

Australia–New Zealand Plan for Future Scientific Ocean Drilling

Australian–New Zealand IODP Consortium Ocean Planet Workshop;
Canberra, Australia, 14–16 April 2019



The iconic Sydney Opera House provides a beautiful backdrop for the drilling vessel *JOIDES Resolution*, flagship of the IODP. Credit: Ian Edwards

By Millard F. Coffin, Joanna Parr, and Leanne Armand © 29 May 2019

A multidisciplinary community workshop has defined scientific themes and challenges for the next decade (2023–2033) of scientific ocean drilling using the capabilities of current and anticipated platforms of the International Ocean Discovery Program ([IODP \(https://www.iodp.org\)](https://www.iodp.org)).

The workshop, attended by 75 mostly early-career and midcareer participants from Australia, New Zealand, Japan, and the United States, featured nine keynote presentations. Working groups

identified important themes and challenges that are fundamental to understanding the Earth system and are addressable only by scientific ocean drilling.

IODP is the largest international program in the ocean and Earth sciences and among the largest international scientific research programs in any discipline. IODP explores Earth's history and dynamics using oceangoing research platforms to recover geological, geobiological, and microbiological information preserved in seabed sediment and rock and to monitor subseafloor environments through the global ocean.

Australia and New Zealand are 2 of 23 member nations of IODP—led by the United States, Japan, and Europe—and participate via the Australian–New Zealand IODP Consortium (ANZIC). ANZIC comprises 16 universities and four publicly funded research agencies in the two countries.

The ANZIC Ocean Planet Workshop program was built around five scientific themes: Biosphere Frontiers, Earth Dynamics: Core to Crust, Global Climate, Natural Hazards, and Ocean Health Through Time.

The ANZIC Ocean Planet Workshop (<https://scienceandtechnologyaustralia.org.au/event/anzic-ocean-planet-workshop/>) program was built around five scientific themes: Biosphere Frontiers, Earth Dynamics: Core to Crust, Global Climate, Natural Hazards, and Ocean Health Through Time. Workshop sessions focused on these themes and 19 associated scientific challenges. Underpinning the themes and challenges are legacy samples and data, technology, engineering, education, public outreach, big data, and societal impact.

Although all challenges are important, the asterisks that follow denote those of particular relevance and interest to ANZIC.

Biosphere Frontiers addresses the habitable limits for life*; the composition, complexity, diversity, and mobility of subseafloor communities (<https://eos.org/meeting-reports/developing-deeplife-continental-drilling-projects>)*; the sensitivity of ecosystems to environmental changes; and how the signatures of life are preserved through time and space*.

Earth Dynamics: Core to Crust encompasses the controls on the life cycle of ocean basins and continents*; how the core and mantle interact with Earth's surface*; the rates, magnitudes, and pathways of physicochemical transfer among the geosphere, hydrosphere, and biosphere*; and the composition, structure, and dynamics of Earth's upper mantle.

Global Climate entails coupling between the climate system and the carbon cycle; the drivers, rates, and magnitudes of sea level change in a dynamic world*; the extremes, variations, drivers, and impacts of Earth's hydrologic cycle*; and cryosphere dynamics*.

Natural Hazards involves the mechanisms and periodicities of destructive earthquakes*; the impacts of submarine (<https://eos.org/meeting-reports/new-frontiers-and-technologies-in-submarine-volcanism-research>)and

coastal volcanism (<https://eos.org/project-updates/new-volcanic-island-unveils-explosive-past>); the consequences of submarine slope failures for coastal communities and critical infrastructure*; and the magnitudes, frequencies, and impacts of natural disasters*.

Ocean Health Through Time comprises the ocean's response to natural perturbations in biogeochemical cycles*; the lateral and vertical influence of human disturbance on the ocean floor; and the drivers and proxies of evolution, extinction, and recovery of life*.

A workshop report is in preparation, to be made available on the ANZIC website (<http://www.iodp.org.au>). This workshop is one of several held in 2019 by IODP member nations and consortia. Together, these workshops aim to formulate the next decadal science plan for scientific ocean drilling, which in turn will guide the focused planning of specific drilling, logging, and monitoring projects.

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