

ANZIC Marine Geoscience Masterclass 2019



Every year ANZIC runs a Marine Geoscience Masterclass introducing high achieving undergraduate students to the specialist techniques and unique opportunities available through the International Ocean Discovery Program (IODP). Up to 30 students are selected by member institutions to attend the week long annual Masterclass.

The 2019 ANZIC Masterclass was held from 2/12/19 to 10/12/19 in Sydney and surrounds, and included marine and geological fieldwork. There were 18 student participants from 15 institutions, three from New Zealand. The activities started with dinner and brief introductions and welcomes on Monday evening, 2/12, attended by Simon George and Stefan Löhner (Macquarie University) and ANZIC programme scientist

Leanne Armand (ANU). Whilst in Sydney, all the students stayed at Glenferrie Lodge, 12a Carabella Street, Kirribilli, <https://glenferrielodge.com/>. This venue turned out to be ideal, with easy access to the train line, a ferry terminal, and several local restaurants.

Tuesday 3/12 was held at Sydney University. Leanne Armand gave a talk on "Introduction to IODP/ANZIC consortium", and showed the cores of the PETM and K-Pg. Jody Webster (USYD) gave a talk on "Overview of scientific results and highlights from the various IODP reef drilling expeditions (specifically expeditions 310, 325 and 389)", which was followed by a Virtual IODP reef logging exercises (Exp. 310, 325), which also exposed the students to actual fossil reef cores that are archived at USYD. In the afternoon Maria Seton (USYD) led a workshop on plate reconstructions for IODP, using GPlates (plate reconstruction software). Two USYD HDR students were paid to help with the practicals.

Wednesday and Thursday 4-5/12 were based at the Sydney Institute of Marine Science (SIMS). We booked a large water taxi to transport the whole group direct to/from Kirribilli and Chowder Bay, which worked very well and was a great experience for the students. Matt Kosnik and April Abbott (Macquarie University) led a day of boat work, which involved grab sampling Sydney Harbour sediments from various locations, and measuring water column chemistry using a CTD. Additionally, earlier in the week Matt Kosnik obtained two fresh piston cores using an underwater diving technique. The grab samples, piston cores and chemistry data were analysed and interpreted in the SIMS labs on Wednesday and Thursday afternoon. The students rotated through the two boats and the SIMS labs on Wednesday. Two Macquarie University HDR students were paid to help with the practical work in the labs.

On Thursday morning there were six talks about various aspects of marine geoscience



and IODP. On Thursday late afternoon there was a 2 hour optional kayaking trip around the Sydney Harbour foreshore, before dinner. Most students took the opportunity to experience this, although a few did not due to the bushfire smoke.

From Friday-Monday 6-9/12 Simon George and Stefan Löhr took the students on a geological fieldtrip to the south coast of NSW. One Macquarie University HDR student was paid to help with teaching the fieldwork, and two additional HDR students from Macquarie University also came so as to enhance their knowledge. We drove to Sussex Inlet in 3 minibuses hired from Avis. The fieldtrip turned out to be the most problematic part of the Masterclass to organise, due to the Currowan bushfire which at that time surrounded Kioloa (where we were booked to stay) and most of our intended fieldwork sites to the S of Kioloa. At three days notice we re-scheduled the accommodation and devised new locations to visit, which involved examining sedimentary rocks mostly from the upper part of the Permian further to the N than the originally intended lower parts of the Permian to the south. Dietmar Müller kindly let us have fieldwork notes from the Illawarra coastline which were very helpful. In the end, this worked well, with the following locations visited:

- Culburra Beach: Crookhaven Lighthouse (N), Penguin Head (S) (upper part of Wandrawandian Siltstone, and the overlying Nowra Sandstone)
- Warden Head (Wandrawandian Siltstone)
- Westley Park, Kiama and Bombo Quarry (Broughton Formation)
- Late Permian Sydney Basin sedimentary and volcanic succession of the Illawarra coast, including the P-T boundary at Coalcliff.

The advantage of this change is that we got to explore areas that we had not visited before, some of which will be useful for future fieldtrips. The Sussex Inlet accommodation (Jervis Bay Holiday Cabins, 196 River Road, Sussex Inlet, 2540; <http://www.jervisbayholidaycabins.com.au/>) was good, and included garages under the cabins, one of which we use for four evening talks on two days Table 3). Additionally, one afternoon we ran a workshop on “Biostratigraphy and magnetochron reversal, and their application for building age-depth models, identifying sedimentation rates, and the implications of hiatuses/gaps in the sedimentary record.”

On the last day (Tuesday 10/12) we visited the Geological Survey of NSW core store at Londonderry (W B Clarke Geoscience Centre: 947-953 Londonderry Road, Londonderry, Western Sydney. <https://www.resourcesandgeoscience.nsw.gov.au/miners-and-explorers/geoscienceinformation/services/drill-core-libraries/londonderry-drillcore-library>. Simon George, Stefan Löhr and the Macquarie University HDR student who taught on the fieldtrip drove the students there in the minibuses. The staff there were very helpful for our morning visit, including laying on morning tea and providing a guided tour to the core repository. They are very keen to encourage more interaction with geology departments and students, so the masterclass fitted well into their operations. We examined the DM Callala DDH1 core (Shoalhaven Group, Jervis Bay area (0-520 m)), which included some of the Permian lithologies we had examined

in outcrop (unfortunately we did not see the deeper units in the core at outcrop, due to the bushfire rescheduling). The students practised some core logging and description. On Thursday afternoon we drove back to Macquarie University and the students were given a guided tour through some of the research labs:

- MQ GeoAnalytical (Tim Murphy/Yi-Jen Lai)
- Stable isotopes and Nanomin (Sean Murray/Stefan Löhr)
- Organic Geochemistry (Simon George)
- Synthetic Biology/Molecular Biology (Sasha Tetu, Lisa)

The masterclass finished with an informal afternoon tea. From the organisers perspective, the masterclass was a great success, and seemed useful for the students. The students selected for it had significantly varied experience, all the way from a student who had done one geology unit, to another who had just completed her 3rd year and is progressing to masters next year. Additionally, some were marine science students, and some were geology students with limited soft-rock experience. This meant a flexible teaching approach had to be adopted, but it all work out fine.

