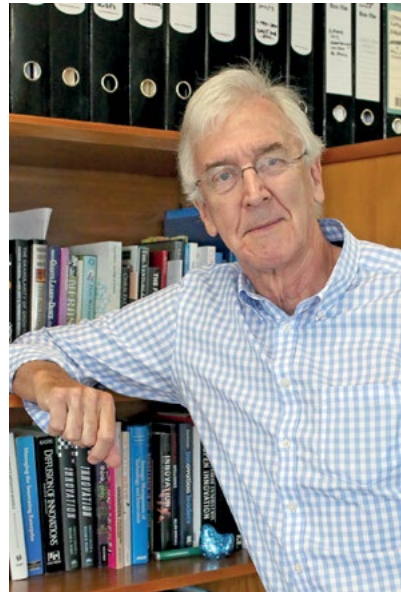


Figure 5.3. Dr Geoff Garrett, ANZIC Chair from mid-2010

Source: Geoff Garrett

Table 5.3. ANZIC Governing Council: 2008–2013

Member	Position	Institution	Expertise
In 2013			
Geoff Garrett from 2010	Chair	Chief Scientist, Queensland Government	Metallurgy and science management
Richard Arculus from 2008	Lead scientist of ARC/LIEF grant	ANU	Igneous petrology, volcanology; ODP shipboard participant
James Daniell from 2012	James Cook University	James Cook University, Townsville	Marine geoscience including sea-floor mapping
Neville Exon from 2008	ANZIC Program Scientist	ANU	Marine geology and geophysics; ODP co- chief scientist
Stephen Gallagher from 2008	ANZIC Science Committee Chair	University of Melbourne	Biostratigraphy, foraminifera
Chris Hollis from 2008	Chair, NZ IODP	GNS Science, NZ	Palaeoclimate, micropalaeontology
Ian Jackson	ANU representative	ANU	Earth structure
Chris Yeats from 2008	CSIRO representative	CSIRO Exploration & Mining Division, Perth	Hydrothermal systems. ODP and IODP shipboard experience
Annette George from 2012	UWA representative	University of Western Australia, Perth	Geology and tectonic history of sedimentary basins
Before 2013			
Kate Wilson, 2008–2010	Chair	CSIRO; NSW Department of the Environment	Molecular biology and Biotechnology
David Falvey, 2008	ARC representative	ARC, Canberra	Geophysics
Ian Mackinnon, 2008–2009	ARC representative	ARC, Canberra	Engineering
Richard Coleman, 2010–2012	ARC representative	ARC, Canberra	Marine geology
Patrick De Deckker, 2008–2009	ANU representative	ANU	Micropalaeontology
Andrew Roberts, 2010–2012	ANU representative	ANU	Palaeomagnetism
Giuseppe Cortese, 2010	New Zealand representative	GNS Science, NZ	Palaeoclimate/ palaeoceanography radiolarians

Member	Position	Institution	Expertise
Will Howard, 2008–2009	University of Tasmania representative	University of Tasmania, Hobart	Palaeoceanography
Kelsie Dadd, 2008–2010	Macquarie University representative	Macquarie University, Sydney	Physical volcanology
Janet Hergt, 2008–2010	Melbourne University representative	University of Melbourne	Petrologist
Moyra Wilson, 2010–2011	Curtin University representative	Curtin University of Technology, Perth	Sedimentology, petroleum geology
Paul Dirks, 2010	James Cook University representative	James Cook University, Townsville	Structural geology, geodynamics, cratons
Robin Beaman, 2011	James Cook University representative	James Cook University, Cairns	Marine geoscience including sea-floor mapping

ANZIC Science Committee

The ANZIC Science Committee encourages and assists the development of science proposals, helps organise topical workshops, assesses cruise applicants and applicants for IODP panel membership, and helps get quality speakers to visit Australian and New Zealand research centres. A sub-committee assesses applications for post-cruise scientific funding. Stephen Gallagher has been a thoughtful and conscientious Chair of this ANZIC Science Committee. The membership balanced expertise and regional representation, and members rotated on and off (Table 5.4).

Table 5.4. ANZIC Science Committee: 2008–2013

People	Institutions	Expertise	Years involved
Will Howard (Chair)	University of Tasmania	Palaeoceanography	2008
Stephen Gallagher (Chair)	University of Melbourne	Micropalaeontology (forams); wide experience in science of drill cores	2008–2013
Neville Exon (Program Scientist, Australian IODP Office)	ANU	Marine geology and geophysics; ODP co-chief scientist	2008–2013
Linda Blackall	AIMS	Microbiology	2008–2011

5. AUSTRALIAN AND NEW ZEALAND PARTICIPATION IN IODP

People	Institutions	Expertise	Years involved
Mike Coffin	Director, IMAS, Hobart	Geophysics; ODP co-chief scientist	2012–2013
Lindsay Collins	Curtin University of Technology	Sedimentologist, petroleum geologist	2008–2013
Leonid Danyushevsky	University of Tasmania	Igneous petrologist, oceanic crust, neotectonics	2008–2011
Trevor Falloon	University of Tasmania	Igneous petrologist, oceanic crust; ODP experience	2012–2013
Michael Gagan	ANU	Isotope palaeoclimatology; IODP shore-based participant	2008–2013
Stuart Henrys	GNS Science, NZ	Basin studies, marine geophysics, structural geology	2008–2011
Gary Huftile	Queensland University of Technology	Active tectonics, structural geology; IODP shipboard scientist	2008–2012
Anna Kaksonen	CSIRO Land and Water Division, Perth	Microbiology; ODP shipboard participant	2008–2013
Janice Lough	AIMS	Coral reef studies	2012–2013
Jill Lynch	University of Melbourne	Microbiology; IODP shipboard participant	2011–2012
Helen McGregor	ANSTO and University of Wollongong	Palaeoceanography	2008–2013
Robert McKay	Victoria University of Wellington	Sedimentology, Antarctic glacial history; IODP shipboard participant; ANDRILL	2012–2013
John Moreau	University of Melbourne	Microbiology; IODP shipboard participant	2008–2011
Louis Moresi	Monash University	Plate kinematics	2008–2011
Wouter Schellart	Monash University	Plate kinematics	2012–2013
Jody Webster	University of Sydney	Carbonate sedimentologist; IODP co-chief scientist	2008–2013
Gary Wilson	University of Otago, NZ	Palaeomagnetism, Antarctica; Marine drilling expert	2008–2013

Science participation

Selection of participants for expeditions went through two phases. In response to information from IODP about forthcoming expeditions, the ANZIC IODP Office called for applications in a standard IODP-wide format. These applications were considered by the ANZIC Science Committee and suitable ANZIC applicants were ranked. Our rankings and the applications were then sent to those planning each expedition, and the planners built a suitable shipboard scientific team from applicants from around the world, normally including at least one Australasian on each expedition (the ANZIC quota). The participants are listed in Table 5.5.

Many Australians and New Zealanders have been involved in helping to write proposals for work in our region and elsewhere. Lead proponents of accepted proposals have been:

- Jody Webster (University of Sydney): Great Barrier Reef Environmental Change Expedition 325. Drilled in 2010 with Dr Webster as co-chief scientist.
- Richard Arculus (ANU): Izu-Bonin-Mariana Arc Origins Expedition 351. Carried out in 2015 with Professor Arculus as co-chief scientist.
- Stephen Gallagher (University of Melbourne): Indonesian Throughflow Expedition. This expedition to Australia's Northwest Shelf was carried out in 2015.

In 2014, another ANZIC lead proponent of a highly ranked regional proposal was:

- Robert McKay (Victoria University of Wellington): Antarctic Cenozoic Palaeoclimate Proposal 751.

In 2009, ANZIC Governing Council set aside money from scientific members to support post-cruise research by shipboard participants, and this was used very widely.

Table 5.5. ANZIC participants on IODP expeditions: 2007–2013

Expedition	Date	Participants
<i>Chikyu</i> NanTroSeize 1; 316, Nankai Trough Faulting	Dec 2007–Feb 2008	Chris Fergusson (University of Wollongong), sedimentology
Canterbury Basin; 317, sea-level fluctuations in last 20 million years	4 Nov 2009–4 Jan 2010	Bob Carter* (James Cook University), Simon George* (Macquarie University), Greg Browne and Martin Crundwell (GNS Science), Kirsty Tinto (University of Otago)
Wilkes Land; 318, climate and oceanographic changes in last 53 million years	4 Jan–9 Mar 2010	Kevin Welsh* (University of Queensland) and Robert McKay (Victoria University of Wellington), both sedimentology
<i>Chikyu</i> NanTroSeize 2; 319 Nankai Trough deep observatory	10 May–31 Aug 2009	Gary Huftle (Queensland University of Technology), structural geology
PEAT 1; 320, Eastern Pacific environments	5 Mar–5 May 2009	Christian Ohneiser (University of Otago), palaeomagnetism
<i>Chikyu</i> NanTroSeize 2; 322, Nankai Trough Subduction	5 Sep–10 Oct 2009	John Moreau* (University of Melbourne), microbiology
Bering Sea; 323, connections from Pacific to Arctic	5 July–4 Sept 2009	Kelsie Dadd* (Macquarie University), sedimentology of volcanic ash
Shatsky Rise; 324, volcanic buildup in northwest Pacific	4 Sept–4 Nov 2009	David Murphy* (Queensland University of Technology), petrology of volcanics
Great Barrier Reef; 325, environmental change caused by post-glacial sea-level rise (<i>Greatship Maya</i>)	11 Jan–5 Mar 2010	Jody Webster* (University of Sydney), co-chief scientist, reef formation. Post-cruise science party Michael Gagan (ANU), palaeoclimate, and Tezer Esat* (ANSTO/ANU), climate
South Pacific oceanic gyre microbiology; 329, east of New Zealand	8 Oct–12 Dec 2010	Jill Lynch* (University of Melbourne), microbiology
Louisville Seamount Trail geodynamics; 330, southeast of Tonga	12 Dec 2010–11 Feb 2011	Ben Cohen* (University of Queensland), volcanic petrology, David Buchs* (ANU), volcanic sedimentology
<i>Chikyu</i> Deep Hot Biosphere; 331, Okinawa Trough	1 Sept–3 Oct 2010	Chris Yeats (CSIRO), sulphide petrology
Costa Rica Seismogenesis Project (CRISP); 334, west of Central America	16 Mar–17 Apr 2011	Gary Huftle (Queensland University of Technology), structural geology
Superfast Spreading Rate Crust 4; 335, eastern Pacific	17 Apr–20 May 2011	Graham Baines (University of Adelaide), petrology

EXPLORING THE EARTH UNDER THE SEA

Expedition	Date	Participants
<i>Chikyu</i> Coalbed Biosphere off Shimokita; 337	6 July–15 Sept 2012	Rita Susilawati* (University of Queensland), coal geologist
<i>Chikyu</i> NanTroSeize Plate Boundary Deep Riser; 338	25 Nov 2012–13 Jan 2013	Lionel Esteban* (CSIRO), structural geology/sedimentology/physical properties
Mediterranean Outflow; 339	17 Nov 2011–17 Jan 2012	Craig Sloss* (Queensland University of Technology), sedimentology
Lesser Antilles volcanism and landslides; 340	3 Mar–17 Apr 2012	Martin Jutzeler* (University of Otago), structural geology
Southern Alaska Margin tectonics, climate and sedimentation; 341	29 May–29 July 2013	Christopher Moy* (University of Otago), sedimentology; Maureen Davies* (ANU), physical properties; Carol Larson (NZ National Aquarium), outreach
Palaeogene Newfoundland sediment drifts; 342	2 June–11 Aug 2012	Brad Opdyke* (ANU), palaeoceanography; Chris Hollis* (GNS Science), radiolarians
<i>Chikyu</i> Japan Trench Fast Drilling Project; 343	1 Apr–21 May 2012	Virginia Toy (University of Otago), structural geology
Costa Rica Seismogenesis Project (CRISP 2); 344	23 Oct–11 Dec 2012	Alan Baxter* (University of New England), nannofossils
Hess Deep Plutonic Crust; 345	11 Dec 2012–13 Feb 2013	Trevor Falloon* (University of Tasmania), igneous petrologist
Asian Monsoon (Japan Sea); 346	29 July–28 Sept 2013	Stephen Gallagher* (University of Melbourne), foraminifera
<i>Chikyu</i> NanTroSeize Deep Riser Observatory 3; 348	25 Nov 2013–10 Jan 2014	Matthew Josh (CSIRO), physical properties/downhole logging

ANZIC shipboard participants and science party are listed by year (those outside ANZIC's normal quota are in brackets).

All expeditions used the *JOIDES Resolution* unless specified otherwise.

* Post-cruise funding was granted.

There were 36 participants in all: 34 shipboard scientists, including Carol Larson in an outreach role, and two land-based members of a science party, Michael Gagan and Tezer Esat.

- 2008: Chris Fergusson
- 2009: Christian Ohneiser, Kelsie Dadd, David Murphy, Gary Huftile, John Moreau, Bob Carter, Simon George, (Greg Browne, Martin Crundwell, Kirsty Tinto)
- 2010: Jody Webster, Mike Gagan, Tezer Esat, Kevin Welsh, Rob McKay, Chris Yeats, Jill Lynch
- 2011: Ben Cohen, David Buchs, Gary Huftile, Graham Baines, Craig Sloss

- 2012: Martin Jutzeler, Virginia Toy, Brad Opdyke, Rita Susilawati, Lionel Esteban, Alan Baxter, (Chris Hollis)
- 2013: Trevor Falloon, Christopher Moy, (Maureen Davies, Carol Larson), Stephen Gallagher, Matthew Josh.

Special scientific funding

A completely new post-cruise science funding scheme was established in 2012, to encourage Australian scientists to address interesting problems that could be solved by working on legacy material (DSDP–ODP–IODP) and hence increase the output from our overall investments in ocean drilling. Thirteen of the funding applications were regarded as of high standard by reviewers and thus supported (Table 5.6), and the successful groups were allocated up to AU\$25,000 each.

Table 5.6. Special ANZIC analytical funding in 2012 for work on legacy material

People and Institution	Title of proposal
David Heslop and Andrew Roberts (ANU)	Searching for giant magnetofossils in the geological record (an integrated analysis of Legs 113, 115, 119, 143, 198 and 208)
Alexandra Abrajevitch (ANU)	Magnetostratigraphy and rock magnetism of Site 747A, ODP Leg 120
Taryn Noble (University of Tasmania) and Michael Elwood (ANU)	Southern Ocean's role in moderating glacial–interglacial variability in atmospheric pCO ₂ : Decoupling nutrient cycling and ocean circulation (Chatham Rise: DSDP 594B)
Gregg Webb (University of Queensland), Luke Nothdurft (Queensland University of Technology) and Jody Webster (University of Sydney)	Tahiti (IODP Leg 310) as a natural laboratory for studying coral and microbialite diagenesis
Frances Jenner (Carnegie Institute) and Richard Arculus (ANU)	Trace element and volatile abundance systematics in the world's largest intra-oceanic igneous provinces
Mark Kendrick (University of Melbourne), Masahiko Honda (ANU) and Richard Arculus (ANU)	Recycled and primitive halogens in backarc basins: Constraints from high precision Cl, Br, and I analyses of basaltic glass (ODP Leg 135: Lau Basin)
Helen McGregor (University of Wollongong)	Great Barrier Reef temperatures and palaeoclimate from the LGM to present: Additional samples from IODP Expedition 325: 'Great Barrier Reef environmental changes'

EXPLORING THE EARTH UNDER THE SEA

People and Institution	Title of proposal
Barbara Wagstaff, Stephen Gallagher and Guy Holdgate (University of Melbourne)	A 6-million-year orbital scale record of the onset and variability of the Australian Monsoon: Pollen evidence from ODP Site 765 northwest Australia
Zanna Chase and Taryn Noble (University of Tasmania)	Links between Australian dust and marine productivity (ODP Leg 189: The Tasmanian Seaway and DSDP 593: Challenger Plateau)
Jon Woodhead and Janet Hergt (University of Melbourne)	Constraints on the global subduction flux: State-of-the-art analytical approaches to determining the composition of the altered oceanic crust
Masahiko Honda (ANU), Mark Kendrick (University of Melbourne) and Richard Arculus (ANU)	Noble gas systematics in basaltic glasses from the Lau Backarc Basin: Characterisation of mantle sources, magmatic degassing and crustal contamination
Andrew McNeill, Trevor Falloon, Sandrin Feig and David Green (University of Tasmania)	Sulphur and metal evolution in parental mid-ocean ridge basalt magmas
Amy Chen and Paul Hesse (Macquarie University)	A multi-proxy approach to address water column oxygenation change at the Palaeocene-Eocene Boundary (New Jersey margin)

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