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The future of scientific ocean drilling: International Ocean Discovery Program

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Various national and international reviews of ocean drilling were held in recent times, some of them focused tightly on the Integrated Ocean Drilling Program itself, while other reviews also focused on its predecessors. This was obviously necessary when considering renewal of a program that costs about US\$180 million annually for its logistics, and has two large drill ships with a replacement value of about US\$1.1 billion. The additional costs of the science participants (carried by their own countries) amount to many millions of dollars.

A 10-year phase of ocean drilling from 2013 to 2023 was approved under the new name International Ocean Discovery Program (IODP(2)). The change of name from Integrated Ocean Drilling Program (IODP(1)) was justified because of the broadening of the activities to include suites of borehole observatories for which drilling is just an enabling tool. Key funding decisions determining the future scope of IODP were made by the US National Science Foundation (NSF), the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the European Consortium for Ocean Research Drilling (ECORD) in late 2013. The structure of the new program is much looser than the previous one, with those who provide the vessels – the US, Japan and Europe –

having ultimate control of their programs. Australian and New Zealand scientists have helped design proposals for funding for the new IODP, with some already carried out.

The latest IODP Science Plan *Illuminating Earth's Past, Present, and Future* was published in early 2013 (www.iodp.org/science-plan/127-low-resolution-pdf-version/file) and summarised in www.iodp.org/science-plan/115-iodp-science-plan-br/file. Its scientific themes are:

Climate and Ocean Change: Reading the Past, Informing the Future

Ocean floor sediment cores provide records of past environmental and climatic conditions that are essential for understanding Earth system processes.

Biosphere Frontiers: Deep Life and Environmental Forcing of Evolution

Samples recovered by ocean drilling permit study of Earth's largest ecosystems, offering insight into the origins and limits of the deep biosphere, the evolution of marine microfauna through times of environmental change and human evolution related to climate change.

Earth Connections: Deep Processes and their Impact on Earth's Surface Environment

The dynamic processes that create and destroy ocean basins, shift the position of continents and generate volcanoes and earthquakes extend from Earth's core to its atmosphere, and are fundamental for understanding global change within the context of planetary evolution.

Earth in Motion: Processes and Hazards on Human Time Scales

Many fundamental Earth system processes, including those underlying major geologic hazards, occur at 'human' time scales of seconds to years, requiring new sampling, downhole measurement, monitoring and active experimental approaches.

Australia and New Zealand in IODP: 2014 and 2015

Australia and New Zealand remain enthusiastic supporters of ocean drilling. We joined the new phase of IODP(2) in September 2013 as the Australian and New Zealand IODP Consortium (ANZIC). Australia was funded for 2014 and 2015 under an ARC/LIEF grant, with agreed funding from our partners. The New Zealand partners funded themselves, with GNS Science paying the lion's share of their costs.

Australian IODP partners

The Australian National University
CSIRO Earth Science and Resource Engineering
Curtin University of Technology
Geoscience Australia
James Cook University
Macquarie University
Monash University
MARGO (Marine Geoscience Office)
Queensland University of Technology
University of Adelaide
University of Melbourne
University of New England
University of Queensland
University of Sydney
University of Tasmania
University of Technology, Sydney
University of Western Australia
University of Wollongong

New Zealand IODP partners

GNS Science
NIWA
University of Otago
Victoria University of Wellington

Australia and New Zealand in IODP: 2016 to 2020

Australia and New Zealand will continue as ANZIC in IODP. Australia has been well funded for 2016 to 2020 under another ARC/LIEF grant. Unfortunately, James Cook University, the University of New England and the University of Technology of Sydney have withdrawn, but the University of New South Wales has joined. Total annual funding from ARC and our Australian partners has increased somewhat. The New Zealand partners will fund themselves and the University of Auckland has joined their consortium. The long-term nature of the new funding is very welcome, allowing us to plan for the longer term at a time when there will be much IODP activity in our region (see Figure 10.1 below).

Australian IODP partners

The Australian National University
CSIRO Earth Science and Resource Engineering
Curtin University of Technology
Geoscience Australia
Macquarie University
Monash University
MARGO (Marine Geoscience Office)
Queensland University of Technology
University of Adelaide
University of Melbourne
University of Queensland
University of Sydney
University of Tasmania
University of New South Wales
University of Western Australia
University of Wollongong

New Zealand IODP partners

GNS Science
NIWA
University of Auckland
University of Otago
Victoria University of Wellington

IODP Regional Expeditions: 2014 to 2018

Three new expeditions were carried out in our region in 2015 and 2016: Indonesian Throughflow Expedition 356, August–September 2015; Sumatra Seismogenic Zone Expedition 362, August–September 2016; and Western Pacific Warm Pool Expedition 363, October–November 2016. Five more regional expeditions are approved in 2017 and 2018 as shown in Figure 10.1 below. Furthermore, it should be noted that nearly 9 per cent of active but not approved proposals are led by ANZIC scientists (Figure 10.2), and that 53 per cent of all active proposals are in the Indian and Pacific Oceans (Figure 10.3), so it is very likely that there will be more drilling in our region before 2023, when the present phase of IODP ends. To help ensure that drilling will happen, an Australasian IODP Regional Planning Workshop was held in Sydney in June 2017.

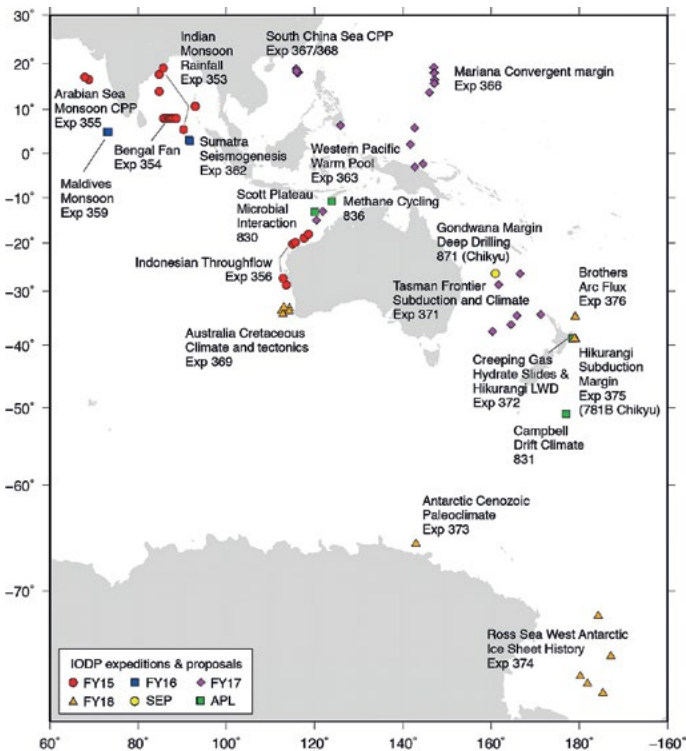


Figure 10.1. Completed, proposed and approved IODP Expeditions in the Australasian region: 2015–2018

SEP means with the IODP Science Evaluation Panel; APL means a short Ancillary Project Letter.

Source: Katerina Petronotis of *JOIDES Resolution* Science Operations, map dated May 2016

All these expeditions have used or will use *JOIDES Resolution*, except for Expedition 373 and Proposals 781B and 871. Note that the US fiscal year is used in these figures; for example, FY17 began in October 2016.

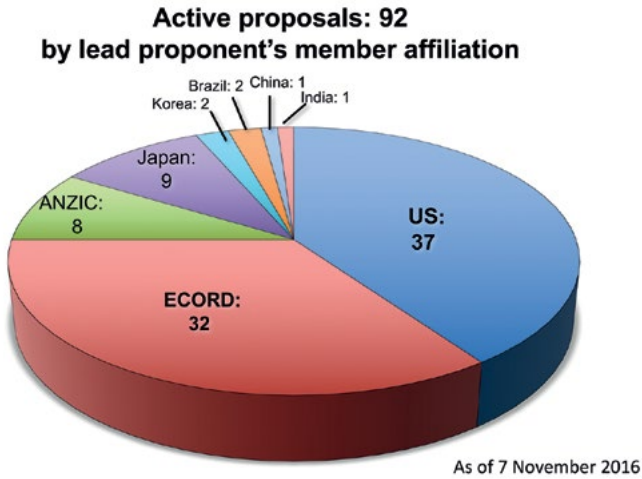


Figure 10.2. Active IODP proposals by lead proponent's member affiliation
Source: IODP Science Support Office at Scripps Institution of Oceanography

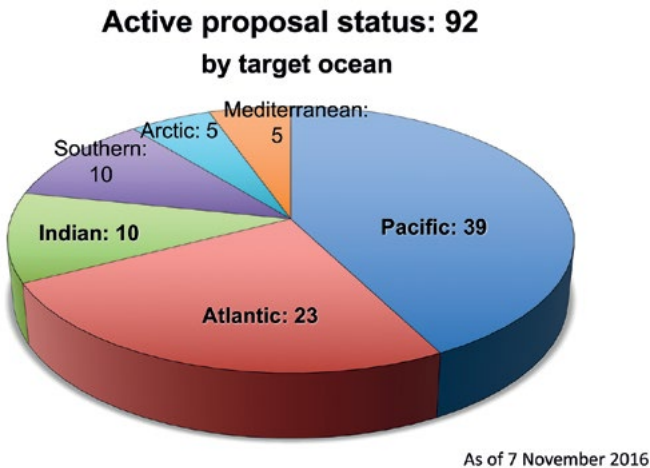


Figure 10.3. Active IODP proposals by target ocean
Source: IODP Science Support Office at Scripps Institution of Oceanography

This text is taken from *Exploring the Earth under the Sea: Australian and New Zealand achievements in the first phase of IODP Scientific Ocean Drilling*, edited by Neville Exon, published 2017 by ANU Press, The Australian National University, Canberra, Australia.