Annual Report 2014

AINSE

THE AUSTRALIAN INSTITUTE OF NUCLEAR SCIENCE AND ENGINEERING

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AINSE

Access	Facilitating access to landmark scientific infrastructure.
Industry	Engaging with industry to enhance funding opportunities and ensure relevance of nuclear education and training.
Network	Providing an effective link between all stakeholders of nuclear science and engineering.
Stimulation	Stimulating and supporting students and early career researchers in pursuing a career in nuclear science and engineering.
Education	Playing a leading role in nuclear education and training.

AINSE • The Australian Institute of Nuclear Science and Engineering

Contents

AINSE 2014 Annual Report

From the President and the Managing Director

2014 has been a challenging yet exciting year in the evolution of AINSE. Both the President and Managing Director were newly appointed this year and there were a number of other changes to membership of the AINSE Board. Many publically funded organisations are currently facing funding challenges. Following recent feedback from members and through a fresh set of eyes with a new Executive, it was timely to review our operations and value proposition to ensure AINSE remains effective and relevant in supporting member institutions.

Our strategic aim is to position AINSE as a focused, contemporary organisation which is agile and responsive in capturing new opportunities that align with national and international priorities and challenges in the nuclear science and engineering domain. AINSE will continue to promote the unique facilities and capabilities located principally at Lucas Heights. However ANSTO has indicated that it intends administering all merit based facility access at some point in the future to align with its objective of integrating the user portals of the Australian Synchrotron, ANSTO Institutes and AINSE into one user office. Whilst AINSE continues to educate and train the future science leaders of Australia and New Zealand it is strengthening this role through greater funding and promotion of early career research activity and will be a major focus of the Institute once facility access management transitions to ANSTO. AINSE will also play an important advocacy role in nuclear science and engineering, and we are looking at ways to best engage industry and support infrastructure development. These activities are crucial in underpinning the high quality outcomes expected by our members.

Having reviewed the AINSE business and environment in which it operates we have taken steps to implement several improvements. This has included a review of previous year awards in accordance with award conditions restricting the carry-over of funds other than in the most compassionate of cases. This measure is allowing AINSE to better manage its books and allocate awards in future rounds with greater funding certainty.

In October AINSE moved towards a more modern travel policy. AINSE continues to book accommodation for facility users at the Lucas Heights Motel, however flight bookings are now arranged by the award holder with expenditure reconciled subsequent to the travel against a set allowance. This change has released valuable Secretariat resources allowing AINSE to undertake new initiatives.

This year has also seen AINSE introduce a program of roadshows with the first AINSE Symposium being held in Perth in July. This was very well attended with over 60 participants attending from the University of Western Australia, Murdoch University, Curtin University of Technology, Edith Cowan University and CSIRO. A similar event was also held in South Australia in August, aligning with the AINSE Board meeting in Adelaide. The John Ferris Memorial Award holder Lydia Mackenzie was invited by AINSE to present her work with some of John's family having accepted an invitation to attend the event. It is hoped that this initiative will be rolled out progressively to other precincts in Australia and New Zealand.

The 2014 Winter School was a huge success with almost full attendance from every member institution, including a junior staff member participating from GNS Science and from the newly created Master of Nuclear Engineering program from the University of New South Wales. AINSE post graduate award holders Lydia Mackenzie (University of Queensland) and Josie Auckett (University of Sydney) assisted at the school along with AINSE Research Fellow Alison Blyth (Curtin University of Technology). Bill Palmer, the first Executive Officer of AINSE holding office from 1960 to 1988 also attended the presentation by CSIRO's

Dr Cathy Foley and stayed for dinner meeting Winter School students. At the end of the School, students spent several hours with ANSTO CEO Dr Adi Paterson where they were given the opportunity to ask questions about life as Head of Australia's only nuclear reactor.

The Postgraduate Research Award (PGRA) program continues to grow in reputation. In 2013 AINSE received 42 applications and 9 were awarded to students from 8 different institutions. In contrast AINSE received 77 applications in 2014 and awarded 18 PGRAs to students from 10 different institutions.

The AINSE Board agreed this year to change the conditions of the Honours Scholarship program. Previously a student's supervisor was required to have an approved Research Award in progress in order to apply. Under the new conditions students are eligible to apply if they are conducting research at ANSTO. The award conditions have also been relaxed to allow those member institutions who no longer offer honours courses to permit students enrolled in masters by research programs to apply. In 2014 AINSE awarded 9 honours scholarships to students from 8 different institutions. We anticipate that the new changes will result in a significant increase in the number of awards offered in 2015.

As part of AINSE's outreach activities and staff development, Administration Manager, Michelle Durant attended the Women in Nuclear (WiN) conference held in October in Sydney. Michelle presented an overview of AINSE's programs and opportunities which was very well received by the audience. In particular many international participants were very pleasantly surprised by the high percentage of female scholarship holders at AINSE.

AINSE also commenced a regular lunchtime seminar series for early career researchers. The first of these talks commenced in September. These talks have been a fantastic opportunity to find out what research the early career scientists at ANSTO and member institutions are involved in. We have invited a diverse cross-section of people from AINSE member organisations who have benefitted from ANSTO's unique facilities to present at these talks. These talks are an opportunity to better co-ordinate and disseminate developments within our field of nuclear science and engineering and provide attendees with a networking opportunity involving a wider cross-section of people. In October, two presentations were held back to back "Finding new evaporite minerals on Saturn's moon Titan" and "Fusion Energy – the grandest challenge of engineering science".

An ANSTO - AINSE Working Party was established in July with the aim of discussing ANSTO's concerns with the effectiveness of the current funding model including the approach to accessing ANSTO facilities. There were a number of working party meetings held this year and general discourse took place regarding ANSTO's vision of their association with AINSE. This culminated with ANSTO indicating it would pay its subscription for facility access by way of an in-kind voucher system of equivalent value effective 1 January 2015. Over two funding rounds, in 2013 AINSE received 236 applications and awarded 119 Research Awards with a success rate of 50%. In 2014 AINSE received 181 applications and awarded 111 Research Awards with a success rate of 61%. We are confident that access to ANSTO facilities by our members will not be adversely affected by the new arrangements and should simplify administrative effort at AINSE, ANSTO and member institutions with much of the invoicing eliminated. ANSTO has indicated that it would continue to honour cash commitments with respect to Research Fellows, Post graduate Research Awards, travel and accommodation, the Winter School, conference support and administration costs.

Similar to the previous year, in 2014 AINSE delivered a surplus of $744,934. This followed three years of consecutive deficits. The surplus this year occurred in part due to delays in announcing the opening of funding rounds whilst there was considerable uncertainty in the business environment we faced. With increased confidence and clarity of purpose, we now intend on delivering maximum benefit to members by running a balanced budget and strengthening AINSE early career programs such as the Winter School, Postgraduate Research Awards and Honours Scholarships.

ANSTO has also reconfirmed its previous commitment of $1.5 million over 3 years to a new fund to leverage high quality outcomes for nuclear science and engineering. Discussions have commenced with ANSTO on possible uses of this funding and this commitment is separate and distinct from the existing contributions ANSTO make to AINSE.

The ability of AINSE to continue to operate effectively throughout this period of change would not have been possible without the dedication and professionalism of the AINSE Secretariat. They have functioned in an environment of ambiguity and uncertainty over the past year but have not wavered in their determination to continue to deliver what our community expects. As always, we are indebted to the invaluable contributions the AINSE Board continue to make. We welcome Dr Richard Garrett and Ms Roslyn Hatton to the AINSE Board and in particular we warmly thank past President Prof Brendan Kennedy, Prof John Dodson and Dr Robert Robinson who have stepped down this year and who have provided generous guidance and hard work over very many years.

AINSE has a proud partnership between ANSTO, Australian and New Zealand universities and other research institutions. We remain firmly committed to bringing the nuclear science and engineering community together so we can leverage off each other and develop the deep collaborations required to achieve important scientific and technical breakthroughs that ultimately will benefit us all. We are confident that AINSE can adapt to the current funding challenges and capture emerging opportunities. We intend on working with all members to develop the business further and with your continued support, increase the value AINSE provides to the nuclear science and engineering community.

Prof Robert Burford
President

Dr Paul Di Pietro
Managing Director

Vision, Mission and Strategic Priorities

Charcoal carbon interactions in a tropical rainforest soil

Michael Bird, Chris Wurster, Anna McBeath – James Cook University, Vladimir Levchenko – ANSTO, Philippa Ascough – Scottish Universities Environmental Research Centre

Charcoal is one of the most commonly dated materials using radiocarbon techniques. Charcoal, in the form of biochar, also has considerable potential for large scale, long-term terrestrial carbon sequestration. Both these applications require understanding the stability and origin of carbon in the charcoal. We placed 24 weighed aliquots of radiocarbon-free charcoal particles in a tropical rainforest soil for three years to quantify both the rate of charcoal-carbon degradation, and the addition of organic carbon to the charcoal particles from the soil environment (Figure 1).

After three years there were significant losses of charcoal-derived carbon ranging from 1.7% to 23.5%, and increases in ash content ranging from <1% to over 30%. The radiocarbon activities of all samples showed some enrichment over the original background values. Activities increased from background to a value between 1.04 pMC and 7.23 pMC, equivalent to apparent ages of 36,680 and 21,100 yrs BP. Aliquots emplaced either on the soil surface with no cover or covered by leaf litter all returned activities >2 pMC, while those aliquots that had local pH modified by a cover of limestone chips with or without additional litter, returned activities of generally <2 pMC. This suggests that pH (and possibly oxygen availability) plays a key role in determining the rate of contamination.

A positive relationship between the loss of charcoal-carbon and increasing radiocarbon activity also suggests that the charcoal is being degraded by bacterial or fungal micro-organisms (Figure 2). These micro-organisms utilize the carbon in the charcoal, leading to a decrease in the amount of original carbon, but also add modern carbon, leading to an increase in the radiocarbon activity of the remaining sample. The results suggest active microbial utilization of charcoal on relatively short timescales.

This work is part of a long running collaboration between James Cook University (Michael Bird, Chris Wurster and Anna McBeath), ANSTO (Vladimir Levchenko) and the Scottish Universities Environmental Research Centre (Philippa Ascough).

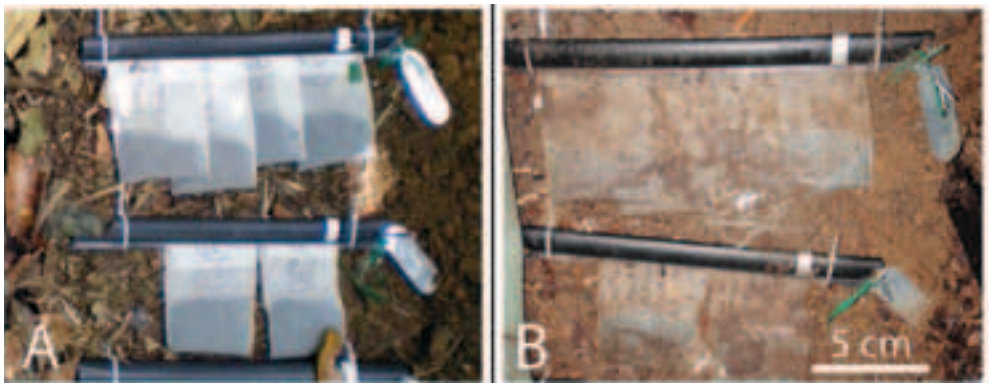


Figure 1 (above): Aliquots of charcoal in mesh bags deployed on the soil surface in the Daintree Rainforest for three years (A) at deployment and (B) after three years exposure (note white fungal hyphae).

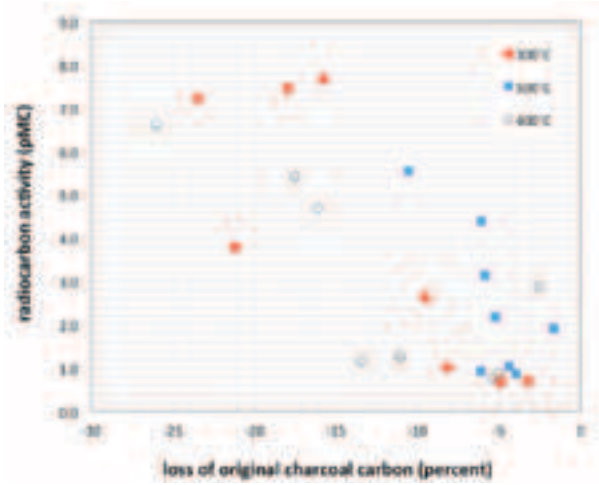


Figure 2 (left): Relationship between radiocarbon activity of charcoal and loss of original charcoal carbon after three years exposure. The results suggest microbial degradation of charcoal carbon is accompanied by ingress of modern organic carbon.

Low abundance compound specific radiocarbon dating of organic matter preserved in cave deposits

Caves have a key role in understanding past terrestrial environments, as their enclosed nature makes them excellent archives for sedimentary and chemical deposits, while they are intimately linked to archaeology and palaeoecology via their role as rock shelters and roost sites. The use of organic matter preserved in both clastic and chemically precipitated cave deposits (speleothems) is becoming more common, but the sources and deposition mechanisms of this material are not always well understood. From the standpoint of radiocarbon dating, most studies have focused on conventional dating of macrofossils in sediments, or dating of the carbonate fraction in speleothems. Both these approaches can give very good results, but can be limited by availability of macrofossils in the former case, and the need to calculate dead carbon contributions in the latter. This project aims to introduce a third approach in this context, by dating the molecular organic matter (e.g. humic acids, particulates, lipid fractions) preserved. This offers a particular opportunity to extend the use of radiocarbon dating in speleothems, and feeds into two wider questions – are the sources of organic records preserved contemporary with their deposition? And can we use radiocarbon dating of organic matter preserved in cave deposits to help date the record when other methods are unsuitable?

For this phase 1 study, work was focused on the development of a clean and efficient method for the dating of particulate and humic organic matter preserved in speleothems. A simple wet chemistry method was developed and refined to allow as clean as possible recovery of the target organic matter, and samples from speleothems of known age were dated at ANSTO. The primary focus was on a flowstone formed in the roman aqueduct at Trento, Italy, as this had a high particulate content and is of further research interest with regards to organic matter sources. Results showed that the technique gives ages that approximate to the time of formation, but which are consistently older by a few hundred years. Research is now ongoing to establish if this is a true environmental feature, or an effect of contamination.

This work was funded by a 2013 AINSE Research Award, and also forms part of Dr Alison Blyth's AINSE Research Fellowship, based in the Organic and Isotope Geochemistry labs at Curtin University (lab director: Prof Kliti Grice). It is carried out in close collaboration with Dr Quan Hua, a Senior Research Scientist in ANSTO's Institute for Environmental Research. Research on the Trento aqueduct flowstone forms part of a collaboration with Dr Silvia Frisia of the University of Newcastle.

Resolving the date of Stilt Villages, Papua New Guinea

Aerial view of Kumbun Island looking west (photo: C.L. Ogleby).

A radiocarbon dating program funded by AINSE (grant ALNGRA 13005) has helped to clarify the origin of houses and other structures built over the shallow coastal waters of the western Pacific. On Kumbun Island off the south coast of New Britain, Papua New Guinea, the Apalo archaeological site revealed in 1990 waterlogged deposits with many pieces of timber, some modified by humans, and a rich array of edible seeds and nuts. This evidence was interpreted as a structure built over the sea, and initial dating of some of the wood placed the structure at about 3800-4000 years before present (BP), much earlier than was then known. The AINSE grant allowed the re-dating of the site by the AMS method at ANSTO and confirmed the age of the structural evidence and the seeds and nuts.

Most striking was the dating of a small piece of charred wood with an incised design. The piece is too small to identify the original object, but it might have been a small container. A sample of 1.9 milligrams was dated to 3625±30 years BP, which calibrates to 4070-3850 cal. BP, (ANSTO sample OZR442), making this the oldest directly-dated decorated object in the Pacific Islands, though decorated stone carvings on mainland New Guinea may be as old. This small piece of incised wood adds a new chapter to the history of Pacific Islands' art by confirming that decorative practices existed long before the appearance in the islands of decorated Lapita pottery around 3300-2800 years ago. A report on this work is being published in Archaeology in Oceania in 2015.

Top: Map showing location of the Arawe Islands off the south coast of New Britain, Papua New Guinea.

Above: Incised piece of charred wood from the base of the Apalo site, Kumbun Island, Papua New Guinea. The scale is in millimetres. (Photo: J. Specht).

Redating the Earliest Site in the Hawaiian Islands: Implications for East Polynesian Colonisation Models

Settlement models for human colonisation across East Polynesia are polarised before or after AD 1200. Recent excavations on Moloka'i (Hawaiian Islands) revealed a basal cultural deposit dated to cal AD 765- 891. The earliest date from a stone adze quarry and habitation locale was: (1) obtained from a basal cultural layer consisting of an ashy sediment with food remains (marine shellfish and fish bone), charcoal chunks, oven stones and stone flakes (the by-products of stone tool manufacture), (2) the dated sample consisted of short-lived nut shell from the candlenut tree (*kukui, Aleurites moluccana*) which is a Polynesian introduction and (3) the sample conventional age has a 1-sigma uncertainty of only 30 years and, hence, provided a calibration close to the 'true' age of the actual event. Consequently, there is no intrinsic reason to dismiss this early date, although it is acknowledged that the calibrated range is older than many settlement dates for other East Polynesian archipelagos from which Hawai'i was probably settled. The fact that the sample consists of a Polynesian prehistorically introduced plant, incapable of natural dispersal to the isolated Hawaiian archipelago, means that this sample represents prehistoric human activity regardless of its stratigraphic context and associations.

Additional archaeological excavations obtained appropriate short-lived samples for dating. Four dates, supported by AINSE, produced a calibrated median age of AD 1770, more in line with expectations for late prehistoric settlement in these marginal leeward regions. However, the oldest date, previously obtained, was not contaminated with old carbon and satisfies all aspects of 'chronometric hygiene'. The radiocarbon dates, their context and cultural associations are reported in full in a forthcoming article in the *Journal of Pacific Archaeology* 6 (1).

This AINSE-supported research, in collaboration with Dr Quan Hua (ANSTO), is part of a long-term study of the prehistory of West Moloka'i, initiated by Marshall Weisler, and supported by the Australian Research Council.

1. The west Moloka'i (Hawaiian Islands) coastline typical of the dry leeward regions of the island.
2. Walter Mendes, en route to the remote prehistoric quarry/ habitation site.
3. The project provided an opportunity to train native Hawaiians in archaeological techniques and share information on Moloka'i prehistory. Seen here is island resident Pulama Lima.

Dating the archaeological remains of the Philippines' Butuan Boats

(Pic.1)

In 1976, looters digging for ancient graves accidentally discovered the waterlogged remains of a plank-built boat in the outskirts of Butuan City, Philippines. This incident led to the discovery of more boat remains, now referred to as the Butuan Boats, under a few metres of alluvial sediment. To date, archaeologists from the National Museum of the Philippines have recovered three boats and are currently in the process of excavating two more.

The builders of the Butuan Boats used doweled and lashed-lug construction techniques described in seventeenth century texts, and seen in remote Indonesian islands as late as the 1980s. The actual age of the Butuan Boats, however, was an enigma. Previous dating of three of the recovered boats resulted in surprisingly disparate ages. Boat 1 dated to 1630±110 BP (GaK-7744), Boat 2 dated to 700±90 BP (GaK-7741) and Boat 5 dated to 960±70 BP (ANU-6193).

In 2013, two samples each from Boats 1 and 2 and one sample each from Boats 4, 5 and 9 were collected and prepared for AMS-C14 analysis at ANSTO. The resulting radiocarbon ages provided new calibrated dates ranging from AD 698 to 988, with an average median age spanning a period from AD 787 to 924 (see Table 1). It can be said that the trees were cut and the boats were built sometime after these dates, and were likely used and discarded during roughly the same time period. The reliable dating of these boats contribute significantly to our understanding of Indigenous Philippine boatbuilding and maritime culture, topics that have yet to be thoroughly studied.

This research was conducted by a National Museum (Philippines) researcher and PhD candidate Ligaya Lacsina, under the supervision of Dr Wendy Van Duivenvoorde, (Flinders University) and Dr Geraldine Jacobsen (ANSTO).

(Pic. 2)

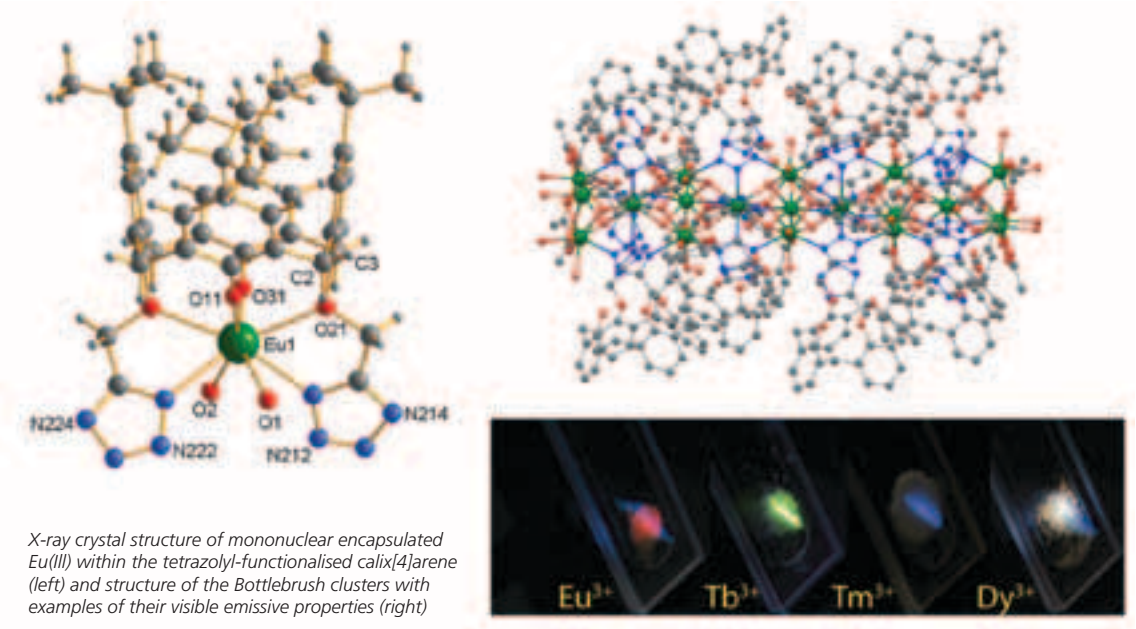
(Pic. 3)

Table 1. Seven wood samples from five Butuan Boats underwent AMS C-14 analysis. The results are summarised in the following table:

ANSTO code	Sample Type	Submitter ID	$\delta^{13}C$ ‰	percent Modern Carbon		Conventional Radiocarbon age		Calibrated Age (IntCal13 dataset using OxCal 4.2)	Median age
				pMC	1σ error	yrs BP	1σ error	cal AD 2σ range	cal AD
OZQ841	Wood	Boat 1 - Keel	-24.9 ± 0.4	86.69 ± 0.27		1,145 ± 25		777 to 974	904
OZQ842	Wood	Boat 1 - Wing end	-25.0 ± 0.1	86.87 ± 0.29		1,130 ± 30		777 to 988	924
OZQ844	Wood	Boat 2 - Keel	-25.5 ± 0.1	86.14 ± 0.30		1,200 ± 30		715 to 940	825
OZQ845	Wood	Boat 2 - Wing end	-25.3 ± 0.1	85.83 ± 0.29		1,230 ± 30		689 to 882	787
OZQ846	Wood	Boat 4 - Keel	-25.4 ± 0.2	86.67 ± 0.36		1,150 ± 35		775 to 973	888
OZQ848	Wood	Boat 5 - Keel	-25.5 ± 0.3	86.65 ± 0.28		1,150 ± 30		776 to 971	890
OZQ851	Wood	Boat 9 - Wing end	-26.8 ± 0.1	86.56 ± 0.27		1,160 ± 30		773 to 968	870

Photo 1. The excavation of Batuan Boat 2c 1978 courtesy of the National Museum of the Philippines.
Photo 2. Batuan Boat 4 (Photo by Ligaya Lacsina).
Photo 3. Wood Samples.

Lanthanoid Bottlebrush Clusters: New Platform of Rod Shaped Nanomaterials



X-ray crystal structure of mononuclear encapsulated Eu(III) within the tetrazolyl-functionalised calix[4]arene (left) and structure of the Bottlebrush clusters with examples of their visible emissive properties (right)

The reliable and uniform synthesis of nanoparticles with a small size distribution has the potential to be applied in a wide variety of applications. The serendipitous discovery of a new method for synthesis of discrete molecules, with the potential to be building blocks for nanoparticles, have the possibility of shifting the way bottom-up synthesis of nanomaterials is approached. The discovery was made while working in collaboration with ANSTO Lifesciences on the development of radiopharmaceuticals for diagnosing and treating metastatic cancer.

The tetrazole functionalised calixarenes were investigated as potential new ligands for the radioisotopes gallium-68 (PET imaging) and lutetium-177 (β- therapy). The tetrazole functional groups were chosen as they are established bio-isosteres of carboxylic acids and have been reported to possess increased metabolic stability. The previous characterisation of the desired complexes exhibiting metal-to-ligand ratios of 1:1, demonstrated the potential success of radiolabelling experiments, but indicated that further modification of the ligand system would be required in order to achieve higher in-vivo stability of the complex. Addition of a simple co-ligand, in this case acetate, from a buffer solution required to maintain a suitable pH for radiolabelling, saw the spontaneous formation of nano-sized discrete linear clusters. These multinuclear (Ln19) clusters have lanthanoid hydroxo cores, surrounded by calixarene tetrazolato ligands. These reproducible clusters lie, in terms of size, somewhere between small molecules and antibodies with a molecular weight over 16,000 and dimensions of 2.1×3.0 nm. Remarkably, the length of these linear clusters can be altered by simply changing the co-ligand from acetate to benzoate. This reduces the dimensions to 2.1×2.3 nm, but the structural motif of the metal hydroxo core remains identical. Photophysical measurements performed on the crystals showed that the clusters exhibit high luminescence in both the visible and infrared spectrum, with particular interest in the terbium and europium clusters.

The investigation is led by Dr Max Massi and Professor Mark Odgen at Curtin University, with the experimental work carried out as part of Daniel D'Alessio's PhD studies at Curtin University. The team is undertaking the work in collaboration with Dr Ivan Greguric, Dr Ben Fraser, Dr Nigel Lengkeek and Ms Anwen Krause-Heuer at ANSTO LifeSciences.

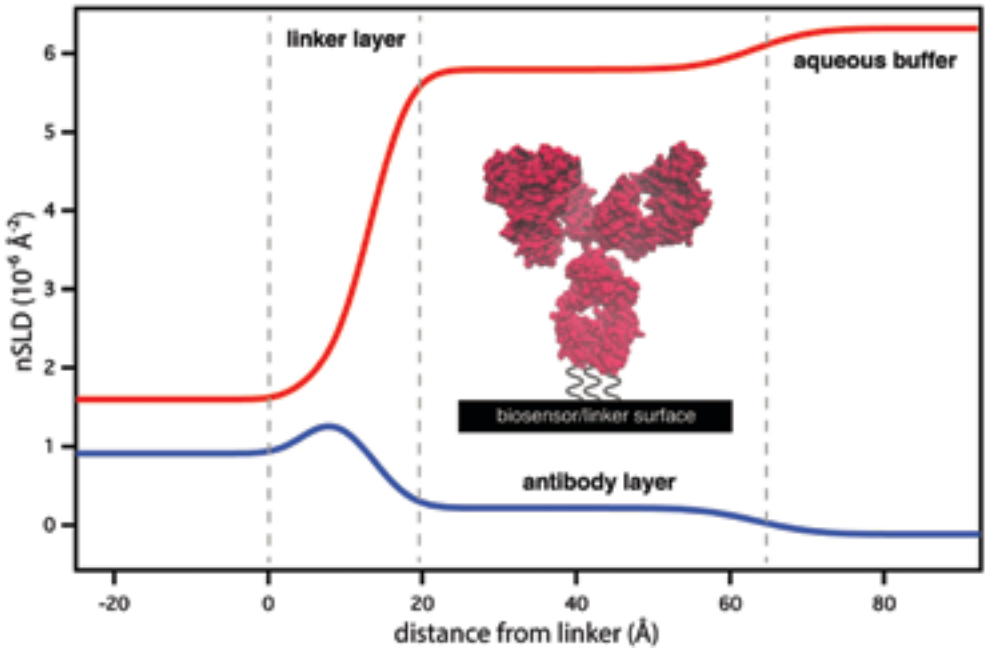
Probing the structure of surface attached antibodies for improved biosensors

Antibody-based biosensors have a wide variety of uses, from pregnancy testing to early detection of cancer and are a multi-million dollar business. The activity of the surface-bound antibody and function of the device is critically dependent on the chemical nature of the surface. Although there are many variations of this test already on the market, important activity-determining factors such as surface orientation and density of the immobilised antibody as well as hydration at the biosensor surface are not well understood. The aim of this AINSE-supported study was to understand different types of polymer surfaces which are effective for antibody attachment, in particular those that allow for maximum antigen capture. Our hypothesis is that a 'soft,' highly hydrated surface is important in retaining activity of immobilised biomolecules and in contrast, 'hard' surfaces, which have low hydration, make inferior substrates. 'Hard' and 'soft' surfaces were prepared by using different surface-linker molecules, each chosen to create different chemical environments for the attached antibody.

We found that although antibody structure and density is similar on surfaces of high, low and medium hydration, those with higher hydration appear to perform better, with higher levels of antigen capture modelled from neutron reflectometry data. Results from this study and future work on similar surfaces will allow us to understand more about the factors important in optimising antigen capture of surface-bound antibodies and will aid in the design of future ELISA-based biosensors.

This work was carried out by Peter Akers as part of his PhD research under the supervision of Dr. Duncan McGillivray (University of Auckland) and Dr. Andrew Nelson (ANSTO), and is part of an international study led by Professor David Williams (University of Auckland) into surface-immobilised antibodies. Vital contributions to this work were made by Dr. Nam Le (CSIRO) and Dr. Vladimir Gubala (University of Kent).

Neutron scattering length density (nSLD) profile of human immunoglobulin G (antibody) attached to a linker-modified surface. This plot shows a highly hydrated antibody layer sitting on a linker surface of relatively low hydration and was obtained by simultaneous refinement of datasets collected in D_2O (red) and H_2O-based (blue) buffers.



Isolating viable circulating tumour cells using electrochemically-switchable surfaces

Circulating tumour cells (CTCs) provide a potentially accessible source for detection, characterisation and monitoring the progression of non-hematological cancers. However, CTCs shed from primary and metastatic cancers are mixed with blood components and are thus rare but dangerous, as well as being heterogeneous in nature.

The work herein describes a way to capture and release live CTCs by using electrochemically-switchable molecules bound to a silicon surface to capture cells and once poised at an appropriate potential, cleave and release the cell. These released CTCs can then be cultivated in order to tailor personalised drug treatment regimes for patients, as well as undertaking genetic analysis on them without the need for complicated multiplex PCR.

In order for electrochemistry to take place, oxide-free silicon surfaces were created by modifying them with a well-defined, passivating, acetylene-terminated monolayer. The electrochemically-switchable molecule was then subsequently attached to the surface via a "click" reaction. This switchable molecule was chemically oxidised to immobilise an antibody on the surface that selectively binds to antigens (EpCAM) overexpressed in the MCF-7 breast cancer cell line. Applying a -1200 mV potential to the surface led to the reduction of the switchable molecule and subsequently, the release of the live CTCs.

This work was carried out by Stephen Parker as part of his PhD research under the supervision of Professor Justin Gooding. Dr Simone Ciampi, Dr Anton Lebrun and Professor Michael James also made contributions to this work. Professor Gooding's research group focuses on the molecular-level manipulation of interfaces to impart a desired functionality.

Use of nuclear techniques to assess the risk of cerium dioxide nanoparticles to aquatic food chains

The manufacture and application of cerium dioxide (CeO_2) nanoparticles in consumer products and as a catalyst in diesel fuels is increasing with demand. As a consequence, the nanoparticle load on aquatic ecosystems will also increase and there is a need to assess the risk that this growing exposure will pose to the resident aquatic organisms and the aquatic food chains that potentially impact human health.

The objective of this project was to generate the gamma-emitting radioisotope Ce-141 formed by irradiation of CeO_2 nanoparticles and determine whether there is dietary assimilation and transfer along a freshwater food chain represented by an alga (*Pseudokirchneriella subcapitata*), a grazing snail (*Potamopyrgus antipodarum*) and a prawn (*Macrobrachium australiense*) in a series of pulse-chase feeding experiments. Comparison with irradiated micron-sized CeO_2 particles would determine the impact of nano size. In addition, autoradiography of Ce-141 was used as a sensitive imaging technique to visually locate and track the uptake of CeO_2 nanoparticles within the prawns.

Results showed no detectable assimilation of CeO_2 in either nano- or micron-sized particles by either the snail when fed with contaminated algae or sediment, or the prawn when fed with contaminated snails as part of the model freshwater food chain. It is likely that the low solubility and high aggregation of the CeO_2 particles makes them unavailable for uptake in the digestive systems of these organisms. Visual evidence from autoradiography showed that all Ce-141 was confined to the digestive system and eliminated from the prawn within 72 h (Figure 1).

The new techniques developed throughout this project can be used to assess the risk to aquatic organisms from other types of nanoparticles. This project was made possible by strong collaborative links at Lucas Heights between CSIRO's Nanosafety programme (Lisa Golding, Brad Angel, Graeme Batley) and ANSTO's Institute for Environmental Research (Tom Cresswell), Life Sciences (Paul Callaghan and An Nguyen) and the Institute of Materials Engineering (Grant Griffiths and Gerry Triani).

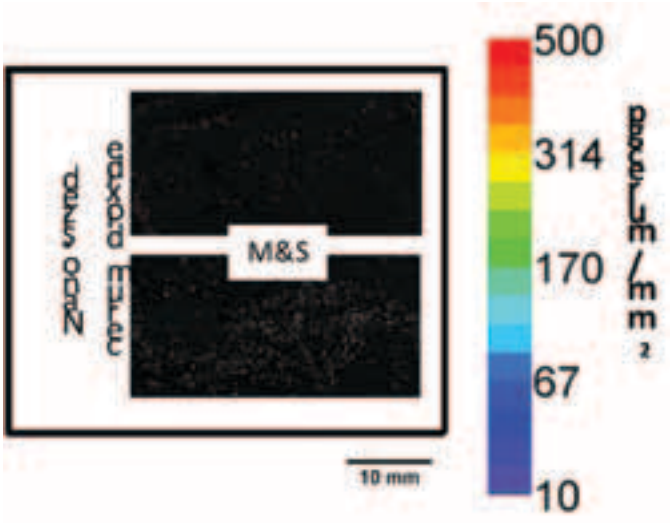


Figure 1: Autoradiography of a freshwater prawn when first fed with a radioactive snail that was fed nano-Ce-141 particles added to algae. The photographic image is the cryo-fixed section of the prawn with the corresponding autoradiographic image below. A non-linear scale of cerium as pg Ce/mm² was shown to capture low intensity radiation. M=mouth, S=stomach.

Australian seagrasses among the world's highest carbon sequesters

1.

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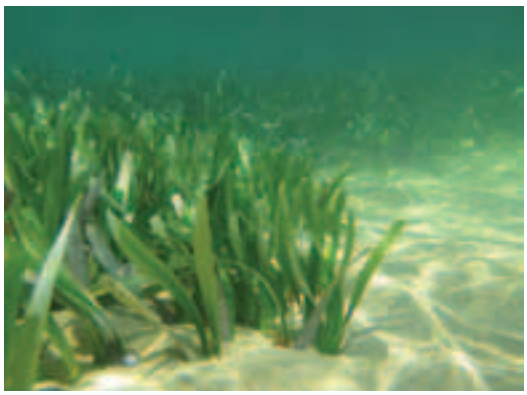

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There has been intense interest in quantifying the carbon accumulated in seagrass ecosystems since it was realized that seagrasses have disproportionately large capacities to sequester atmospheric carbon dioxide. This project determined the rates at which organic matter accumulates in seagrass meadows over the past 7,000 years. The research focused on the dense *Posidonia* meadows of Oyster Harbour and Waychinicup Inlet in Western Australia. Radiocarbon and lead-210 dating was conducted at ANSTO to determine the chrono-stratigraphy of cores from both sites. The base of the cores proved to be up to 7,500 cal yr BP, indicating significant carbon accumulation over millennia. However, the dating also revealed that in some sites there was massive loss of the surface sediments, possibly due to erosion events, that would have exported sequestered carbon from the meadow, possibly releasing it back to the atmosphere. Using the dating together with carbon mass and stable isotope data, we have estimated that the surface 1.5 m of the meadows store almost 11 kg of organic carbon, and accumulate this at a rate of about 7 g m-2 yr-1. This makes these meadows among the highest-ranking organic carbon accumulators worldwide. The stable isotope data indicated that 50-60% of the carbon came from the seagrasses, the remainder from other sources, such as phytoplankton and terrestrial vegetation, trapped by the canopy of the meadow. The results confirm the enormous capacity of seagrasses to trap atmospheric carbon, a critical ecosystem service that argues for the need to protect these important coastal ecosystems.

5.

6.

1. Drilling a core: Mohammad Rozaimi and Oscar Serrano prepare the drill to take a core from a Posidonia *meadow*
2. A Posidonia australis *core, showing the organic-rich soil that underlay the meadow*
3. Close up of a sediment core from a Posidonia *meadow showing the accumulation of seagrass materials in the soils beneath a meadow*
4. A Posidonia australis *meadow*
5. Posidonia australis *forms extensive meadows in the coastal areas of southern Australia*
6. Mohammad Rozaimi and Oscar Serrano prepare a vibracore to take a core from a Posidonia *meadow*

This work was carried out by Mohammad Rozaimi, as part of his Ph.D. research at Edith Cowan University, under the supervision of Professor Paul Lavery and Dr Oscar Serrano and with ANSTO collaborators Atun Zawadski and Quan Hua. The findings were presented at the Australian Marine Sciences Association conference and some early results were published in the Journal of the Royal Society WA. A fuller publication is currently in review.

Modelling and measurement of 3D fields in stellarators and tokamaks

High temperature magnetically confined plasmas exhibit a variety of modes and instabilities such as Alfven eigenmodes and edge localised modes (ELMs). These can impact the plasma confinement, degrading the performance of the two most advanced magnetic confinement fusion machines: the stellarator and tokamak. In order to mitigate the effects of these modes and possibly use them for beneficial purposes, improved understanding is required. This relies on accurate experimental measurements of the 3D fields associated with these modes.

This AINSE funded research on the H-1NF stellarator at ANU has led to the development of a novel imaging technique, which uses a broadband reference such as a magnetic probe signal along with a phase locked loop and field programmable gate array, to provide synchronous gating signals to an intensified CCD camera[1]. This has allowed high frequency modes in high temperature plasmas to be imaged in high resolution with excellent signal to noise for the first time. To take advantage of this experimental data, a novel tomographic reconstruction technique which uses Fourier basis modes in straight field line magnetic co-ordinates was also developed [2]. Additionally, this work has looked at the optimisation of 3D magnetic fields [3, 4] which have been successfully applied to suppress ELMs on the DIII-D tokamak based in San Diego as well as several other machines around the world.

A large portion of this work was performed by Dr. S. Haskey on the H-1NF heliac at ANU as part of his PhD research under the supervision of Associate Professor Boyd Blackwell, Professor John Howard, and Associate Professor Matthew Hole. The imaging technique was originally the idea of Prof. John Howard. The work on ELM suppression on DIII-D has involved collaborations with Dr. M. Lanctot, Dr. C. Paz-Soldan, Dr. J. King (General Atomics), Dr. R. Nazikian (Princeton plasma physics laboratory) and Dr. Y. Q. Liu (CCFE), among others.

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[3] S. R. Haskey, M. J. Lanctot, Y. Q. Liu, J. M. Hanson, B. D. Blackwell, and R. Nazikian. Linear ideal MHD predictions for n=2 non-axisymmetric magnetic perturbations on DIII-D. Plasma Physics and Controlled Fusion, 56(3):035005, 2014

[4] S. R. Haskey, M. J. Lanctot, Y. Q. Liu, C. Paz-Soldan, J. D. King, B.D. Blackwell and O. Schmitz. Effects of resistivity and rotation on the linear plasma response to non-axisymmetric perturbations on DIII-D. Plasma Physics and Controlled Fusion, 57(2):025015, 2015

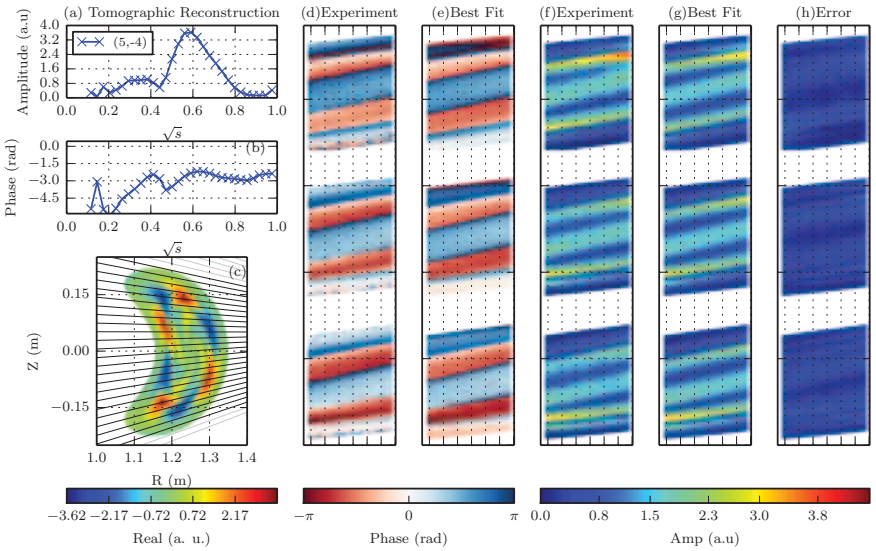


Figure1: Details of the imaging and tomographic inversion of a 25kHz mode on H-1NF using three camera views. The radial structure of the amplitude and phase shown in (a) and (b) were obtained from the tomographic inversion. (c) shows a poloidal cross-section with the real part of the mode and a small subset of the lines of sight from the central camera view. The experimental and best fit phase (d, e) and amplitude (f, g) for all three camera views, and error in the best fit (h) are also shown. The error is generally low demonstrating that the tomographic inversion is extremely good.

Development of 3D microdosimeters for hadron therapy, space, avionic and radiation protection applications

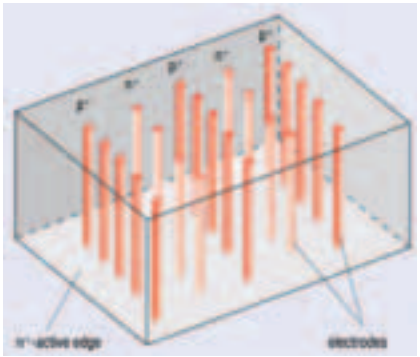
Microdosimetry is the science of studying the effect and modeling the consequences of ionizing radiation exposure at biological cell scales. It gives us the ability to monitor, quantify and predict radiation damage to human tissues in any mixed radiation environment. Such research is crucial for new cancer treatments (proton-and heavy ion therapy), radiation safety (avionic, mining) and, new exploration frontiers (space). This project presents the studies of innovative diamond and silicon on insulator (SOI) structures applied for microdosimetry in charged particle therapy and space radiation protection. This work is a strong contribution to the National Heavy Ion Therapy project recently initiated by ANSTO, Australian Space Program and in collaboration with NASA/NSBRI.

A 3D detector concept was first proposed by Professor S. I. Parker in 1995 [1] for high energy physics and medical imaging applications. The fabrication of 3D detectors has become possible in the last two decades by the latest developments in Micro-Electro-Mechanical-Systems (MEMS) and standard VLSI (Very Large Scale Integration) technologies [2] (Figure 1).

The Centre for Medical Radiation Physics has proposed design of a SOI microdosimeter with 3D sensitive volumes (SVs) using the 3D technology. The first part of the project was to study the charge collection in 3D ATLAS silicon detector using the Ion Beam Induced Charge (IBIC) technique at ANSTO. An IBIC study has shown that several different geometries of silicon detectors with a 3D P+ and N+ columnar electrodes array have full depletion under very low applied bias, providing low noise detectors. The effect of fast neutron and gamma radiation on charge collection efficiency was also investigated. 3D active edge silicon detector technology has demonstrated extremely promising performance for application of the 3D Sensitive Volumes (SVs) fabrication methods to SOI microdosimetry (Figure 2).

As the second part of this project, the large area 7.52 mm x 7.52 mm Ultra 3D Thin (U3DTHIN) detector was fabricated on high restivityn-SOI active layer using the 3D technology followed by a thinning process which removed the 300 µm supporting wafer under the active area of the microdosimeter, while leaving the 1 µm SiO_2 layer unaffected. A schematic of the U3DTHIN detector and its charge collection characteristics are shown in Figure 3 and Figure 4, respectively.

Using the U3DTHIN detector in microdosimetric mode , it was possible to obtain microdosimetric spectra along Spread out Bragg Peak (SOBP) of 12C ion therapeutic beam and derive relative biological effectiveness (RBE) with sub-millimeter spatial resolution Results provided new knowledge of the RBE of low energy ions and fragments at the distal part of the Bragg Peak (BP), which never was investigated experimentally earlier due to the absence of high spatial resolution solid state microdosimeters. The proposed design of SOI support substrate free microdosimeter is an innovative step for better QA in heavy ion therapy. The RBE10 derived from microdosimetric spectra obtained with the U3DTHIN detector along the central axis of the field , in response to 290 MeV/u Spread out Bragg Peak (SOBP) of ^{12}C ions at heavy



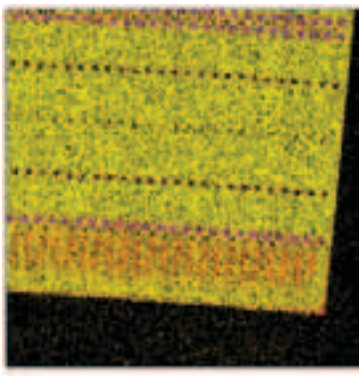


Figure 1 (far left): In 3D detectors, the electrodes and the active edges are fabricated inside the detector bulk using micromachining techniques [1]

Figure 2 (left): An IBIC median energy map of the response of 3D detector to the microbeam of 5.5 MeV He^{2+} at 100 V. Yellow regions are corresponding to the full charge collection.

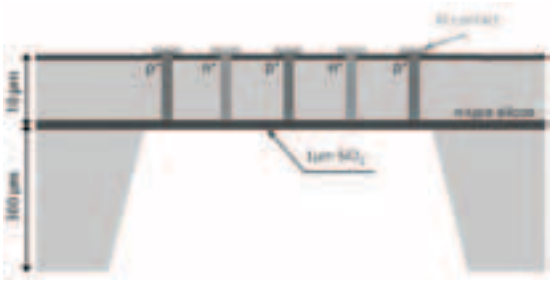


Figure 3: Cross-section of ultra-thin 3D detector (not to scale).

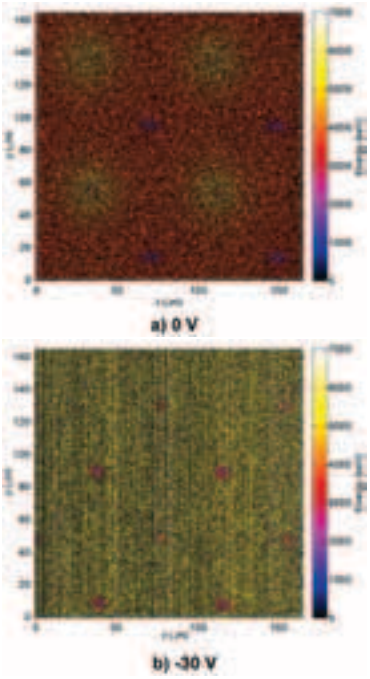
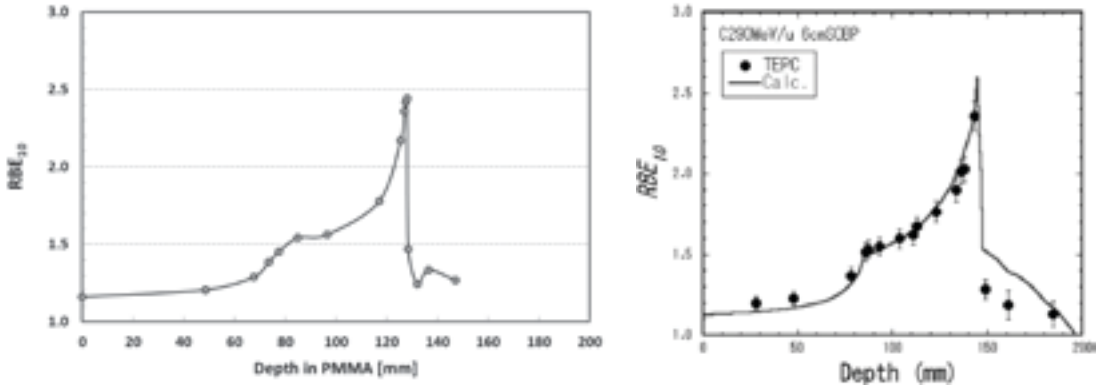


Figure 4: IBIC median energy maps of a U3DTHIN detector in response to a microbeam of 20 MeV ^{12}C ions a) at 0 V; b) at -30 V.

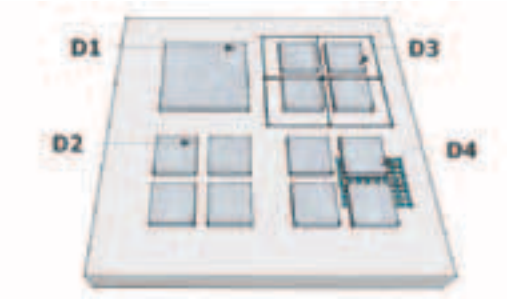
ion medical accelerator (HIMAC) in Chiba, Japan is shown in Figure 5. Derived RBE_{10} values based on the Microdosimetric Kinetic Model (MKM) and SOI microdosimetric spectra (Figure 5a) match well with RBE_{10} values derived from the Tissue Equivalent Proportional Counter (TEPC) measurements (Figure 5b), both in the plateau and along the SOBP. RBE_{10} in the distal part of the SOBP and fragment tail region obtained with the U3DTHIN detector provided a better match to theoretical simulations than RBE_{10} obtained from TEPC measurements, which suffer from a volume averaging effect, particularly in the distal part and close proximity of the SOBP.

Additionally, a new method was proposed for fabrication of pixilated diamond detectors using laser milled trenches as a future microdosimeter. A diamond microdosimeter prototype with sensitive volumes separated through laser milled trenches was characterised using IBIC measurements at the ANSTO microprobe. In this work, it is shown that laser milled trenches have a significant effect upon the lateral confinement of charge collection, essentially creating a pixelated diamond detector. These laser milled trenches are evident in section D3 of Figure 6. In this device, four pixel structures separated by laser milled trenches have been created.

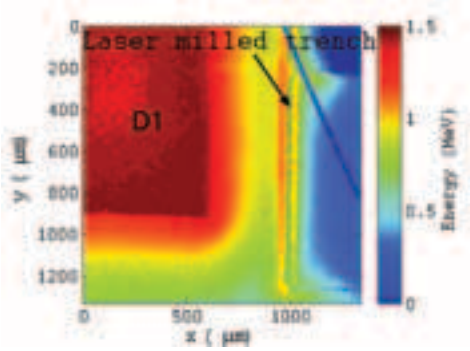


(a) (b)

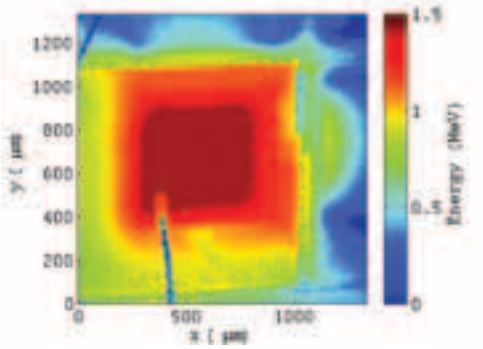
Figure 5: a) RBE_{10} distribution obtained from ultra-thin 3D detector measurements on the central axis of a 290 MeV/u SOBP ^{12}C ion beam with a size 10cmx10 cm. b) RBE_{10} obtained in a water phantom derived from measurements with TEPC for the same ^{12}C ion beam field. (Courtesy of Prof N. Matsufuji, NIRS, Japan, collaborator on this project).



a) 3D representation of the 2nd generation diamond radiation detector.



b) Median energy map of diamond detector with 1.5 MeV H+ ions. Scan is situated over D1 and D3. D1 is the active detector in this result.



c) Median energy map of diamond detector with 1.5 MeV H+ ions. Scan is situated over D3.

Figure 6: Charge collection characteristics of the 3D diamond radiation detector.

In summary, an essential step has been made in 3D solid state microdosimetry science to be applied in heavy ion therapy. Proposed and experimentally confirmed new laser milling technology for fabrication of the diamond pixilated detectors is an essential step for future application in microdosimetry for space exploration and charged particle radiotherapy.

Two Paul-Phelps Awards and AIP Postgraduate Award for excellence in research were awarded to CMRP/ ANSTO PhD students Linh Tran and Jeremy Davis for high quality research. Two papers have been accepted in the December 2014 issue of IEEE Transactions on Nuclear Science [3, 4].

This Project continues the long term collaboration with the Radiation Detection Group at ANSTO and the School of Physics at the University of Melbourne.

Acknowledgement

We would like to thank AINSE for financial support. We would also like to thank Dr Angela Kok SINTEF, Norway and Dr Celeste Fleta, CNM, Spain for fabrication of the detectors. Beam time on ^{12}C ion therapy facility at NIRS, Japan was provided as part of the continuing collaboration with CMRP.

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Elucidating the origins of fast lithium ion transport in defect perovskites

Defect perovskites have been shown to exhibit the highest lithium ion conductivity over a wide range of temperatures, an essential property for fast recharging batteries. It was proposed that high lithium mobility is due to the concerted motions between octahedral rotations and lithium. This was explored in $Li_{0.18}Sr_{0.66}Ti_{0.5}Nb_{0.5}O_3$ using a combination of *in situ* and *ex situ* powder diffraction techniques.

The presence or absence of dynamic octahedral rotations can be detected by measuring the rate of unit cell expansion in response to a change in temperature or a change in Ti/Nb-O bond length due to lithium insertion into the structure. *In situ* diffraction experiments at the Australian Synchrotron and on the POLARIS beamline at ISIS revealed an increase in the rate of unit cell expansion at high lithium contents, suggesting the damping of octahedral rotations. Diffraction data from ECHIDNA revealed that if more than one lithium ion is inserted per vacant site, lithium migrates into the oxygen window between vacant sites. Thus, lithium pinning in the oxygen window leads to a damping of the octahedral rotations. The *in situ* neutron diffraction data from POLARIS reveals behaviour which is more complex than expected however, with an increase in oxygen atomic displacement parameters preceding the predicted drop. That is, as more mobile lithium ions are inserted into the structure a greater proportion of the octahedra are interacting with the lithium and on average the ADPs increase. Thus, the *in situ* neutron experiment on POLARIS enabled the interaction between lithium and oxygen to be tracked during electrochemical cycling.

This project involved collaborations with Professor Helmut Ehrenberg and Dr Frieder Scheiber (KIT), Professor Kristina Edstrom and Dr Matthew Roberts (Uppsala University), Dr Jordi Jacas Biendicho and Dr Steven Hull (The ISIS Facility), Dr James Hester (ANSTO) and Dr Qinfen Gu (Australian Synchrotron). Dr William Brant's research was financially supported by an AINSE PGRA.

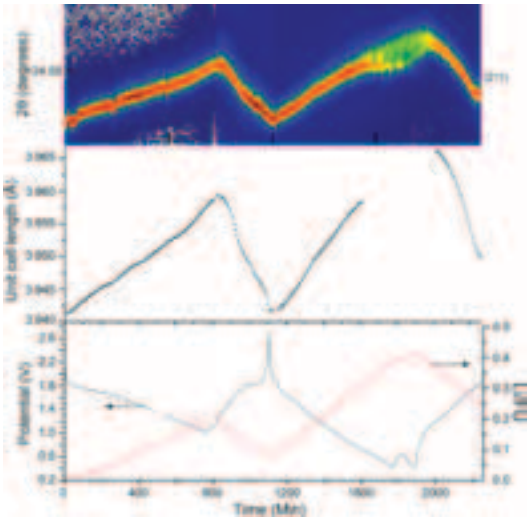

Figure 1: William Brant preparing the materials to be studied via a high temperature quench reaction.
Figure 2: The in situ electrochemical cell used on POLARIS
Figure 3: Plot of changes to the diffraction pattern, refined cell parameter and electrochemical profile as a function of time, collected in situ.

Unravelling the impact of oxidative stress on Alpha-Synuclein

α-Synuclein is a mystery protein found predominately in neural tissue, most famous as the main protein component of Lewy bodies (the characteristic marker of Parkinson's Disease (PD)). Not only is its normal function unknown, but also its role in the debilitating aging-related disease is subject to much speculation. There is, however, a hypothesis that the increase of oxidative damage in cellular membranes associated with aging may lead α-synuclein to form the oligomers that disrupt cellular membrane function, and nucleate the protein aggregates that form Lewy bodies. We have used neutron reflectometry to test this hypothesis, investigating the membrane binding interactions of α-synuclein and the impact of oxidative stress on them.

As shown in Figure 1 α-synuclein was introduced to model cellular membranes made from tethered phospholipid bilayers (tBLMs). The protein binding to undamaged tBLMs (see Figure 2a) was consistent with the known membrane binding conformation – the protein N-terminus forms an α-helix at the bilayer interface and the C-terminal domain extends from the bilayer into solution. A slight increase in the volume fraction of water in the hydrocarbon chains was also observed, indicative of some membrane penetration of α-synuclein with subsequent limited disruption of the bilayer.

The tBLMs were then oxidised with a mixture of Fe(II) and ascorbate, a common initiator of oxidative stress used to model natural damage in the body. We have previously shown that after being exposed to oxidising conditions stressed model membranes have more and/or larger structural defects, which are expected to promote α-synuclein membrane binding and even initiate aggregation. Indeed, on exposure to the protein there was a large reduction in the amount of water in the hydrocarbon chains in the centre of the stressed membrane, as the protein readily displaces water in membrane defects as it penetrates the bilayer. However, otherwise the behaviour of the protein was very similar when comparing the binding on stressed and unstressed membranes (see Figure 2B), with the most significant differences being the increase in the amount of protein penetrating the bilayer, with a consequent decrease in the amount of α-synuclein bound in and above the head groups. No significant aggregation of the α-synuclein at the membrane surface and extending into solution was observed.

Overall, this work lends credence to the idea that the build-up oxidative damage in cellular membranes leads to an increase in the amount of α-synuclein protein penetrating the cellular membrane, with presumed disruptive effects on the membrane function in nerve tissue. But there is still no evidence of the nucleation of the Lewy bodies that are so characteristic of Parkinson's disease.

This work was carried out as part of the PhD thesis of Jackie Knobloch from the University of Auckland under the supervision of Dr Duncan McGillivray and Dr Andrew Nelson (Bragg Institute). The neutron reflectivity experiments were carried out on the INTER reflectometer at ISIS, supported by travel funding from AINSE. Jackie Knobloch is grateful for the support of an AINSE PGRA during her studies.

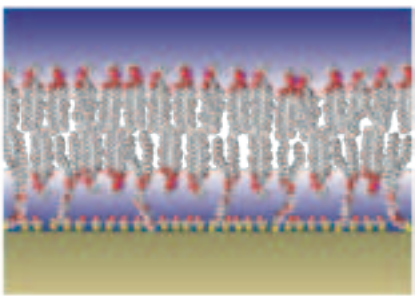

Figure 1. A schematic diagram of a tethered bilayer lipid membrane (tBLM).

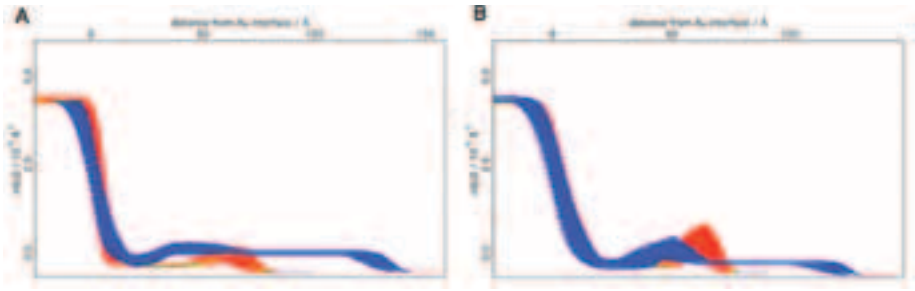

Figure 2. Neutron scattering length density profiles of unoxidised (A) and Fe(II) and ascorbate oxidised (II) tBLMs before (red) and after (blue) addition of 5 μM α-synuclein.

Combining polarised neutron and resonant X-ray scattering to uncover the magnetic interface of functional transition metal oxide thin films

Today's electronics are primarily based upon thin film semiconductor structures that utilise the charge of electrons. Spintronics based upon transition metal oxide (TMO) thin films additionally use the spin property of electrons to provide exciting new functionality. Controllable spin-polarised current flow in a magnetic tunnel junction (MTJ), for example, allows for a high-speed, high-density, robust memory device with no moving parts. Such a system can further be improved with the introduction of a multiferroic TMO such as $BiFeO_3$ (BFO) that exhibits strong coupling between ferroelectric and magnetic orders, enabling direct readout and control via an electric circuit.

Interestingly, the massive potential for TMO based spintronic devices arises from coupling between electrons only a few atomic layers from the interface. As such, the detailed origin of the physics that form in these thin film systems is still under debate since standard experimental techniques do not provide the depth-sensitive information required to study buried magnetic interfaces [1]. To overcome this issue, we present an approach utilising the combination of polarised neutron reflectometry (PNR) and element-specific X-ray resonant magnetic reflectometry (XRMR) as a means of quantifying the magnetic, structural and chemical properties of TMO structures with sub-nanometre resolution in the interfacial region, well beyond what is capable with standard techniques [2]. The time-of-flight PNR instrument Platypus, located at the Bragg Institute, ANSTO, was essential to our study, in particular for the ability to apply both positive and negative magnetic fields without depolarisation of the neutron beam, making it possible to probe the full hysteresis of our samples.

We applied this approach to gain unique insight into bilayers of BFO and 100% spin polarised ferromagnetic $La_{0.67}Sr_{0.33}MnO_3$ (LSMO), a system with great potential for MTJ devices. XRMR measurements at the Fe and Mn resonance edges allowed us to determine the element specific depth profile of the ferromagnetic moments in both the LSMO and BFO layers. In combination with PNR, shown in Figure 1, our measurements indicate a modified magnetic region within the LSMO layer. Resonant X-ray reflection measurements indicate a region of an altered Mn- and O-content at the interface, with a thickness matching that of the modified magnetic layer. The close correlation between the observed region of altered stoichiometry and magnetic properties forms despite an atomically flat interface shown via transmission electron microscopy (TEM). This result clearly imparts the importance of our approach, which reveals the magnetic, chemical and structural properties of TMO thin film interfaces.

There exists an extraordinary opportunity to fine-tune the stoichiometry and magnetism at the interface in these systems. In this way the spin-polarised current flow can be optimised, essential to the performance of derived technical devices like magnetic tunnel junctions and other spintronic applications.

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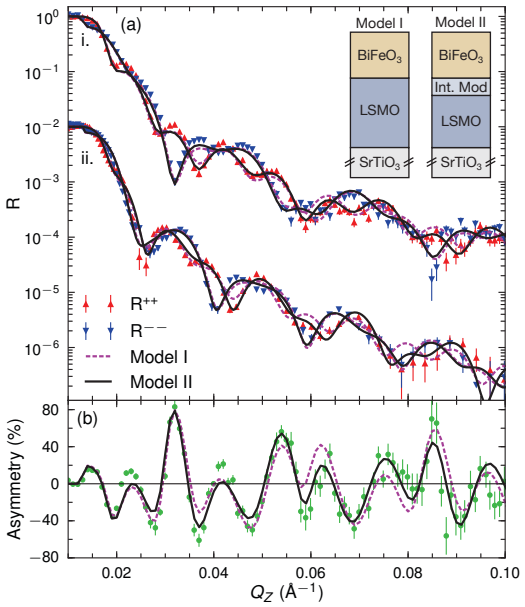


Figure 1: (a) PNR reflectivity for the spin polarised R++ and R-- channels of a (i) 30 nm LSMO / 20 nm BFO sample collected on NRex, FRM-II at T=150 K and (ii) 30 nm / 30 nm on Platypus, ANSTO at 300 K (b) Spin asymmetry between channels of experiment (i). The best fit to the data was obtained with an intermediate region with modified magnetic properties extending 2.6 nm into the LSMO layer (Model II).

AINSE Winter School 2014

Monday 14th July 2014 to Friday 18th July 2014

The Winter School continues to be a most valuable AINSE activity for the promotion of research opportunities at the Australian Nuclear Science and Technology Organisation (ANSTO) to prospective research students. One student is selected by the AINSE councillor at each of the 46 member universities and organisations. The purpose of the Winter School is to enable undergraduate students from member universities and member organisations to participate in experiments at Lucas Heights utilising some of the facilities at ANSTO. The aim of this approach is to encourage undergraduates to take an interest in nuclear science and engineering and to learn how to apply these in their future research.

Equally important is the social programme including speakers to encourage discussion not just on scientific issues but also on how science and technology might impact on current social issues and vice versa, as well as general aspects of a career in science and engineering. A component of the school is the research roundup program, which encourages students to discuss prospective honours projects with ANSTO scientists and build collaborations in nuclear science and engineering.

The Winter School was fortunate to have AINSE PGRA and research fellows assisting with the organisation. AINSE would like to thank Lydia Mackenzie, University of Queensland, Josie Auckett, University of Sydney, and Alison Blyth, Curtin University for their invaluable help. 2014 was also the first year to have a student from the University of New South Wales, enrolled in Australia's first and only nuclear engineering program, Master of Engineering Science in Nuclear Engineering. This course offers graduate students the opportunity to train for a career in the nuclear industry.

AINSE was proud to present three high-profile guest speakers in 2014: Dr Cathy Foley, Chief of the CSIRO's Division of Materials Science and Engineering, Professor Dale Bailey, Principal Physicist, Department of Nuclear Medicine, Royal North Shore Hospital / Professor in Medical Radiation Sciences, University of Sydney, and Dr Adi Paterson, Chief Executive Officer of ANSTO.

Student	
Ruth Bajo	ACU
Aniket Kulkarni	ADE
Dana Goodacre	AKL
Saliha Muradoglu	ANU
Carline Bakker	CAN
Ashlea Kinnane	CBR
Madeline Goddard	CDU
Alyce Goode	CSU
Joshua Butson	CUR
Daniel Batey	DEA
Jakob Brooks	ECU
Adam Trewarn	FED
Ka Yan (Sharon) Yu	FLI
Ashleigh Immers	GNS
Carol Muller	JAM
James Donlon	LAT
Grace York	MAC
Hannah Van Bentum	MAS
Kristopher Orlowski	MEL
Marthinus Stephanus Jacobs	MON
Edwin Mutai	MUR
Andre Cook	NCT
Vinay Babu Yalamanchili	NSW
Ben Nistor	OTA
Jacob Seiler	QLD
Georgia Brown	QUT
Krichelle Mariano	RMI
Levi Loughlin	SCU
Tao Chen	SWI
Maggie Corrigan	SYD
Linda Hong	SYN
Georgia Wulf-Rhodes	TAS
Edward Ledingham	UNE
Athanasia Dalkos	USA
Jemma Nicholls	USC
Aaditi Dang	USQ
Le Quan Ly	UTS
Georgina Carson	UWA
David Wales	UWS
Andrew Galloway	VUW
Matthew Cooke	WAI
Wanchese Saktura	WOL

Discipline / Area of Study	No.
Archaeology	1
Biochemistry	1
Biology	1
Biomedical Science	1
Biotechnology	1
Chemistry	11
Engineering	5
Environmental Science	6
Forensic Science	1
Geology	6
Mineral Science	1
Nuclear Medicine	2
Pharmaceutical science	1
Physics	6
Science	2

Previous year's attendance:

2013 – 42 students

2012 – 38 students

2011 – 41 students

2010 – 37 students

2009 – 33 students

"Friendly group + Excellent staff + Inspiring research = Life-changing experience!"

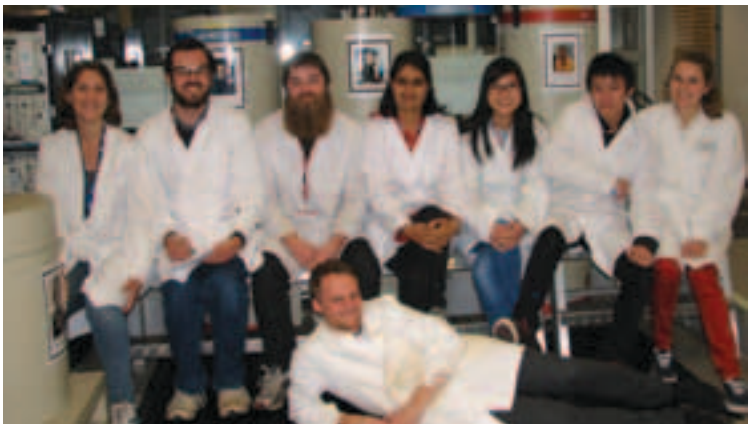
"It made me very interested and excited about techniques and developments, and I intend to now continue to try to learn more about the areas I learnt about with AINSE"

"Prior to the Winter School I had heard of some of the instruments at ANSTO, but had no idea what one would use the techniques for. The Winter School was a great "ice breaker" and introduction"

"It was such a fantastic opportunity to meet such inspirational people and get to see and interact with the technology. Amazing stuff! Feeling very inspired to further my knowledge of science and nuclear science techniques"

"I would like to thank the lovely staff for organising the school and ensuring our comfort. I really loved the experience and encourage other students (future) to take the opportunity to participate"

AINSE Winter School 2014 participants, representing 42 universities and organisations.



Students taking part in the natural radioactivity in environmental studies experimental session.

Sydney Harbour Cruise - students enjoying the many social activities AINSE Winter School offers.

Students enjoying lunch time discussions.

2014 Conferences and Workshops

AINSE conferences play a major part in the information exchange process for scientific and technological information, providing a forum for debate and an opportunity for young researchers to present their work. In 2014 AINSE hosted the following conference:

12th AINSE-ANBUG Neutron Scattering Symposium (AANSS 2014)

24-25 November 2014

14 Organisations were involved in the conference – AKL, ANS, ANU, FLI, LAT, MEL, MON, NCT, NSW, QLD, SYD, TAS, UTS and UWA

AINSE hosted the 12th annual AANSS symposium on the 24th and 25th November 2014. This meeting is unique on the annual conference calendar. Rather than focus on a specific scientific discipline, these meetings highlight the diversity of science that can be carried out by firing neutral, sub-atomic particles at 'things'. Congratulations to Zakiah Mohamed from the University of Sydney for winning the "Best Student Poster Prize", and Henry Kirkwood from La Trobe University for winning the "Best Student Presentation Prize". Along with organising the conference, AINSE provided 11 students with travel support.

Additional Support

Participants from member organisations receive assistance with travel and accommodation to attend a number of other AINSE approved conferences. These were:

ASAP2014 – ACAS School for Accelerator Physics - Australian Synchrotron, Melbourne

13-23 January 2014

7 Students - ANU / SYD / NSW

20th International Workshop on Inelastic Ion-Surface Collisions (IISC) - Fleurieu Peninsula, South Australia

16-21 February 2014

3 Students - NCT

Nuclear History - ANSTO Tour - ANSTO

12 March 2014

20 Students - SYD

Neutron strain scanning and imaging for engineering applications - AINSE

1-2 April 2014

17 Students – LAT / ADE / MON / SWI / UOW / NSW / RMI / SYN

Accelerator Technical Forum (ATF) 2014 - Rydges Hotel, Cronulla

20-23 May 2014

Australian Quaternary Association, Biennial Meeting - Grand Hotel, Mildura

29th June - 4th July 2014

7 Students – WOL / CBR / ANU / MEL / UWA / VUW

Heavy Ion Accelerator Symposium - ANU

30 June - 3 July 2014

22nd Australian Earth Science Convention 2014 - Newcastle NSW

7-10th July 2014

15 Students – WOL / RMI / ANU / QUT / NSW / UWA / MAC / CUR/ ADE

AINSE Perth Symposium - University of Western Australia

8 July 2014

Students from ECU / CUR / UWA / MUR / CSI

9th IsoEcol International Conference, Applications of Stable Isotope Techniques to Ecological Studies - University of Western Australia

3-8 August 2014

8 Students – CAN / SYD / LAT / DEA / MON / AKL / FLI

AINSE Adelaide Symposium – Flinders University

19 August 2014

Students from FLI / ADE / USA / QLD

South Pacific Environmental Radioactivity Conference (SPERA 2014) - Charles Darwin University

1-4 September 2014

6th AONSA Neutron School - Serpong, Indonesia

12-17 October 2014

2 Students – SYD / AKL

12th International Conference on X-Ray Microscopy 2014 - Melbourne Convention and Exhibition Centre

26-31 October 2014

1 Student - QLD

ANSTO-AINSE Neutron School 2014 - AINSE Theatre / Bragg Institute

4-7 November 2014

15 Students – ANU / NSW / VUW / USA / AKL / DEA / MAS / MUR / CUR / SWI / MON

Nuclear Sciences and Technologies for Health - University of Sydney

12-14 November 2014

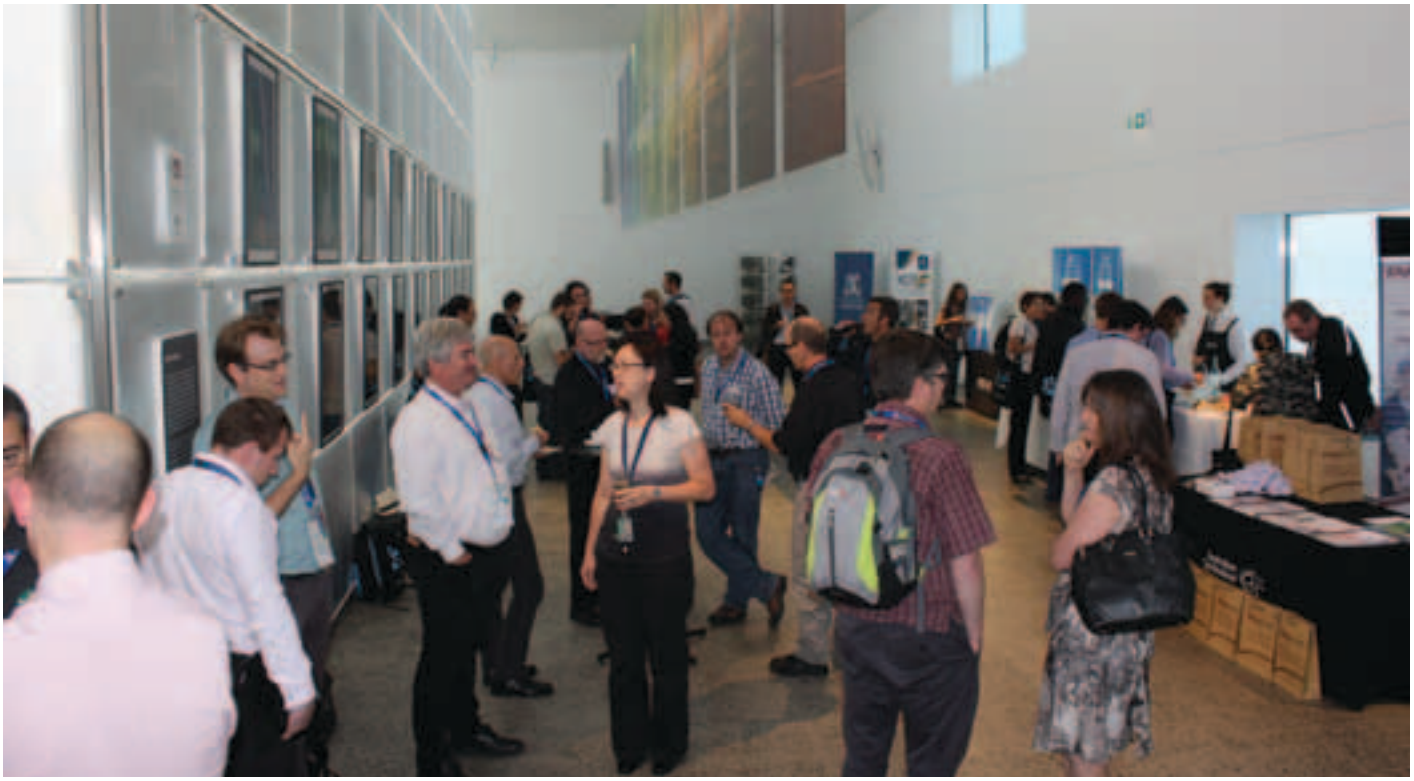
Synchrotron & Neutron New Users Symposium 2014 - Australian Synchrotron, Melbourne

19 November 2014

7 Students – JAM / USA / MUR / SYD / TAS

Bragg Institute PAC meetings

AINSE supported travel and accommodation for member representatives to attend two Program Advisory Committee meetings. These meetings provide recommendations to the Head of the Bragg Institute concerning the allocation of beam time.



New user Symposium 2014, Synchrotron, accelerator and neutron techniques held at the Australian Synchrotron on the 19th November 2014 (Image courtesy of the Australian Synchrotron)

AINSE COUNCIL 2014 Member Organisations and Representatives at Council

Three Meetings of Council were held in 2014.
In May 2014 a General Meeting and Annual General Meeting were held on the same day. A General meeting was also held in December 2014.

Abbreviations	Organisation	Membership Commenced	Councillor	Meetings Attended
ACU	Australian Catholic University	2001	Dr Brian Bicknell	2
ADE	The University of Adelaide	1958	Emeritus Professor Richard Keene	3
AKL	The University of Auckland	1995	Professor James Metson	2
ANS	ANSTO, Bragg Institute	1958	Dr Robert Robinson	3
ANS	ANSTO, Institute for Environmental Research		Professor John Dodson	3
ANS	ANSTO, Institute for Materials Engineering		Professor Lyndon Edwards	0
ANU	The Australian National University	1958	Professor Keith Fifield	2
CAN	University of Canterbury	2005	A/Professor Greg Russell	3
CBR	University of Canberra	1996	Professor Bill Maher	2
CDU	Charles Darwin University	1995	Professor Jim Mitroy	2
			A/Professor Krishnan Kannoorpatti	1
CQU	CQ University	1991	A/Professor Owen Nevin	3
CSI	CSIRO	2010	Dr Patrick Hartley	2
CSU	Charles Sturt University	1995	Dr Padraig Strappe	3
CUR	Curtin University of Technology	1989	Professor Craig Buckley	3
DEA	Deakin University	1997	Professor Lee Astheimer	0
ECU	Edith Cowan University	1996	A/Professor Stephen Hinckley	2
FED	Federation University Australia	1997	Dr Jessica Reeves	3
FLI	Flinders University	1966	A/Professor Claire Lenehan	2
GNS	GNS Science	2005	Dr Christopher Daughney	3
GRI	Griffith University	1975	Professor Greg Hope	1
JAM	James Cook University	1970	A/Professor Scott Smithers	2
LAT	La Trobe University	1966	Dr Andy Herries	2
MAC	Macquarie University	1966	Professor Peter Nelson	0
MAS	Massey University	2014	Professor Richard Haverkamp	1
MEL	The University of Melbourne	1958	Professor Jim Camakaris	0
			A/Professor Damian Myers	1
MON	Monash University	1961	Professor Ian Smith	2
MUR	Murdoch University	1985	Dr Aleks Nikoloski	2
NCT	The University of Newcastle	1965	Dr Silvia Frisia	0
			Professor Erich Kisi	1
NSW	The University of New South Wales	1958	Professor Robert Burford (President)	2
			Professor Justin Gooding	1
OTA	University of Otago	2007	Professor Gary Wilson	0
QLD	The University of Queensland	1958	Professor Ian Gentle	3
QUT	Queensland University of Technology	1992	Professor Godwin Ayoko	3

RMI	Royal Melbourne Institute of Technology	1988	Professor Suresh Bhargava	0
SCU	Southern Cross University	1994	Professor Bill Boyd	3
SWI	Swinburne University of Technology	1991	Professor Elena Ivanova	1
SYD	The University of Sydney	1958	Professor Brendan Kennedy, (President)	2
			Professor Jill Trewhella	1
SYN	Australian Synchrotron	2010	Professor Andrew Peele	0
TAS	University of Tasmania	1958	Professor Andrew McMinn	3
UNE	The University of New England	1958	Dr Chris Fellows	3
USA	University of South Australia	1991	Professor Namita Choudhury	3
USC	University of Sunshine Coast	2010	Professor John Bartlett	3
USQ	University of Southern Queensland	1996	A/Professor Joachim Ribbe	1
UTS	University of Technology Sydney	1988	Professor Greg Skilbeck	2
			Professor Michael Cortie	1
UWA	The University of Western Australia	1958	A/Professor Pauline Grierson	3
UWS	University of Western Sydney	1993	A/Professor Gary Dennis	2
VUW	Victoria University of Wellington	2010	Professor Mike Wilson	2
WAI	The University of Waikato	2011	A/Professor Graham Saunders	3
WOL	University of Wollongong	1975	Professor William Price	1
	AINSE		Dr Frank Bruhn, (Managing Director)	2
	AINSE		Dr Paul Di Pietro, (Managing Director)	1

Alternate Representatives and other attendees

Abbreviations	Organisation	Representative	Meetings Attended
ANU	Australian National University	Professor Andrew Stuchbery	1
ECU	Edith Cowan University	Dr Magdalena Wajrak	1
MAC	Macquarie University	A/Professor Robert Willows	3
MEL	The University of Melbourne	A/Professor Damian Myers	2
OTA	University of Otago	A/Professor Claudine Stirling	3
RMI	RMIT University	Professor Gary Bryant	2
SWI	Swinburne University of Technology	Professor Saulius Joudkazis	2
SYN	Australian Synchrotron	Professor Michael James	3
UWS	University of Western Sydney	Dr Leigh Sheppard	1
	Independent Director / Finance ANSTO (o)	Ms Roslyn Hatton	2/1
	Independent Director	Dr Peter Coldrey	1
	ANSTO, Life Sciences	Dr Marie-Claude Gregoire	1
	Group Executive, ANSTO (o)	Dr Greg Storr	1
	NST, ANSTO	Dr Richard Garrett	1

(o) denotes observer

AINSE Board

Six Board Meetings were held in 2014 with details of Members and Observers listed below.

Executive Member	Office/Position	Organisation	Meetings Attended
Professor Brendan Kennedy	President (until June 2014)	The University of Sydney	3
Professor Robert Burford	President (from June 2014)	University of New South Wales	5
Dr Frank Bruhn	Managing Director (until June 2014)	AINSE	2
Dr Paul Di Pietro	Managing Director (from June 2014)	AINSE	4
Professor Lyndon Edwards		IME, ANSTO	5
Dr Robert Robinson		BI, ANSTO	5
Professor John Dodson		IER, ANSTO	6
Dr Peter Coldrey		Independent Director	6
Ms Roslyn Hatton		Independent Director	4
A/Professor Claire Lenehan		Flinders University	6
Professor Ian Gentle		The University of Queensland	3
Professor Ian Smith		Monash University	2
Observers			
Dr Marie-Claude-Gregoire		ANSTO, Life Sciences	2
Dr Greg Storr		ANSTO, Group Executive	1

AINSE Staff

Managing Director

Dr Frank Bruhn (until June 2014)

Dr Paul Di Pietro (commenced June 2014)

Secretariat

Ms Michelle Durant

Ms Rachel Caldwell (until June 2014)

Dr Ai Li Chau (commenced September 2014)

Mrs Sandy O'Connor (part-time)

Mrs Nerissa Phillips (part-time)

Chris Munn (part-time)

Specialist Committees for 2014

The Managing Director, AINSE, is an *ex-officio* (non-voting) member of all Committees. Committees met in May and in October. (a) indicates 'alternate' (c) indicates 'councillor'

Archaeology and Geosciences Committee

Professor Keith Fifield (c) – Convenor	The Australian National University
Professor Glenn Summerhayes	University of Otago
Dr Jessica Reeves (c)	Federation University
Dr John Bennett	ANSTO
Dr Quan Hua	ANSTO
Dr Michael-Shawn Fletcher	The University of Melbourne

Biotechnology and Biomedical Science Committee

Professor Michael Davies – Convenor	The University of Sydney
Professor Pam Sykes	Flinders University
Professor Les Copeland	The University of Sydney
A/Professor Damian Myers – Convenor	The University of Melbourne
Professor Elena Ivanova (a) (c)	Swinburne University
Professor Roger Price (a)	University of Western Australia
Dr Anthonin Reilhac-Laborde	ANSTO
Dr Ben Fraser	ANSTO
Dr Arnaud Charil (a)	ANSTO

Environmental Sciences Committee

A/Professor Pauline Grierson (c) – Convenor	University of Western Australia
Professor James Goff	The University of New South Wales
A/Professor Paul Augustinus	The University of Auckland
Professor Andrew McMinn (c)	The University of Tasmania
Dr Dioni Cendon	ANSTO
Dr Henk Heijnis	ANSTO
Professor John Dodson	ANSTO
Dr Kerrylee Rogers (a)	University of Wollongong

Materials – Structures and Dynamics Committee

Professor Gary Bryant – Convenor	RMIT University
Dr Victor Streltsov	CSIRO
Professor Roland De Marco	University of Sunshine Coast
Dr Ludovic Dumee	Deakin University
Dr Peter Holden	ANSTO
Dr Shane Kennedy	ANSTO
Dr Stephen Holt	ANSTO
Dr Garry McIntyre (a)	ANSTO

Materials – Properties and Engineering Committee

Professor Robert Burford - Convenor	The University of New South Wales
Professor Michael Cortie	University of Technology Sydney
Professor Roger Lewis	University of Wollongong
Dr Leigh Sheppard	University of Western Sydney
Professor Raman Singh	Monash University
Dr David Cohen	ANSTO
Professor Lyndon Edwards	ANSTO
Dr Greg Lumpkin (a)	ANSTO

Other Committees

12th AINSE-ANBUG Neutron Scattering Symposium (AANSS)

Ai Li Chau	AINSE (Conference Coordinator)
Neeraj Sharma	University of New South Wales (Conference Chair)
Chris Ling	University of Sydney
Michelle Durant	AINSE
Anton Le Brun	Bragg Institute, ANSTO

Winter School Committee

Professor Thomas Millar, Convenor	University of Western Sydney
Dr Frank Bruhn	AINSE
Dr Paul Di Pietro	AINSE
Ms Michelle Durant	AINSE
Ms Rachel Caldwell	AINSE
Ms Connie Banos	ALS, ANSTO
Dr Ben Fraser	ALS, ANSTO
Dr Andrew Studer	Bragg, ANSTO
Dr Tamim Darwish	Bragg, ANSTO
Mr Rob Russell	Bragg, ANSTO
Mr Rod Dowler	Discovery Centre
Dr Rachel Popelka-Filcoff	Flinders University
Dr Mihail Ionescu	IER, ANSTO
Ms Patricia Gadd	IER, ANSTO
Ms Danielle Fierro	IER, ANSTO
Dr Henk Heijnis	IER, ANSTO
Ms Atun Zawadzki	IER, ANSTO
Dr Daniel Gregg	IME, ANSTO
Dr Gordon Thorogood	IME, ANSTO
Mr Robin Foy	SERA, ANSTO
Ms Tina Paneras	SERA, ANSTO
Mr Ralph Blake	ANSTO

Directors' Report

for the year ended 31 December 2014

Your Directors present their report on the Company for the financial year ended 31 December 2014.

Directors

The names of Directors in office at any time during or since the end of the year are:

Professor Brendan Kennedy (resigned 30/06/14)

Emeritus Professor Robert Burford

Dr Frank Bruhn (resigned 10/06/14)

Dr Paul Di Pietro (commenced 11/06/14)

Professor John Dodson (resigned 31/12/14)

Professor Lyndon Edwards

Dr Robert Robinson (resigned 30/12/14)

Professor Ian Smith (commenced 20/08/14)

Professor Ian Gentle (commenced 20/08/14)

Dr Peter Coldrey

Ms Roslyn Hatton (resigned as Independent Board Member 24/09/14)

Associate Professor Claire Lenehan (commenced 12/03/14)

Ms Roslyn Hatton (recommenced as ANSTO representative Board Member 31/12/14)

Dr Richard Garrett (commenced 1/01/15)

Directors have been in office since the start of the financial year to the date of this report unless otherwise stated.

Principal Activities

The principal activity of the company during the financial year was to advance research, education and training in the field of nuclear science and engineering and related fields within Australasia by being, in particular, the key link between universities, ANSTO, other member organisations and major nuclear science and associated facilities.

The company's short-term objectives are to:

- Offer Research Grants, Postgraduate top up Scholarships, and Honours Scholarships to people in 46 member institutions for the conduct of research principally at ANSTO
- Organise conferences in specific areas relating to nuclear science and engineering and in related fields that utilise nuclear techniques analysis
- Support travel and accommodation for students and academics to present their AINSE supported research at conferences both within Australia and overseas.

The company's long-term objectives are to:

- Be an effective link between all stakeholders of nuclear science and engineering
- Play an advocacy role for the Australasian nuclear community
- Play a leading role in nuclear education and training
- Facilitate the development of multilateral and multidisciplinary strategic research initiatives
- Utilise new streams of funding to increase its impact

Directors' Report for the year ended 31 December 2014

Strategic plan

OUR VISION

AINSE will be a leading authority and resource in addressing Australia's societal challenges through nuclear science and engineering.

OUR MISSION

AINSE will reach its vision through:

- being an effective link between all stakeholders of nuclear science and engineering
- playing an advocacy role for the Australasian nuclear community
- playing a leading role in nuclear education and training
- facilitating the development of multilateral and multidisciplinary strategic research initiatives
- Utilising new streams of funding to increase its impact

STRATEGIC CONTEXT

AINSE has identified the following key trends and uncertainties influencing the future environment in which AINSE will operate.

Trends

- Integration of technologies at discipline boundaries
- Increasing role of science and technology in addressing grand societal challenges
- Ever-increasing flood of big data
- Increasing importance of large-scale strategic research
- Increasing importance of metric-driven funding
- Declining international competitiveness of the Australian manufacturing industry
- Increasing risks related to capex investments
- Declining industry R&D
- Low level of innovation in some Australian companies
- Evolution of the CRC system as a funding model

Uncertainties

- Ongoing funding for established infrastructure (both ANSTO and Universities)
- Ongoing debate about nuclear energy
- Industry appetite for nuclear research
- State of the Australian Research Council
- Research environment in nuclear areas in Asia
- Changes in geopolitical priorities
- AINSE/ANSTO relationship
- Rate of employment
- Stability of financial markets (domestic and international)
- Incentives for researchers to engage with industry

Directors' Report for the year ended 31 December 2014

STRATEGIC PRIORITIES

AINSE has defined the following seven strategic priorities for its Strategic Plan. These will drive our focus, resource allocation and how we monitor our success over the life of the Strategic Plan.

1. Effectively communicate AINSE's purpose to a wide range of different stakeholders

- Clearly enunciate AINSE's value proposition and align it with the priorities of Government, ANSTO and the Universities.
- Enhance AINSE's outreach activities to reach a wider audience beyond nuclear scientists and engineers.
- Work with outcome-focused advocacy groups to enhance the impact of nuclear technology.
- Re-evaluate the metrics AINSE uses to measure and demonstrate its performance.
- Constantly review how we best serve our stakeholders.

2. Create an appropriate balance between funding project-based research and funding/ facilitating multilateral and multidisciplinary collaboration

- Explore future opportunities for funded collaborative projects through workshops related to thematic areas.
- Ensure continued relevance of AINSE programs.
- Consider focussed program style grants in strategic areas.
- Maintain small grants opportunities.
- Encourage a broad engagement within member organisations.

3. Demonstrate leadership in the education of Australasia's next generation of scientists with an interest in nuclear science and engineering

- Expand AINSE's role in engaging the next generation of scientist with an interest in nuclear science.
- Engage with Universities at the executive level to be aware of, and align with, Universities' strategic priorities.
- Consider University accreditation for some AINSE activities (e.g. short/intensive courses).

4. Develop AINSE's role as a credible advocate for the Australasian nuclear science and engineering community

- Maintain and strengthen AINSE's independence while providing value to ANSTO.
- Speak with a coherent voice representing universities on nuclear aspects.
- Become a facilitator of increasing industry awareness (e.g. promotions, training courses, education, and professional development).
- Maintain and further develop a network of experts to communicate the state of the art in nuclear science and technology.
- Draw on AINSE alumni as a resource of support and expertise.
- Develop and maintain a catalogue of key messages that decision makers should be aware of.
- Provide leadership in the development of a decadal plan for nuclear infrastructure investment.

Directors' Report for the year ended 31 December 2014

5. Provide an effective and efficient link between different capabilities related to nuclear science and engineering

- Support the user base across the facilities at ANSTO, Australian Synchrotron, and other AINSE-supported facilities.
- Become a facilitator for collaboration and complementary use of scientific infrastructure.
- Effectively access the expertise within AINSE to facilitate optimum use of capabilities.
- Make effective use of the expertise and enthusiasm of ANSTO staff.
- Re-establish AINSE's reputation with the ARC and NHMRC as credible lead organisation for funding proposals (e.g. LIEF, Centres of Excellence).

6. Seize new opportunities for funding beyond AINSE's traditional sources

- Be prepared to take advantage if/when new funding opportunities arise.
- Develop links with the philanthropy community through the AINSE Trust.
- Exploit our developed authority to leverage joint industry/government funding for innovation initiatives.
- Use our wide membership base and coherence as a credible argument to demonstrate an effective and efficient return on government/industry investment.

7. Diversify AINSE's membership and stakeholder base

- Increase the range of opportunities for existing members through flexible membership arrangements and new services.
- Review our membership fee calculation.
- Explore how to expand our stakeholder base, e.g. medical research organisations, international and environmental organisations, industry.

Directors' Report for the year ended 31 December 2014

Information on Directors

The Directors in office at the date of this report are listed below with particulars of qualifications, experience and special responsibilities (if any).

Robert Burford – President

Board Member since May 2014

36 years at UNSW, most recently as Associate Dean, Research, Engineering, and Head, School of Chemical Engineering.

BSc (Hons), PhD, FRACI, FIEAust, FIChemE

Paul Di Pietro – Managing Director

Board Member since June 2014

20 years' experience in engineering, scientific research and research management.

BE (Hons), PhD, MAICD

Lyndon Edwards – Board Member

Board Member since 2008

31 years' experience in academia and scientific research in Australia and UK.

MA, DPhil(Oxon), FIMMM, CEng

Roslyn Hatton – Board Member

Independent Board Member until September 2014

Board Member representing ANSTO since December 2014

26 years in public (ANAO) and private (Ernst & Young) sector audit and 8 years at the Commonwealth Bank in a financial accounting role. Currently the Finance Manager – Govt Finance Policy at ANSTO.

BComm (Accounting, finance and information systems) UNSW

FCA

Richard Garrett – Board Member

Board Member since January 2015

30 years' experience in synchrotron radiation research and research management in Australia and the USA.

BSc (Hons) PhD

Peter Coldrey – Board Member

Board Member since August 2012

27 years' experience in the industrial research in chemical and ophthalmic lens industry.

FTSE, BE,PhD, BCom,

Claire Lenehan – Board Member

Board Member since March 2014

16 years' experience in scientific research.

PhD.

Ian Smith – Board Member

Board Member since August 2014

40 years' experience in Medical Research,

Research Administration and Industry Engagement,

most recently as Vice Provost (Research and Research Infrastructure)

Monash University

UK and Australia.

PhD

Ian Gentle – Board Member

Board Member since August 2014

32 years' experience in academia and scientific research and research management.

PhD

Directors' Report for the year ended 31 December 2014

Meetings of Directors

During the financial year, 6 meetings of directors were held. Attendances by each director were as follows:

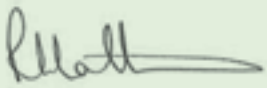
	Number eligible to attend	Number attended
Professor Brendan Kennedy	3	3
Emeritus Professor Robert Burford	6	5
Dr Frank Bruhn	2	2
Dr Paul Di Pietro	4	4
Professor John Dodson	6	6
Professor Lyndon Edwards	6	5
Dr Robert Robinson	6	5
Associate Professor Claire Lenehan	6	6
Professor Ian Smith	3	2
Professor Ian Gentle	3	3
Dr Peter Coldrey	6	6
Ms Roslyn Hatton	4	4

The Company is incorporated under the Corporations Act 2001 and is a company limited by guarantee. If the company is wound up, the constitution states that each member is required to contribute a maximum of $10 each towards meeting any outstanding obligations of the entity. At 31 December 2014, the total amount that members of the company are liable to contribute if the company is wound up is $460 (2013: $450).

Auditors Independence Declaration

The auditor's independence declaration for the year ended 31 December 2014 has been received and can be found on page 42 of the report.

Signed in accordance with a resolution of the Board of Directors.



Roslyn Hatton
Director

Paul Di Pietro
Director

Dated this 13th day of April, 2015

Auditor's Independence Declaration

for the year ended 31 December 2014

I declare that, to the best of my knowledge and belief, during the year ended 31 December 2014 there have been:

(i) no contraventions of the auditor independence requirements as set out in the Corporations Act 2001 in relation to the audit; and

(ii) no contraventions of any applicable code of professional conduct in relation to the audit.

Escott Aston
Chartered Accountants

David G Aston
Partner

RIVERWOOD NSW 2210

Dated this 22nd day of January, 2015.

Statement of Financial Position as at 31 December 2014

	Notes	31-Dec-14 $	31-Dec-13 $
ASSETS			
Financial Assets			
Cash	2	10,972	70,040
Trade and Other Receivables	3	174,505	245,024
Investments	4	2,767,788	1,890,441
Other	5	55,202	21,266
Total Financial Assets		3,008,467	2,226,771
Non-Financial Assets			
Plant and Equipment	6	46,810	46,123
Total Non-Financial Assets		46,810	46,123
Total Assets		3,055,277	2,272,894
LIABILITIES			
Payables			
Trade and Other Payables	7	461,644	387,846
Employees	7	-	13,818
Other	7	3,636	-
Total Payables		465,280	401,664
Provisions			
Employees Provisions	8	65,911	92,078
Total Provisions		65,911	92,078
Total Liabilities		531,191	493,742
NET ASSETS		2,524,086	1,779,152
Equity			
Awards Reserve	10	2,205,514	1,747,664
Accumulated Surplus		318,572	31,488
TOTAL EQUITY		2,524,086	1,779,152

The accompanying notes form part of these financial statements

Statement of Profit or Loss and other Comprehensive Income

	Notes	31-Dec-14 $	31-Dec-13 $
Operating Revenue			
Payments from members		3,578,579	3,436,510
Interest Received		74,879	78,697
Other	12	23,483	16,883
Total Operating Revenue		3,676,941	3,532,090
Operating Expenses			
Wages & Salaries		324,148	408,820
Superannuation		53,995	45,258
Consultancy Fees		123,059	8,512
AINSE Awards			
Students		432,467	611,189
Research Fellowship		363,489	477,608
Research Awards		1,165,320	1,116,086
Conference Subsidies		97,785	95,760
External Grants		(2,483)	-
Doubtful Debt		150,502	-
Other Expenses		223,725	202,170
Total Operating Expenses		2,932,007	2,965,403
Surplus (Deficit) for the year		744,934	566,687
Accumulated Surplus brought forward		31,488	(1,229,786)
Accumulated Surplus (Deficit)		776,422	(663,099)
Other Comprehensive Income		-	-
Transfer (to)/from Reserves			
Awards Reserve	10	(457,850)	694,587
Total Other Comprehensive Income		(457,850)	694,587
Accumulated Surplus at end of financial year		318,572	31,488

The accompanying notes form part of these financial statements

Statement of Cash Flows for the year ended 31 December 2014

	Notes	31-Dec-14 $ Inflows/(Outflows)	31-Dec-13 $ Inflows/(Outflows)
CASH FLOWS PROVIDED BY (USED IN) OPERATING ACTIVITIES			
Receipts from operations		23,483	16,883
Receipts from members		3,482,467	3,354,545
Interest received		67,588	88,343
		3,573,538	3,459,771
Grant payments		(2,056,578)	(2,300,643)
Payments to suppliers and employees		(698,681)	(1,886,297)
		(2,755,259)	(4,186,940)
Net cash flows provided by (used in) operating activities		818,279	(727,169)
Net increase (decrease) in cash held		818,279	(727,169)
Cash at beginning of reporting period		1,960,481	2,687,650
Cash at end of reporting period	2/4	2,778,760	1,960,481

Statement Of Changes In Equity for the year ended 31 December 2014

	Awards Reserve $	Accumulated surplus/(deficit) $	Total $
Balance at 1 January 2013	2,442,251	(1,229,786)	1,212,465
Surplus / (Deficit) attributable to company	-	566,687	566,687
Transfers (to)/from reserves	(694,587)	694,587	-
Balance at 31 December 2013	1,747,664	31,488	1,779,152
Surplus / (Deficit) attributable to company	-	744,934	744,934
Transfers (to)/from reserves	457,850	(457,850)	-
Balance at 31 December 2014	2,205,514	318,572	2,524,086

The accompanying notes form part of these financial statements

Notes to the Financial Statements for the year ended 31 December 2014

Note 1: Statement of Significant Accounting Policies

The financial report covers AINSE (AINSE Ltd) as an individual entity. It is a company limited by guarantee.

Basis of Preparation

The financial statements are general purpose financial statements that have been prepared in accordance with Australian Accounting Standards - Reduced Disclosure Requirements of the Australian Accounting Standards Board (AASB) and the Corporations Act 2001. The company is a not-profit entity for financial reporting purposes under Australian Accounting Standards.

Australian Accounting Standards set out accounting that the AASB has concluded would result in financial statements containing relevant and reliable information about transactions, events and conditions. Material accounting policies adopted in the preparation of these financial statements are presented below and have been consistently applied unless stated otherwise.

The financial statements, except for the cash flow information, have been prepared on an accruals basis and are based on historical costs, modified, where applicable, by the measurement at fair value of selected non-current assets, financial assets and financial liabilities.

a) Income Tax

AINSE is exempt from income tax under section 50-5 of the Income Tax Assessment Act 1997 as the Company is established for the purpose of enabling scientific research to be conducted in Australia.

b) Property, Plant and Equipment

Each class of property, plant and equipment is carried at cost or fair value, less where applicable, any accumulated depreciation and impairment losses.

Plant and Equipment

Plant and equipment are measured on the cost basis less depreciation and impairment losses.

The cost of fixed assets constructed within the economic entity includes the cost of materials, direct labour, borrowing costs and appropriate proportion of fixed and variable overheads.

Subsequent costs are included in the asset's carrying amount or recognised as a separate asset, as appropriate, only when it is probable that future economic benefits associated with the item will flow to the group and the cost of the item can be measured reliably. All other repairs and maintenance are charged to the income statement during the financial period in which they are incurred.

Depreciation

The depreciable amount of all fixed assets excluding plant and equipment currently under construction, is depreciated on a straight line basis over their useful lives to the Company commencing from the time the asset is held ready for use. The depreciation rates used for each class of depreciable assets are:

Class of Fixed Asset	Depreciation Rate
Plant and Equipment	15 - 35%
Motor Vehicles	25%
Furniture and Fittings	10 - 25%

The asset's residual values and useful lives are reviewed, and adjusted if appropriate, at each balance date.

An asset's carrying amount is written down immediately to it's recoverable amount if the asset's carrying amount is greater than it's estimated recoverable amount.

Gains and losses on disposals are determined by comparing proceeds with the carrying amount. These gains or losses are included in the statement of profit or loss and other comprehensive income.

Notes to the Financial Statements for the year ended 31 December 2014

c) Financial Instruments

Initial recognition and measurement

Financial instruments are initially measured at fair value plus transaction costs except where the instrument is classified "at fair value through profit or loss", in which case transaction costs are recognised as expenses in profit or loss immediately.

Financial instruments are subsequently measured at fair value, amortised cost using the effective interest method, or cost. Where available, quoted prices in an active market are used to determine fair value. In other circumstances, valuation techniques are adopted.

Amortised cost is calculated as the amount at which the financial asset or financial liability is measured at initial recognition less principal repayments and any reduction for impairment, and adjusted for any cumulative amortisation of the difference between the initial amount and the maturity amount calculated using the effective interest method.

Fair value is determined based on current bid prices for all quoted investments. Valuation techniques are applied to determine the fair value for all unlisted securities, including recent arm's length transactions, reference to similar instruments and option pricing models.

Financial assets at fair value through profit and loss

Financial assets are classified at "fair value through profit or loss" when they are either held for trading for the purpose of short-term profit taking, derivatives not held for hedging purposes, or when they are designated as such to avoid an accounting mismatch or to enable performance evaluation where a group of financial assets is managed by key management personnel on a fair value basis in accordance with a documented risk management or investment strategy. Such assets are subsequently measured at fair value with changes in carrying amount being included in profit or loss.

Loans and receivables

Loans and receivables are non-derivative financial assets with fixed or determinable payments that are not quoted in an active market and are subsequently measured at amortised cost. Gains or losses are recognised in profit or loss through the amortisation process and when the financial asset is derecognised.

d) Impairment of Assets

At each reporting date, the Company reviews the carrying values of its tangible and intangible assets to determine whether there is any indication that those assets have been impaired. If such an indication exists, the recoverable amount of the asset, being the higher of the asset's fair value less costs to sell and value in use, is compared to the asset's carrying value. Any excess of the asset's carrying value over its recoverable amount is expensed to the statement of profit or loss and other comprehensive income.

Where it is not possible to estimate the recoverable amount of an individual asset, the Company estimates the recoverable amount of the cash-generating unit to which the asset belongs.

e) Employee Benefits

Provision is made for the Company's liability for employee benefits arising from services rendered by employees to balance date. Employee benefits that are expected to be settled within one year have been measured at the amounts expected to be paid when the liability is settled, plus related on-costs. Employee benefits payable later than one year have been measured at the present value of the estimated future cash outflows to be made for those benefits.

Notes to the Financial Statements for the year ended 31 December 2014

f) Provisions

Provisions are recognised when the Company has a legal or constructive obligation, as a result of past events, for which it is probable that an outflow of economic benefits will result and that outflow can be reliably measured.

g) Cash and Cash Equivalents

Cash and cash equivalents include cash on hand, deposits held at call with banks, other short-term highly liquid investments with original maturities of three months or less, and bank overdrafts. Bank overdrafts are shown within short-tem borrowings in current liabilities on the balance sheet.

h) Revenue

Revenue relating to the provision of services is recognised to the extent that expenditure is recoverable, which may be before or after delivery of the service to the customer.

Grants in relation to the day to day operations of the Company are recognised when the entity obtains control of the grant and it is probable that the economic benefits gained from the grant can be measure reliably.

Interest revenue is recognised on the proportional basis taking into account the interest rates applicable to the financial assets.

All revenue is stated net of the amount of Goods and Services Tax.

i) Goods and Services Tax (GST)

Revenues, expenses and assets are recognised net of the amount of GST, except where the amount of GST incurred is not recoverable from the Australian Taxation Office. In these circumstances, the GST is recognised as part of the cost of acquisition of the asset or as part of an item of expense. Receivable and payables in the statement of financial position are shown inclusive of GST.

Cash flows are presented in the cash flow statement on a gross basis, except for the GST component of investing and financing activities, which are disclosed as operating cash flows.

j) Awards Reserve

The Awards Reserve represents the future commitments for funding to scientists for research in three categories:

Research Awards, Postgraduate Research Awards and Fellowships. Research Awards provide opportunities twice a year for academics to apply for funding for a period of 12 months. Postgraduate Research Awards provide support to post graduate students at any entry point in their qualification and last for the duration of their underlying primary scholarship. Fellowships are for a three-year appointment extendable to five years. AINSE currently has 4 Fellows but has not offered any new Fellowships since 2013.

Notes to the Financial Statements for the year ended 31 December 2014

	31-Dec-14 $	31-Dec-13 $
2. CASH		
Operating Account	9,972	69,040
Petty Cash	1,000	1,000
	10,972	70,040
3. TRADE AND OTHER RECEIVABLES		
Trade Debtors	268,755	1,100
Less: Provision for Impairment	150,502	-
	118,253	1,100
Other Receivables	56,252	243,924
Total Trade and Other Receivables	174,505	245,024
4. INVESTMENTS		
Cash Deposit Account	2,767,788	1,890,441
	2,767,788	1,890,441
5. OTHER CURRENT ASSETS		
Prepayments	37,195	10,550
Interest Accrued	18,007	10,716
	55,202	21,266
6. PLANT AND EQUIPMENT		
Plant and Equipment		
At Cost	11,831	15,780
Additions	-	-
Accumulated Depreciation	(1,208)	(4,627)
Total Plant and Equipment	10,623	11,153
Furniture and Fittings		
At Cost	10,340	-
Additions	-	-
Accumulated Depreciation	-	-
Total Furniture and Fittings	10,340	-
Motor Vehicles		
At Cost	45,613	45,613
Accumulated Depreciation	(19,766)	(10,643)
Total Motor Vehicles	25,847	34,970

Notes to the Financial Statements for the year ended 31 December 2014

Movements in Carrying Amounts	Plant & Equipment $	Furniture & Fittings $	Motor Vehicles $	Total $
Balance at 1 January 2013	6,085	-	44,092	50,177
Additions	6,042	-	-	6,042
Depreciation Expense	(974)	-	(9,122)	(10,096)
Balance at 31 December 2013	11,153	-	34,970	46,123
Additions / Accrual	5,789	10,340	-	16,129
Disposals	(4,137)	-	-	(4,137)
Depreciation Expense	(2,182)	-	(9,123)	(11,305)
Balance at 31 December 2014	10,623	10,340	25,847	46,810

	31-Dec-14 $	31-Dec-13 $
7. PAYABLES		
Trade and Other Payables	461,644	387,846
Employees - Accrued Salary and Wages	-	13,818
Revenue in Advance	3,636	-
Total Payables	465,280	401,664
8. PROVISIONS		
Employees Provision		
Provision for Annual Leave	22,660	47,776
Provision for Long Service Leave	43,251	44,302
Total Provisions	65,911	92,078

9. SEGMENT REPORTING

The Institute operates in the research sector providing funds for research to members within Australia and New Zealand.

10. AWARDS RESERVE

Awards Reserve		
Opening Balance at 1 January	1,747,664	2,442,251
Transfer from/(to) Other Comprehensive Income	457,850	(694,587)
Balance as at 31 December	2,205,514	1,747,664

The Awards Reserve was established to provide for the value of unexpended grants at the end of each year. It consists of commitments for Research Awards up to 6 months in advance (2013: 6 months in advance), Fellowships and Postgraduate awards.

11. AUDITORS REMUNERATION

Remuneration of the auditor of the entity for:		
Auditing the financial report	12,790	12,300
Other Services	2,790	3,805
	15,580	16,105

Notes to the Financial Statements for the year ended 31 December 2014

	31-Dec-14	31-Dec-13
	$	$
12. OTHER INCOME		
Sponsorships:		
AOCNS	3,636	-
AANSS	1,000	2,250
Conference Registrations	18,847	13,883
Other	-	750
	23,483	16,883

13. FINANCIAL INSTRUMENTS

Financial Risk Management

The Company's financial instruments consist mainly of deposits with banks, local money market instruments, short-term investments and accounts receivable & payable.

The main purpose of non-derivative financial instruments is to raise finance for the Company operations.

The Institute does not have any derivative instruments at 31 December 2014 (2013: nil).

Financial Instruments are held under normal commercial policies, terms and conditions regularly adopted by businesses in Australia.
The main risks the Institute is exposed to through its financial instruments are liquidity risk, credit risk and interest rate risk.

a) Liquidity Risk

The Company manages liquidity risk by monitoring forecast cash flows and ensuring that adequate utilised borrowing facilities are maintained.

b) Credit risk

The maximum exposure to credit risk, excluding the value of any collateral or other security at balance date to recognised financial assets, is the carrying amount, net of any provisions for impairment of those assets, as disclosed in the statement of financial position and notes to the financial statements.

The Company does not have any material credit risk exposure to any single receivable or group of receivables under financial instruments entered into by the economic entity.

c) Interest Rate Risk

The Company's exposure to interest rate risk, which is the risk that a financial instrument's value will fluctuate as a result of changes in market interest rates and the effective weighted average interest rates on those financial assets and financial liabilities, is as follows:

Notes to the Financial Statements for the year ended 31 December 2014

	Fixed Interest Rate Maturing							
	Weighted Average Effective Interest Rate		Floating Interest Rate		Non-interest bearing		Total	
	2014	2013	**2014**	2013	**2014**	2013	**2014**	2013
	%	%	$	$	$	$	$	$
Financial Assets								
Cash and cash equivalents	2.23%	3.41%	2,777,760	1,959,481	-	-	2,777,760	1,959,481
Trade and other receivables	-	-	-	-	174,505	245,024	174,505	245,024
Total Financial Assets			2,777,760	1,959,481	174,505	245,024	2,952,265	2,204,505
Financial Liabilities								
Trade and other payables	-	-	461,644	387,846	-	-	461,644	387,846
Total Financial Liabilities			461,644	387,846	-	-	461,644	387,846

Net Fair Values

The net fair value of financial assets and liabilities approximates their carrying value because of their short term to maturity. No financial assets and financial liabilities are readily traded on organised markets in standardised form. Financial assets where the carrying amount exceeds net fair values have not been written down as the Institute intends to hold the assets to maturity.

The aggregate net fair values and carrying amounts of financial assets and financial liabilities are disclosed in the Statement of Financial Position and in the Notes to the Financial Statements.

Aggregate net fair values and carrying amounts of financial assets and financial liabilities at balance date:

	2014		**2013**	
	Carrying amount	Net Fair Value	Carrying amount	Net Fair Value
Financial assets	$	$	$	$
Cash and cash equivalents	2,778,760	2,778,760	1,960,481	1,960,481
Trade and other Receivables	174,505	174,505	245,024	245,024
	2,953,265	2,953,265	2,205,505	2,205,505
Financial liabilities				
Trade and other payables	461,644	461,644	387,846	387,846
	461,644	461,644	387,846	387,846

Fair values are materially in line with carrying values.

Notes to the Financial Statements for the year ended 31 December 2014

14. ASSOCIATION DETAILS

The principal place of business of the Institute is:

Australian Institute of Nuclear Science and Engineering Limited

New Illawarra Road,

Lucas Heights, NSW 2234, AUSTRALIA

15. KEY MANAGEMENT PERSONNEL COMPENSATION

	Short-term Benefit	Post Employment	Total
	$	$	$
2014			
Total compensation	277,154	27,223	304,377
2013			
Total compensation	217,909	6,352	224,261

Key management personnel compensation includes a rate of $1,000 per meeting provided to Independent Board Members and secondment of ANSTO employee.

16. MEMBERS' GUARANTEE

The entity is incorporated under the Corporations Act 2001 and is an entity limited by guarantee.

If the entity is wound up the constitution states that each member is required to contribute a maximum of $10 each towards meeting any outstandings and obligations of the entity. At 31 December 2014 the number of members was 46 (In 2013 the number of members was 45).

Directors' declaration

for the year ended 31 December 2014

The Directors of the Company declare that:

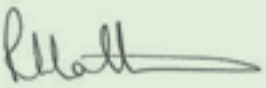
1. The financial statements and notes, as set out on pages 43 to 53, are in accordance with the Corporations Act 2001:

(a) Comply with Accounting Standards - Reduced Disclosure Requirements; and

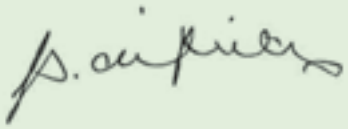
(b) Give a true and fair view of the financial position as at 31 December 2014 and of the performance for the year ended on that date of the Company.

2. In the Directors' opinion there are reasonable grounds to believe that the Company will be able to pay its debts as and when they become due and payable.

This declaration is made in accordance with a resolution of the Board of Directors.



Roslyn Hatton
Director



Paul Di Pietro
Director

Dated this 13th day of April, 2015

Independent audit report to the members

for the year ended 31 December 2014

Report on the Financial Report

We have audited the accompanying financial report of AINSE Limited (the Company), which comprises the statement of financial position as at 31 December 2014, statement of profit or loss and other comprehensive income, statement of changes in equity and cash flow statement for the year ended on that date, a summary of significant accounting policies and other explanatory notes and the directors' declaration.

Directors' Responsibility for the Financial Report

The directors of the Company are responsible for the preparation of the financial report that gives a true and fair view in accordance with Australian Accounting Standards – Reduced Disclosure Requirements and the Corporations Act 2001 and for such internal control as the directors determine is necessary to enable the preparation of the financial report that is free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on the financial report based on our audit. We conducted our audit in accordance with Australian Auditing Standards. These Auditing Standards require that we comply with relevant ethical requirements relating to audit engagements and plan and perform the audit to obtain reasonable assurance whether the financial report is free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial report. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the financial report, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Company's preparation and fair presentation of the financial report in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by the directors, as well as evaluating the overall presentation of the financial report.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Independence

In conducting our audit, we have complied with the independence requirements of the Corporations Act 2001. We confirm that the independence declaration required by the Corporation Act 2001, provided to the directors of AINSE Limited on 13th April 2015 would be in the same terms if provided to the directors as at the date of this auditor's report.

Audit Opinion

In our opinion, the financial report of AINSE Limited is in accordance with the Corporations Act 2001, including:

(a) Giving a true and fair view of the Company's financial position as at 31 December 2014 and of its performance for the year ended on that date; and

(b) Complying with Australian Accounting Standards and the Corporations Regulations 2001.

Escott Aston
Chartered Accountants

David G Aston
Partner

RIVERWOOD NSW 2210

Dated this 13th day of April, 2015

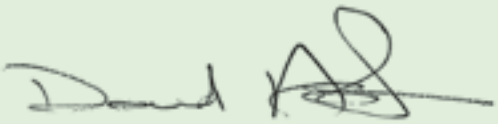
Auditor's Disclaimer

for the year ended 31 December 2014

The additional data presented in the Detailed Statement of Income & Expenditure on pages 58 & 59 is in accordance with the books and records of AINSE Ltd (our client) which have been subjected to the auditing procedures applied in the statutory audit of the Company for the year ended 31 December 2014. It will be appreciated that the statutory audit did not cover all details of the financial data and no warranty of accuracy or reliability is given. Neither the firm nor any member or employee of the firm undertakes responsibility in any way whatsoever to any person (other than the client) in respect of such data, including any errors or omissions therein however caused.

Escott Aston

Chartered Accountants



David G Aston
Partner

RIVERWOOD NSW 2210

Dated this 13th day of April, 2015

Detailed Statement of Income and Expenditure for the year ended 31 December 2014

		31-Dec-14		31-Dec-13
		$		$
Operating Revenue				
Payments from members		3,578,579		3,436,510
Interest Received		74,879		78,697
Sponsorships				
NCTA Conference Conference	3,636		-	
AANSS	1,000		2,250	
		4,636		2,250
Conference Registrations		18,847		13,883
Other Income		-		750
Total Operating Revenue		3,676,941		3,532,090
Operating Expenses				
Wages & Salaries		324,147		408,820
Superannuation		53,995		45,258
AINSE Awards				
Postgraduate Awards				
ANSTO Facility Costs	280,833		310,409	
Travel and Accommodation	46,044		35,096	
Stipends	95,205		256,561	
		422,082		602,066
Winter School		10,385		9,123
Research Fellowships		363,489		477,608
Research Awards				
ANSTO Facility Costs	909,678		928,408	
Minor Equipment and Materials	4,500		9,650	
Travel and Accommodation	236,492		151,378	
Other Costs	14,650		26,650	
		1,165,320		1,116,086
Conference Subsidies		97,785		95,760
External Grants		(2,483)		-
Conference Management		2,210		6,248
Publications and Promotions		17,724		9,363
Meetings and Committees		104,892		85,873
Doubtful Debt		150,502		-

Detailed Statement of Income and Expenditure for the year ended 31 December 2014

		31-Dec-14		31-Dec-13
		$		$
AINSE Secretariat				
Audit Fees	13,370		12,960	
Bank Charges	1,973		530	
Depreciation	11,305		10,096	
Advertising and Printing	-		208	
Office Supplies	2,349		4,677	
Postage and Telephone	1,546		2,291	
Insurance	13,532		12,128	
Entertaining	1,168		659	
Books and Software	-		283	
Office Equipment and Repairs	3,305		1,372	
Administration and Staff Training	2,819		10,904	
Travel and Accommodation	11,232		8,602	
Vehicle Expenses	11,000		9,620	
Consultancy Fees	123,059		8,512	
Staff Recruitment	240		261	
Loss on Disposal of Assets	4,137		-	
FBT Expense & Payments	6,013		686	
Credit Card Expense	10		-	
Legal expenses	13,083		22,690	
Miscellaneous	1,817		2,719	
		221,958		109,198
Total Operating Expenses		2,932,007		2,965,403
Surplus for the Year		744,934		566,687

AINSE Honours Scholarships

In 2014 AINSE continued the Honours program which first commenced in 2011. This program provides Honours Scholarships to a small number of excellent students who have a project which utilises the research facilities at ANSTO. The scholarships provide a stipend of $5,000. The students' supervisors held a current AINSE Research Award to support the facility access as well as travel and accommodation requirements.

The purpose of the scholarships are to provide a link between the Winter School and the other AINSE programs. There were 16 applications from 11 Universities.

The eight successful students and their projects were:

Lachlan Chartier, University of Wollongong

Advanced microdosimetry detection utilizing 3D MEMS technology

Diana Fusco, Flinders University

Resolving the age of potentially late-surviving 'megafauna' on Kangaroo Island using AMS radiocarbon dating of tooth enamel

Jodie Haigh, Queensland University of Technology

Radiation Modification of Polyoxazolines to Create a New Class of Elastomers with Biomedical Applications

Harry MacDermott, University of Tasmania

Human artefact or the imprint of climate? Using d^{13}C and ^{14}C dating to trace the late Holocene dynamics of a grassland-savanna-forest mosaic in southern Queensland

Bethany McBride, Australian National University

Structural modification and atomic diffusion of multi-functional langasite (LGS) single crystal under electrical field

Gabriel Murphy, University of Sydney

Disorder in the complex pyrochlores Bi2Ir2-xMnxO7-d

Silva Paulo, Federation University

Psyche bend lagoon: productive wetland to acid wasteland within a century

Rui Teng Wun, Monash University

Design of New Smart Polymer structures for imaging and therapeutic agent delivery: their precise tracking

AINSE Postgraduate Research Awards

An AINSE Postgraduate Research Award (PGRA) is a top-up scholarship. To be eligible for one of these awards, an applicant must hold an Australian Postgraduate Award (APA) or equivalent scholarship. The PGRA may be held until the expiry of the primary scholarship.

In addition to providing a student with a stipend of $7,500 pa, the award provides access to ANSTO's world-class facilities and expertise by making a nominal payment of $10,000 pa to ANSTO in recognition of the use of facilities and the contribution of the ANSTO co-supervisor. An allowance for travel expenses for two visits and a total of one month's accommodation to Lucas Heights per annum is also awarded.

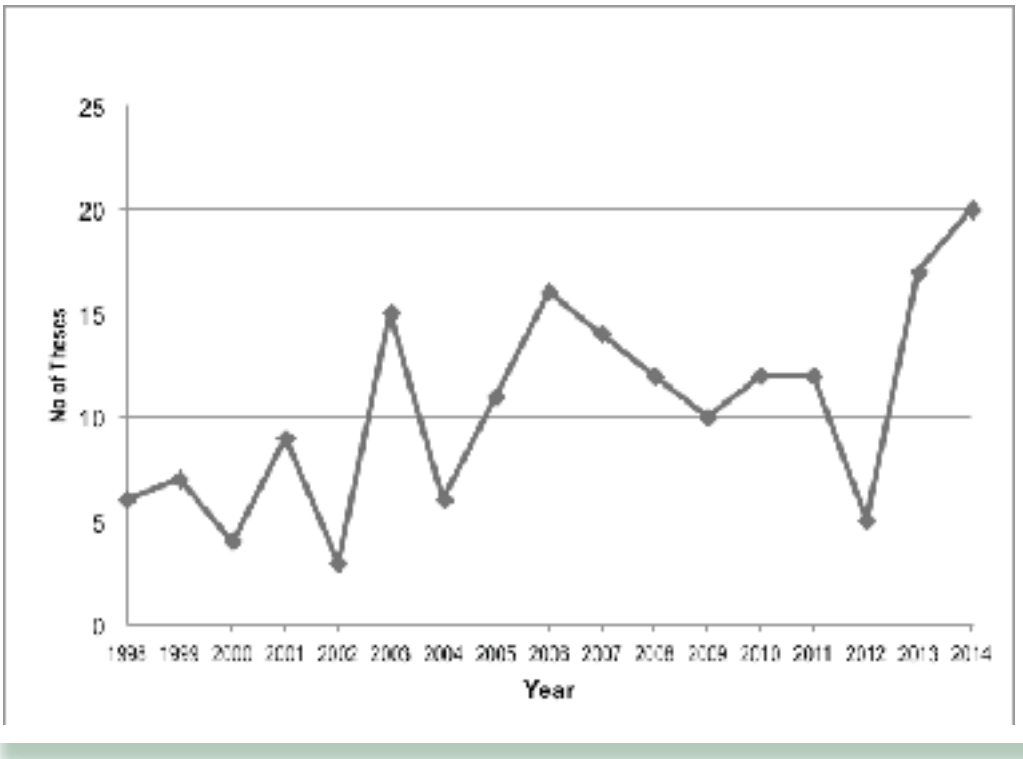
Eighteen new AINSE postgraduate research projects were supported by a PGRA in 2014, and 19 were finalised with the receipt of 20 theses, bringing the total number of current scholars to 37. Through its PGRA program, AINSE has now helped train 358 students in aspects of nuclear science and associated techniques of analysis. Many more students have been assisted with their research by gaining access to Lucas Heights facilities through AINSE Awards made to their supervisors. The Council believes that one of the most valuable roles fulfilled by AINSE is the provision of these scholarships.

John Ferris Memorial postgraduate scholars

2008-9 Jamie Howarth, University of Otago

2010-11 John Dawson, James Cook University

2013 Lydia Mackenzie Queensland University (current scholar)



Graph showing the number of PGRA scholars' theses received by year.

PhD theses of Postgraduate Scholars received during 2014

Bioprocessing and immobilization of cell envelope proteinases from Lactobacillus delbruecku subsp. lactis 313, for protein degration

Dominic Agyei, Chemical Engineering, Monash University. Commenced 1/7/2012

Structural studies of lead-free piezoelectrics with the fresnoite structure type

Patryck Allen, Chemistry, University of Sydney. Commenced 1/07/2009

Late quaternary ice sheet thinning and retreat in southern Victoria land, Antarctica

Jacob Anderson, Geology, University of Otago. Commenced 1/7/2013

Replicate palaeoclimate multi-proxy data series from different speleothems from N. Italy: Reproducibility of the data and new methodologies

Romina Belli, Environmental and Life Sciences, University of Newcastle. Commenced 1/07/08

Investigation of the structure-property relationships in defect perovskite lithium ion conductors

William Brant, School of Chemistry, University of Sydney. Commenced 1/7/2010

On the structure-property relationships in framework materials: negative thermal expansion & lithium insertion behaviours

Lisa Cameron, Chemistry, University of Sydney. Commenced 1/7/2010

Biomolecular engineering of human protein galectin-2: Effects on ligand binding, stability and physical state

Xiaojing Chen, Australian Institute for Bioengineering & Nanotechnology, University of Queensland. Commenced 1/7/2010

Interface effects in magnetic metal/metal-oxide thin film systems

David Cortie, Institute of Superconducting & Electronic Materials, University of Wollongong. Commenced 1/7/2010

Macromolecular structure and dynamics in the bacterial replisome

Flynn Hill, School of Chemistry, University of Wollongong. Commenced 1/7/2010

Stability of organic carbon in soil particle sized fractions at different depths: insight on C dynamics in two Australian soils

Eleanor Hobley, School of Engineering, University of Newcastle. Commenced 1/7/2010

A quaternary history of ice sheet dynamics in the transantarctic mountains

Kurt Joy, Gateway Antarctica, University of Canterbury. Commenced 1/7/2011

Probing the effects of oxidative stress on biomimetic cellular membrane interactions

Jacqueline Knobloch, Chemistry, University of Auckland. Commenced 1/7/2010

Spectroscopic investigations into disease diagnosis and pathogenesis

Joonsup Lee, Chemistry, University of Sydney. Commenced 1/7/2010

Solid-state micro-and nano-dosimetry: Theory and applications

Jayde Livingstone, Centre for Medical Radiation Physics, University of Wollongong. Commenced 1/7/2011

Natural carbonation of ultramafic rocks in the Great Serpentinite Belt, New South Wales, Australia

Hans Christoph Oskierski, Priority Research Centre for Energy, University of Newcastle. Commenced 1/7/2011

Synthesis of titanium dioxide nanoparticles: phase, morphology and size control

Jan-Yves Ruzicka, Chemistry, University of Canterbury. Commenced 1/07/2009

Study on newly discovered iron-based superconductors

Mahboobeh Shahbazi-Manshadi, Institute for Superconducting and electronic materials, University of Wollongong. Commenced 1/7/2012

The effect of the amylopectin molecular structures on the helical, crystalline and the crystalline-amorphous lamellar properties of native starch

Torsten Witt, Centre for Nutrition and Food Science, University of Queensland. Commenced 1/07/2009

Modelling the pH-and lipid-dependent activity of the antimicrobial protein amoebapore A

Gloria Xun, School of Biological Sciences/ Department of Chemistry, University of Auckland. Commenced 1/07/2009

Postgraduate scholars, and their projects, who were supported during 2014

Interfacial properties of stimuli-responsive peptide biosufactants and their interaction with chemical surtactants for advanced foaming control

Dominic Agyei, Chemical Engineering, Monash University. Commenced 1/7/2012

Biofilm inhibition by immobilisation of antimicrobial proteins

Peter Akers, School of Chemical Sciences, University of Auckland. Commenced 1/7/2012

East Antarctic Ice Sheet thinning and retreat of the Ross Sea Ice Sheet

Jacob Anderson, Geology, University of Otago. Commenced 1/7/2013

Temperature dependence of superstructural order and its role in oxide ion conduction in brownmillerites

Josie Auckett, School of Chemistry, University of Sydney. Commenced 1/7/2012

Morphology effect of novel poly(p-phenylene vinylene) brush thin films on their photoluminescence in solid-state

Paul Baek, School of Chemical Science, University of Auckland. Commenced 1/7/2014

The potential of Corchia Cave (Italy) speleothem trace element and radiocarbon variations as indicators of past environmental change

Petra Bajo, Resource Management & Geography, University of Melbourne. Commenced 1/7/2011

Neutron scattering on functional transition metal oxide thin films

Joel Bertinshaw, Physics, University of New South Wales. Commenced 1/7/2012

Compartmentalisation in protic ionic liquids: implications for synthetic and non-aqueous lifeforms

Saffron Bryant, Chemistry, University of Sydney. Commenced 1/7/2014

A coherent inelastic neutron scattering investigation of polycrystalline magnesium deuteride

Andrew Buckley, Imaging & Applied Physics, Curtin University of Technology. Commenced 1/7/2012

Search for novel multiferroic materials: Magnetic and structure phase transition study in Cu1-xZnxFe2O4 and SrCoO3-x

Fenfen Chang, Physics, University of New South Wales. Commenced 1/7/2014

Establishing a late Holocene chronology for the development and maintenance of open grasslands in northern Tasmania

Hahjung Chin, Archaelogy & Natural History, Australian National University. Commenced 1/7/2012

Design of novel radiopharmaceuticals based on calix[4]arene complexes of gallium and lutetium

Daniel D'Alessio, Chemistry, Curtin University of Technology. Commenced 1/7/2012

Using stable isotope analysis and carbon 14 to assess the feeding ecology of Southern Hemisphere humpback whales

Pascale Eisenmann, SOPOPP, Griffith University. Commenced 1/7/2014

Designed nanoparticles for dual-modality imaging and drug/radiopharmaceutical delivery: combining SPECT/PET and MRI

Lars Esser, Monash Institute of Phamaceutical Sciences, Monash University. Commenced 1/7/2014

Surface chemistry of a complex mineral system: Mineralogy and sorption processes in modified bauxite refinery residues

Tiago Freire, School of Environment, Science and Engineering, Southern Cross University. Commenced 1/7/2012

Understanding the mode of action of analgesic conotoxin Vc1.1 and other analgesic conotoxins.

Ellen Gleeson, Chemistry, Monash University. Commenced 1/7/2014

The interaction of the molecular chaperone 14-3-3 with aggregating target proteins

Katy Goodwin, Chemistry, University of Adelaide. Commenced 1/7/2011

Developing the first long-term (>150yrs) rainfall record for Southeast Queensland

Heather Haines, Australian Rivers Institute, Griffith University. Commenced 1/7/2014

From stellarators to tokamaks: the effects of 3D structure on Alfvén eigenmodes

Shaun Haskey, Physical Sciences and Engineering / Plasma Physics, Australian National University. Commenced 1/7/2010

Tracing the source of reservoir sediment using Pu-239 by AMS and Pb-210, Cs-137 by high resolution gamma spectrometry

Sarah Hobgen, Research Institute for Environment & Livelihoods, Charles Darwin University. Commenced 1/7/2011

Investigating the role of cholesterol in the metamorphic protein CLIC1's membrane interactions

Khondker Rufaka Hossain, Medical & Molecular Biosciences, University of Technology Sydney. Commenced 1/7/2013

Oxygen ordering induced magnetic phase transition in strain tuned SrCoO3-x thin film

Songbai Hu, Materials Science and Engineering, University of New South Wales. Commenced 1/7/2014

In-situ investigation of the mechanism of proton conduction in phosphotungstic acid impregnated mesoporous silica based proton exchange membranes for high temperature direct alcohol fuel cells

Krystina Lamb, Faculty of Science, Health, Education & Engineering, University of Sunshine Coast. Commenced 1/7/2013

Digging up the Yarra's dirty past: High resolution sediment core analysis using the ITRAX micro-XRF core scanner for identifying the water quality of historical floods in the Yarra catchment

Anna Lintern, Faculty of Engineering, Monash University. Commenced 1/7/2014

Holocene environments, human arrival and rates of environmental change in tropical northern Australia, South Wellesley Island

Lydia Mackenzie, Geography, Planning & Environment Management, University of Queensland. Commenced 1/7/2013

Particle-size dependence on arsenic distribution in historical gold mine wastes: Investigating the pathways for human exposure

Rachael Martin, School of Science, Information Technology & Engineering, University of Ballarat. Commenced 1/7/2013

Investigation and development of molten salt reactor designs

Lance Maul, Mechanical & Manufacturing Engineering, University of New South Wales. Commenced 1/7/2014

Making low cost Australian carbon fibres

Srinivas Nunna, Institute of Frontier Materials, Deakin University. Commenced 1/7/2014

Coordination Frameworks: Host-guest chemistry and associated structural dynamics

Stephen Ogilvie, Chemistry, University of Sydney. Commenced 1/7/2013

Towards single cell isolation

Stephen Parker, Chemistry, University of New South Wales. Commenced 1/7/2011

Inter-aquifer connectivity - investigating groundwater movement through regional aquitards utilising uranium isotopes

Stacey Priestley, School of the Environment, Flinders University. Commenced 1/7/201

Plasma equilibrium and stability in presence of flow and pressure anisotropy in a linear pinched helicon discharge

Zhisong Qu, Plasma Research Laboratory, Australian National University. Commenced 1/7/2014

Structural, magnetic and electronic properties of technetium oxides

Emily Reynolds, Chemistry, University of Sydney. Commenced 1/7/2013

Use of small angle x-ray and neutron scattering techniques to construct quantitative models that correlate the morphology fluctuations of graphene-based disordered lamellar structures with the transport of liquids, ions, and gasses within these materials

Ashley Roberts, Materials Engineering, Monash University. Commenced 1/7/2014

Carbon burial and vertical accretion rates in seagrass sediments in Moreton Bay

Jimena Samper-Villarreal, Marine Spatial Ecology Lab, University of Queensland. Commenced 1/7/2012

Neutron reflectometry for the kinetic study of biomimetic calcium phosphate growth on a zein protein template

Rayomand Shahlori, School of Chemical Sciences, University of Auckland. Commenced 1/7/2014

Determining and controlling residual stress in parts made from Selective Laser Melting (SLM)

Tim Slingsby, Materials Engineering, Monash University. Commenced 1/7/2013

The environmental fate of silver iodide and indium(III) oxide used for cloud seeding operations in the Snowy Mountains region of New South Wales

Nicola Stromsoe, Geography, University of Queensland. Commenced 1/7/2011

Nanostructure at complex suractant-polymer interfaces

Kristian Tangso, Drug Delivery Disposition & Dynamics, Institute of Pharmaceutics, Monash University. Commenced 1/7/2012

An archaeological and palaeoenvironmental investigation into prehistoric occupation of the Namadgi Ranges in the southeast Australian uplands

Fenja Theden-Ringl, Archaeology and Natural History, Australian National University. Commenced 1/7/2013

Radio frequency wave dynamics in the H-1 Heliac and MagPIE

Alexander Thorman, Plasma Research Laboratory, Australian National University. Commenced 1/7/2014

Neutron scattering techniques to probe hydride ligand dynamics in catalytically relevant metal hydrides

Catriona Vanston, School of Chemistry, University of Tasmania. Commenced 1/7/2012

Inelastic neutron scattering studies of crystal field splitting in lanthanoid-polyoxometalate Single-Molecule Magnets

Michele Vonci, Chemistry, University of Melbourne. Commenced 1/7/2014

Structure-function relationships in metal hydrides: origin of pressure hysteresis

Timothy Webb, Queensland Micro-and Nanotechnology Centre, Griffith University. Commenced 1/7/2012

The character and evolution of upland chain-of-ponds: Developing a geomorphic framework for conservation and rehabilitation

Rory Williams, Environment & Geography, Macquarie University. Commenced 1/7/2014

Aluminium mobility and geochemistry in acid sulfate soils using novel isotope exchange techniques and Accelerator Mass Spectrometry

Yliane Yvanes-Giuliani, Civil and Environmental Engineering, University of New South Wales. Commenced 1/7/2011

AINSE Research Fellows

AINSE, in conjunction with the Australian Nuclear Science and Technology Organisation (ANSTO) in 2006 established a Fellowship Scheme to add impetus to member Universities' growing stature in nuclear science and engineering and in related fields. The first two Fellowships were awarded in 2006. Fellowships are for a three-year appointment in the first instance with the possibility of an extension to five years where subsequent continuing appointment at the university is foreseen. Due to financial constraints, the AINSE Board decided not to offer any more new Research Fellowships from 2013.

Since the commencement of the program in 2006 AINSE has awarded the following Fellowships:

2006 Darren Goossens Australian National University

Study of the nature and role of nanoscale order in complex materials

Concluded November 2011

Dr Goossens is employed in the Research School of Chemistry, ANU as a research associate.

2006 Daniel Riley University of Melbourne

Use of ultra-fast in-situ diffraction in the development of advanced materials

Concluded June 2010

Dr Riley is employed at ANSTO as a research scientist in the Institute of Materials Engineering.

2007 Duncan McGillivray University of Auckland

Probing the mechanisms of biomembrane interactions

Concluded December 2010

Dr McGillivray is employed as a senior lecturer in the School of Chemistry at The University of Auckland.

2007 Moeava Tehei University of Wollongong

Study of relationships between function, structure and dynamics of biological molecules by neutron scattering

Concluded March 2013

Dr Tehei is employed as the Scientific Leader Diagnostics and Therapeutics at IHMRI.

2008 Lizhong He University of Queensland

The physical states of pharmaceutical proteins and self-assembled proteins

Concluded December 2011

Dr He is employed as a senior lecturer in the School of Chemical Engineering at Monash University.

2008 Helen McGregor University of Wollongong

El Niño in context: reading the coral record of past climate extremes

Concluded October 2013

2009 David Turner Monash University

Structural studies of metal organic materials for gas storage and anion exchange

Concluded December 2012

Dr Turner is employed as ARC Future Fellow at Monash University.

2009 John Daniels University of New South Wales

Application of advanced diffraction techniques for component and material design in functional, biological and structural applications

2010 Rachel Popelka-Filcoff Flinders University

Geochemical characterisation of Australian ochre by k0-neutron activation analysis for characterisation and sourcing of aboriginal Australian mines and artefacts

2010 Roman Dronov Flinders University

Design of advanced optical biosensors through neutron based surface analysis

Concluded October 2013

2011 Alison Blyth Curtin University of Technology

Molecular, stable isotopic and radiocarbon analyses of organic matter preserved in terrestrial records

2012 Dr Neeraj Sharma University of New South Wales

Developing improved materials for energy generation and storage

Summary of AINSE Research Awards

The primary purpose of the AINSE Research Award program is to facilitate access by researchers from member organisations to the nuclear science and technology facilities at Lucas Heights and other AINSE supported facilities. They provide facility access fees as well as travel and accommodation expenses during periods of attachment. AINSE Research Awards very often provide the valuable initial support which leads to additional external funding, estimated to have been worth several million dollars to member organisations. For neutron scattering projects conducted at ANSTO's Bragg Institute facility charges do not generally apply, however travel and accommodation support is provided and AINSE covers the novice users' charge for this facility access.

The disciplines involved during 2014 included the following:

physics applied, electronic materials, mathematical, nuclear and high energy, plasma

chemistry applied, biochemistry, chemical technology, polymer science

engineering chemical, electrical, mechanical, materials science, microelectronics

biology biological science, biomaterials, biomedical science and engineering, biophysics, genetics

environmental and earth sciences Antarctic and Southern Ocean studies, environmental biology, environmental geology, geochemistry, geomorphology, geography, coastal management, marine science

medicine medical and health physics, and nuclear

plus Aboriginal and Torres Strait Studies, anthropology, archaeology, botany, cultural studies, geophysics, microscopy and microanalysis, natural history, resource science and management, safety science, zoology.

Research Awards for 2014 are shown on the following pages in order by member organisation to highlight the diversity of institutions and disciplines within which projects occur. This program includes arrangements for general research students to access Lucas Heights facilities but does not include access arrangements for AINSE postgraduate scholars (reported separately). The total amount of the awards for each member organisation is also shown. The listing also includes travel support or novice user support given for access to the ANSTO Bragg facility and the name of the person supported is listed above the proposal title. Nearly all of these projects involved close cooperation with ANSTO staff and required substantial use of the reactor, accelerators and other facilities at ANSTO.

For information on particular facilities utilised, see the Researchers' Guide on our home page, http://www.ainse.edu.au.

A total of 201 projects were allocated funding in 2014. They had a total value of **$1,265,320** involving 33 of the forty-six members.

Australian Catholic University

ALNGRA14536	Vaughan Monamy	$3,150
Dietary preferences of insectivorous bats on permanent and ephemeral inland rivers.		
	Total	**$3,150**

University of Adelaide

ALNGRA14035	Ehsan Tavakkoli	$9,920
Long-term stabilisation of soil organic carbon (SOC) in micro- and nano-aggregates of soils: with a focus on high pH soils.		
	Total	**$9,920**

University of Auckland

ALNBRG143539	Peter Akers	$697
Probing the structure of surface immobilised PAMAM dendrimers.		
ALNGRA14001	Melinda Allen	$11,780
Climate Effects on Prehistoric Long-distance Interaction in Polynesia: Temporality of Cook Island Connectivity and Local Tool Production.		
ALNBRG143508	Seher Ata	$5,562
Interfacial behaviour of non-ionic surfactants and odecylamine.		
ALNGRA14501	Paul Augustinus	$8,195
Extracting high-resolution signals of Holocene environmental change from northern New Zealand lakes.		
ALNBRG143454	Adam Berlie	$922
In-situ observation of phase transition with dramatic physical dimension change on CuQ2-TCNQ single crystal.		
ALNBRG143458	Adam Berlie	$1,487
Low Energy Excitation of Multi-functional Langasite (LGS) Single Crystal.		
ALNBRG143459	Adam Berlie	$1,044
Low Temperature Magnetic Excitations in a Metal-Organic Ferromagnet.		
ALNGRA14018	Gary Brierley	$7,322
A cross-scalar examination of long-term sediment dynamics within the upper Yellow River.		
ALNBRG143430	Gang Chen	$5,127
The clarification of two puzzles in the current Ti-Ni binary phase diagram.		
ALNBRG143391	Martyn Coles	$3,400
Superbasic Guanidines.		
ALNBRG143463	Peter Czabotar	$1,208
Understanding interactions between the pore-forming protein Bax and biological membranes by neutron reflectometry.		
ALNBRG143309	Li Day	$10,146
Bilayer Models of the Milk Fat Globule Membrane.		
ALNBRG142214	Andrew Dingley	$3,340
The structure of hydramacin-membrane complexes by neutron reflectometry.		
ALNGRA14013	Murray Ford	$6,200
Recently deposited reef islands: modern sediment input or recycled relic sediment?		
ALNBRG143615	Estela Garcez	$684
Water in opal.		
ALNBRG143943	Estela Garcez	$884
Copy of P3615: Water in opal.		
ALNBRG143617	Yacine Hemar	$3,355
Gluten networks under shear.		
ALNBRG143171	Yan Ma	$535
Effect of post weld heat treatment on residual stress in *in-situ* alloyed and additively manufactured titanium aluminide components.		

ALNBRG141655	Duncan McGillivray	$4,307
Probing oxidative stress of cellular membranes.		
ALNBRG141656	Duncan McGillivray	$6,351
Probing oxidative stress of cellular membranes.		
ALNBRG143493	Phillip Nakashima	$5,334
Accurate atomic parameters for charge density study of simple metals.		
ALNBRG143442	Stuart Prescott	$12,565
Critical salt effects in polymer brushes.		
ALNBRG143524	Andrzej Radlinski	$9,890
Thermal maturity and gas and oil release potential of tight shales in unconventional petroleum targets of southern Georgina Basin.		
ALNBRG143538	Rayomand Shahlori	$892
Kinetic Biomimetic Calcium Carbonate Growth.		
ALNBRG143211	Tilo Soehnel	$7,356
Structural Studies of CuxCo1-xSb2O6 phase Transitions.		
ALNBRG143679	Tilo Soehnel	$3,294
Studies of crystal and magnetic structure of $(M'M'')_3Si_2Sn_7O_{16}$ (M = Mn, Fe, Co) Part II.		
ALNBRG143628	Sun Yung Kim	$5,424
The effect of various heat treatments on the residual stress of cold sprayed nickel based super alloy coatings.		
	Total	**$127,301**

Australian National University

ALNBRG143312	Robert Corkery	$5,334
SANS study to test structural models of photosynthetic membranes.		
ALNGRA14505	Richard Greene	$7,780
Baseline calibration of MIR to IBA: the first step towards wide spread chemical analysis of aeolian dust to improve provenancing.		
ALNBRG141717	Patrick Kluth	$6,060
SANS measurements of swift heavy ion tracks.		
ALNBRG143221	Yun Liu	$6,355
Structural Modification and atomic diffusion of Multi-functional Langasite (LGS)Single Crystal under Electrical Field.		
ALNBRG143682	Yun Liu	$859
Pressure and electric field induced phase transition in doped lead zirconate stannate titanates.		
ALNGRA14030	DC Bear McPhail	$7,575
The tritium composition of rainwater, surface water and groundwater in the Lake George basin, NSW.		
ALNGRA14513	Matthew Prebble	$7,500
Calibrating late Holocene precipitation changes in the SPCZ using Pb^{210} dating of lake sediments.		
ALNBRG143313	John White	$4,079
	Total	**$ 45,542**

Federation University

ALNGRA14039	Kim Dowling	$6,895
Goldfields fungi: Friend, Food or Fiend?		
ALNGRA14533	Giri Kattel	$5,000
Understanding ecological resilience of two contrasting floodplain wetlands in the River Murray system.		
ALNGRA14037	Jessica Reeves	$8,045
Industrial past, urban future: assessing risks of metal mobilisation in a contaminated wetland.		
	Total	**$19,940**

University of Canberra

ALNGRA14521	Duanne White	$14,190
Can meteoric Beryllium-10 be used to map the location of past ice shelves?		
	Total	**$14,190**

CQUniversity

ALNGRA14540	Scott Wilson	$4,460
Determining trophic transfer of micro-plastics through an aquatic food chain using isotopic signatures.		
	Total	**$4,460**

CSIRO

ALNBRG143122	James Boland	$551
Residual stress measurements in TSDC materials.		
ALNBRG143236	Darren Fraser	$1,326
Residual stresses in super alloy coatings made with high deposition rate Cold Spray manufacturing process.		
ALNGRA14556	Leigh Morpeth	$1,100
Small Angle X-Ray Scattering of Coal.		
ALNGRA14525	Megan Osmond	$15,400
Dermal penetration and bioaccumulation of titanium dioxide nanoparticles from topical sunscreen application: Development of an in vivo rodent model using a radiotracer approach.		
	Total	**$18,377**

Curtin University of Technology

ALNGRA14502	Alison Blyth	$13,440
Comparative radiocarbon dating of bulk and compound specific organic matter in Lake Chittering, Western Australia.		
ALNGRA14017	Kliti Grice	$1,990
Elemental distribution of Lower Jurassic calcium carbonate concretions.		
	Total	**$15,430**

Deakin University

ALNGRA14050	Ludovic DUMEE	$13,655
Investigating formation of high density nano-pores across pre-functionalized single graphene sheets by gamma-ray lithography.		
ALNGRA14552	Bronwyn Fox	$7,830
SAXS Analyses of the Nano-enhanced PAN Precursors for the Manufacturing of Australian High Performance Carbon Fibres.		
ALNGRA14553	Nishar Hameed	$9,200
Investigating the dispersion of graphene in flexible nanocomposite films.		
ALNGRA14532	Hashmath Hussain	$8,165
Novel nanoparticle mediated biomolecule delivery systems for plants.		
ALNBRG143307	Lingxue Kong	$3,911
Localisation of monomer in a self-assembled template.		
ALNGRA14004	Peter Macreadie	$4,980
Is ancient 'blue carbon' stabilized by its chemical composition and mineral environment?		
ALNGRA14031	Peter Macreadie	$13,200
Stability of ancient blue carbon in seagrass meadows.		
	Total	**$60,941**

Flinders University

ALNGRA14549	Gunther Andersson	$16,390
Diffusion at Interfaces in Photovoltaic Devices.		
ALNGRA14528	Erick Bestland	$13,030
Residence time of soil organic carbon and dissolved organic carbon in two contrasting soil types: Baseline data on soil carbon dynamics, Mt Lofty Ranges, South Australia.		
ALNBRG143305	Jacqueline Knobloch	$8,172
Interaction of cationic amphiphilic drugs with biomimetic membranes.		
ALNGRA14555	Jacqueline Knobloch	$8,160
Investigating the interaction of silver nanoparticles with model cellular membranes.		
ALNGRA14027	Sophie Leterme	$18,934
Impact of drought conditions on the uptake of trace metals by diatoms.		
ALNGRA14514	Gavin Prideaux	$2,880
Resolving the age of Australia's deepest Quaternary vertebrate sequence at the Wellington Caves, New South Wales, using AMS radiocarbon dating of bone and tooth enamel.		
ALNGRA14011	Amy Roberts	$7,510
An Investigation into the Compositional Variation of Clay Sources from the Atacama Region of Northern Chile using Neutron Activation Analysis (NAA).		
ALNGRA14516	Amy Roberts	$8,518
An Expanded Investigation into the Compositional Variation of Ceramics from Caleta Vitor in Northern Chile via Neutron Activation Analysis.		

ALNGRA14519	Wendy van Duivenvoorde	$9,130
Dating the Phoenician Shipwreck from Bajo de la Campana, Spain.		
ALNGRA14009	Lynley Wallis	$9,190
Analysis of ochres at Gledswood Shelter 1, northwest Queensland.		
ALNBRG143418	Christopher Wilson	$50
Texture characterization in quartzites and relationship to Himalayan Orogeny.		
ALNBRG143333	Julius Zieleniecki	$5,873
Influence of model drugs on Tethered Bilayer Lipid Membranes.		
ALNBRG143585	Julius Zieleniecki	$2,941
Influence and interaction of simple anaesthetics on tethered Bilayer Lipid Membrane systems.		
	Total	**$110,778**

Griffith University

ALNBRG143214	Evan Gray	$3,340
Preliminary high-resolution powder diffraction study of Magneli phases.		
ALNBRG143302	Gretel Heber	$978
A neutron reflectometry study of the interaction of octanohydroxamate with iron.		
ALNGRA14534	Jon Knight	$12,200
Independent dating of 210Pb mangrove sediment chronology using Pu concentration and isotopic ratios.		
	Total	**$16,518**

James Cook University

ALNGRA14049	Mohan Jacob	$21,735
Tailoring the electrical properties of environmentally friendly polymer thin films using irradiation.		
ALNGRA14554	Mohan Jacob	$6,240
Tailoring the optical and electrical properties of environmentally friendly polyterpenol thin films via the application of gamma radiation.		
ALNGRA14003	Stephen Lewis	$7,440
Mid-late Holocene sea-level variability in the central Great Barrier Reef: a novel record from the mid-shelf.		
ALNGRA14545	Bobby Kannan Mathan	$16,100
Surface engineering magnesium-based material using ion implantation for temporary body implant applications.		
ALNGRA14005	Scott Smithers	$7,440
A High-resolution Late-Holocene sea-level record from the Northern Great Barrier Reef: Age control for lagoonal infill, reef growth and reef island formation.		
	Total	**$58,955**

La Trobe University

ALNGRA14012	Andy Herries	$6,960
Comparing C14 dating of charcoal and Turbo sarmaticus opercula from a shell midden near Apollo Bay, Victoria.		
	Total	**$6,960**

Macquarie University

ALNGRA14523	Jennifer Cornish	$15,000
The effect of adolescent sugar consumption on brain resilience.		
ALNGRA14002	Paul Hesse	$7,440
Dating a multiproxy record of climate change from the Falkland Islands, South Atlantic Ocean.		
ALNGRA14507	Paul Hesse	$4,370
Radiogenic dating of a Falkland Islands peat core: recent dust and metal deposition in a remote oceanic site.		
ALNGRA14535	Matthew Kosnik	$14,440
Isotopic techniques to constrain the timing and cause of macrobenthic community changes in Port Jackson and Port Hacking.		
ALNGRA14537	Peter Nelson	$16,800
Source apportionment of fine ambient airborne particles in Suva and comparison with indoor environments.		
ALNGRA14014	Sandra Piazolo	$1,360
Neutron Activation Analysis of natural polycrystalline diamond aggregates.		
ALNBRG143495	SandrPiazolo	$340
The effect of deformation microstructures on reaction rates: Insights from phase transformation of pre-deformed KBr to KCl in the presence of a fluid.		
ALNGRA14034	Timothy Ralph	$5,600
Assessing environmental impacts of historical gold mining with ITRAX core scanning.		
ALNBRG143546	Artur Sawicki	$2,667
The solution structure of the magnesium chelates H-GUN4- Protoporphyrin IX complex.		
	Total	**$68,017**

University of Melbourne

ALNGRA14025	Uwe Ackermann	$8,120
The role of bioorthogonal chemistry in radiopharmaceuticals development.		
ALNGRA14028	Kathryn Allen	$13,905
Developing elemental tree-ring chronologies from multiple Tasmanian species for climate reconstruction.		
ALNGRA14504	Russell Drysdale	$8,320
Bomb-pulse 14C dating of a French Polynesian speleothem for palaeorainfall reconstruction.		
ALNGRA14509	David Kennedy	$3,720
Acid Sulfate Soils in Victorian Estuaries.		
ALNGRA14040	Spas Kolev	$12,080
Cellular localisation of mercury (Hg) and gold (Au) in selected plant species grown in substrates composed of mine tailings and heavy metal contaminated biosolids using micro-PIXE.		
ALNGRA14510	Philip Marren	$7,260
Evaluating bushfire controlled long-term sediment delivery from headwater catchments by dating pyrogenic carbon rich debris flows.		

ALNGRA14512	Petronella Nel	$13,960

Indigenous art fraud: comparative characterisation of ochres from the Kimberley region and other sources by Neutron Activation Analysis.

ALNGRA14033	Craig Nitschke	$8,375

Tree ferns as proxy records of stand dynamics and fire history in wet eucalypt and cool temperate rainforests in southeastern Australia.

ALNBRG143298	Frances Separovic	$702

The orientation of the deuterated antimicrobial peptide maculatin in bilayer membranes.

ALNGRA14539	Kale Sniderman	$7,500

Are northern- and southern-hemisphere climates synchronised on orbital timescales? Development of a high resolution, Early Pleistocene sediment chronology using ITRAX micro-XRF analyses.

ALNBRG143329	Rico Tabor	$4,098

Alignment and relaxation in bilayer phases using Rheo-SANS.

ALNBRG143330	Rico Tabor	$1,449

Aggregation and liquid crystals from new light-sensitive surfactants in ionic liquids.

ALNBRG143335	Rico Tabor	$1,076

Stabilisation of 2D nanomaterials in lamellar liquid crystals.

ALNBRG143592	Rico Tabor	$5,393

Combined USANS/SANS investigation of complex fluids.

ALNGRA14518	Ian Thomas	$5,800

Correlating the occurrence of carbonised particles in Tasmanian lake sediments with historically documented fires.

ALNBRG144202	Michele Vonci	$349

Ligand Field Splitting of Lanthanoid-Polyoxometalate Single Molecule Magnets.

	Total	**$102,107**

Monash University

ALNGRA14053	Yao Dong	$7,830

Assembly of polymer matrices enveloping lipid-based nanoparticles for drug delivery applications.

ALNBRG143301	Gil Garnier	$4,927

Effect of charge and counter ion condensation on chain conformation of a polyelectrolyte in concentrated solution.

ALNBRG143363	Gil Garnier	$2,189

Structure of adsorbed polyelectrolyte layer on cellulose films.

ALNBRG143293	Lizhong He	$1,552

Interaction of stimuli-responsive biosurfactants with a chemical surfactant at the air -water interface.

ALNBRG143294	Lizhong He	$6,105

Structures of DNA within DNA-capped nanoparticles: missing knowledge of soft corona.

ALNBRG143331	Lizhong He	$2,598

Interaction of designer biosurfactant peptide and protein at the oil-water interface: physical knowledge guiding design of nanoemulsion interface.

ALNBRG143527	Lizhong He	$259
Interaction of microRNA with peptide-functionalized nanoparticles.		
ALNBRG143244	Raafat Ibrahim	$2,170
Influence of Welding Parameters on Residual Stresses in Aluminothermic Rail Welds.		
ALNBRG143314	Huazhen Li	$4,649
Mechanism of enhanced foaming ability of biosurfactant protein by addition of.		
ALNGRA14052	Stefan Salentinig	$18,730
Deuterium NMR Study on the digestion of selectively deuterated triglyceride-oil emulsions.		
ALNBRG143606	Hsin-Hui Shen	$461
Protein secretion: Studying the folding and assembly of membrane proteins using neutron reflection.		
ALNGRA14022	Michael Whittaker	$11,950
Design of New Smart Polymer structures for imaging and therapeutic agent delivery: their precise tracking.		
ALNGRA14541	Vanessa Wong	$8,790
Australian continental dust flux to the Indian Ocean.		
	Total	**$72,210**

University of Newcastle

ALNBRG143145	Erich Kisi	$943
In situ study of oxide-carbide exchange reactions -2.		
ALNBRG143354	Erich Kisi	$7,065
Understanding Stress Distributions in Granular Materials.		
ALNBRG143734	Erich Kisi	$4,566
Understanding Stress Distributions in Granular Materials.		
	Total	**$12,574**

University of New South Wales

ALNGRA14550	Alice Antony	$2,200
Studying the structural changes for reverse osmosis membrane upon degradation.		
ALNGRA14551	Sean Cadogan	$1,440
The Dysprosium magnetic moment in Dy-nitride films.		
ALNBRG143626	Stewart Campbell	$558
Investigation of the low energy crystal field excitations of YbMn2Si2. Accommodation support.		
ALNBRG143611	John Daniels	$5,801
Structural investigations of mono-domain BNT-xBT single crystals.		
ALNGRA14046	Rylie Green	$11,300
Investigating the structure and function of hybrid conducting polymer/hydrogels.		
ALNBRG143503	Jan Manuel Hinterstein	$919
Correlation of macroscopic properties and structural response to an applied electric field in BNT-xBT.		
ALNBRG143192	Wayne Hutchison	$2,067
Investigation of magnetostructural transition induced by magnetic field in Fe doped MnCoGe.		

ALNGRA14543	Pramod Koshy	$16,100
Role of Contaminant and Dopant Ion Distributions on the Photocatalytic Properties of TiO2 Thin Films.		
ALNGRA14019	Scott Mooney	$6,200
Date What? The radiocarbon age of various fractions and components in peat and organic sediments.		
ALNBRG143237	Narendirakumar Narayanan	$1,276
Magnetic structures of the spin -1 multiferroic triple perovskite Ba3NiNb2O9 in an external magnetic field.		
ALNBRG143672	Narendirakumar Narayanan	$1,425
Magnetic structures of Ir containing double perovskites La2MIrO6 (M=Co,Ni,Cu).		
ALNGRA14020	Michael Rogers	$12,000
Quantifying the localisation of bisphosphonate drugs in mouse mammary tumours *in-vivo.*		
ALNGRA14032	Helen Rutlidge	$4,960
Paleoclimate records in cave speleothems: New trace elements as hydrological proxies for semi-arid karst environments.		
ALNGRA14547	Glen Stewart	$2,880
Crystal field splitting and hyperfine interactions in Na9[Dy(W5O18)2] - a dysprosium polyoxometalate single molecule magnet analogue.		
ALNGRA14557	Ashraf Uddin	$4,000
Study of ITO/ZnO and ZnO/Organic interfaces for OPV devices.		
ALNBRG143359	Clemens Ulrich	$6,479
Novel multiferroic materials for the next generation of microelectronics: the physics behind the coupling between the electric and magnetic degrees of freedom.		
ALNBRG143774	Clemens Ulrich	$1,410
Novel multiferroic materials for the next generation of microelectronics: the physics behind the coupling between the electric and magnetic degrees of freedom.		
ALNBRG143775	Clemens Ulrich	$558
Novel multiferroic materials for the next generation of microelectronics: the physics behind the coupling between the electric and magnetic degrees of freedom.		
ALNGRA14047	Clemens Ulrich	$4,800
X-ray reflection studies of superconducting/ferromagnetic single interfaces and superlattices.		
ALNGRA14527	Katerina Zavitsanou	$10,500
Imaging microglia with PET in a maternal infection model of schizophrenia.		
	Total	**$96,873**

University of Queensland

ALNBRG143665	Andrew Clulow	$3,416
Investigating the relationship between glass transition and diffusion in organic thin films.		
ALNBRG142313	Ian Gentle	$1,201
Non-Fullerene Based Acceptors for Organic Solar Cells (see also ALNBRG122313).		
ALNBRG143344	Ian Gentle	$2,546
Factors affecting interdiffusion of thin organic films.		
ALNBRG143643	Ian Gentle	$861
Solution Structure of Conjugated Polymers for Efficient Organic Photovoltaics.		

ALNGRA14530	Harald Hofmann	$15,005
Understanding groundwater dynamics on barrier islands using geochronological data: An example from Stradbroke Island, Southeast Queensland.		
ALNGRA14023	Daryl Joyce	$10,655
Disinfestation of Calypso mango using irradiation.		
ALNGRA14041	Catherine Lovelock	$4,960
The use of 14C and 210Pb to investigate historical variations in soil carbon accumulation in coastal wetlands of Moreton Bay, Australia.		
ALNGRA14008	Patrick Moss	$8,320
Late Quaternary environments of coastal subtropical south-eastern Queensland.		
ALNBRG141390	Andrew Whitten	$994
Structural Characterisation of the Munc 18c-Syntaxin4-SNAP23-VAMP2 complex.		
	Total	**$47,958**

Queensland University of Technology

ALNGRA14026	Malcolm Cox	$14,740
Potential impact of coal seam gas extraction on surface and groundwater systems in the Teviot Brook catchment.		
ALNGRA14044	Tim Dargaville	$7,655
Radiation Modification of Polyoxazolines to Create a New Class of Elastomers with Biomedical Applications.		
ALNGRA14051	Konstantin Momot	$7,620
Microstructural study of articular cartilage using X-ray scattering.		
	Total	**$30,015**

RMIT University

ALNBRG143289	Gary Bryant	$507
Neutron Scattering study of crystallization Colloidal Suspensions.		
ALNBRG143303	Gary Bryant	$744
Comparative SANS study of solute exclusion in multilamellar bilayer systems: sucrose and trehalose.		
ALNBRG143742	Gary Bryant	$311
New insights into colloidal phase transitions using SANS.		
ALNGRA14548	Graham Wild	$3,000
New High Dose Rate Dosimetry: The effect of gamma radiation on the mechanical properties of composite materials - Pilot.		
	Total	**$4,562**

Southern Cross University

ALNGRA14016	Malcolm Clark	$7,990
Isotopic determinations of mangrove sedimentation rate changes and bioturbation depths; can Northern NSW mangroves keep pace with sea-level change?		

ALNGRA14006	Renaud Joannes-Boyau	$9,890
Sourcing obsidian artefacts from the Mediterranean region: case study of the archaeological site of Renaghju, Corsica.		
ALNGRA14015	Damien Maher	$9,300
Are mangrove carbon exports, old or modern? A C-14 analysis of particulate organic carbon (POC), dissolved organic carbon (DOC), and dissolved inorganic carbon (DIC).		
	Total	**$27,180**

Swinburne University of Technology

ALNBRG143098	Ryan Cottam	$873
To measure the martensite transformation temperatures and arising quenching stresses of Ti-6Al-4V during in-situ quenching.		
ALNBRG143656	Elena Ivanova	$169
Dynamics of bacterial microstructure formation within hydrogels in the hydrated state.		
ALNGRA14043	Pandiyan Mugugaraj	$22,790
Reactive ion beam irradiation to fabricate P doped n-type semiconductive carbon nanostructures within polymer matrices.		
ALNBRG142146	Aimin Yu	$3,299
Effect of pH and salt on the structure change of polypeptide multilayer films.		
	Total	**$27,131**

University of Sydney

ALNGRA14522	Dale Bailey	$6,500
Do Human Pituitary Adenomas Demonstrate an Increased Expression of Corticotropin Releasing Factor (CRF) Receptors?		
ALNBRG143312	Min Chen	$2,667
SANS study to test structural models of photosynthetic membranes.		
ALNGRA14542	Wojciech Chrzanowski	$18,900
Multifunctional surfaces for implantable devices.		
ALNGRA14524	Manuel Graeber	$13,000
Development of multi-ligand imaging in a unique live null background model.		
ALNGRA14506	Daniel Harris	$5,580
Constraining the mid-Holocene highstand and abrupt sea-level fall in the Southern Great Barrier Reef.		
ALNBRG143662	Brendan Kennedy	$2,667
Structural studies of doped titanate perovskites.		
ALNGRA14021	David Pattison	$13,970
Assessing the fate of tryptophan radicals in peptides and proteins: the balance between crosslinks and peroxides.		
ALNBRG142954	Gregory Warr	$6,900
Understanding Amphiphilic Self-Assembly in and by Protic Ionic Liquids. Neutron scattering.		

ALNGRA14526	Giselle Yeo	$5,000
Gamma-ray sterilisation of peptide- and protein-coated polymer and metal surfaces.		
	Total	**$75,184**

University of Tasmania

ALNGRA14036	David Bowman	$8,680
Human artefact or the imprint of climate? Using d13C and 14C dating to trace the late Holocene dynamics of a grassland-savanna-forest mosaic in southern Queensland.		
ALNGRA14529	David Bowman	$5,320
The age and growth rate of Callitris sulcata, an endangered extra-Australian conifer.		
ALNGRA14503	Zanna Chase	$7,440
Improved quaternary age models for Ocean Drilling Program cores from the southern Australian dust corridor.		
ALNGRA14520	Jan cent van Moort	$7,650
Chemistry of minerals associated with the occurrence of native metals (in Tasmania).		
	Total	**$29,090**

University of South Australia

ALNBRG143550	Namita Choudhury	$3,391
USANS Characterization of the Morphology and Supramolecular Organisation of Protein-based Hydrogels. Accommodation and travel support.		
ALNBRG143603	Naba Kumar Dutta	$4,987
Understanding the self-assembly of novel multi responsive biomimetic protein polymers. Travel, accommodation and novice user support.		
ALNGRA14054	Sanjay Garg	$8,685
SAXS and XRD characterisation of Docetaxel Containing Polymeric Films.		
ALNBRG143489	Phillip Pendleton	$2,321
Probing structural perturbations in [Emim][[Zn(TFSI)3] ionic liquid induced by water and carbon dioxide.		
	Total	**$19,384**

University of the Sunshine Coast

ALNBRG143323	Roland De Marco	$382
The effect of water and heavy water on heteropoly acid impregnated mesoporous silica based proton exchange membranes.		
	Total	**$382**

University of Technology Sydney

ALNBRG143304	Stella Valenzuela	$3,153
CLIC1 penetration of Phospholipid / Cholesterol Membranes.		
	Total	**$3,153**

University of Western Australia

ALNBRG143728	Houman Alipooramirabad	$850
Effects of pass number and restraint on welding residual stresses.		
ALNBRG143736	Olivier Lavigne	$2,667
Copy of P3535: Assessment of the role of the crystallographic texture on the SCC susceptibility of low carbon line pipe steel.		
ALNBRG143727	Xiaopeng Li	$4,875
Effect of geometry on residual stresses in 3D printed metal components.		
ALNGRA14029	Alison O'Donnell	$8,125
ITRAX measurements of tree ring density and chemistry to reconstruct past rainfall patterns in NW Australia.		
ALNBRG143486	Alice Vrielink	$7,235
Lipid A PEA transferase (LptA), structural transitions induced by substrate/inhibitor binding.		
	Total	**$23,752**

University of Western Sydney

ALNGRA14531	Sara Hortal Botifoll	$9,000
Investigating the impact of nutrient trading dynamics between plants and symbiotic fungi on the outcomes of fungal competition in the rhizosphere.		
ALNGRA14544	Wenxian Li	$15,700
Application of ion implantation for the enhancement of solar energy conversion of oxide semiconductors.		
ALNGRA14024	Anya Salih	$4,000
Photoactivatable fluorescent proteins as novel ionising radiation frequency receptors.		
ALNGRA14538	Anya Salih	$8,040
Effects of ionising radiation on GFP-type photoactivatable fluorescent proteins of reef corals.		
	Total	**$36,740**

Victoria University of Wellington

ALNGRA14515	Andrew Rees	$1,500
A disturbed past - using a paleo-biomonitoring scheme to assess Maori, European, and Anthropocene impacts at Lake Pounui, New Zealand.		
ALNGRA14517	Daniel Sinclair	$9,270
Corals, climate and phytoplankton: Reconstructing a millennium of marine productivity off Northwest Africa.		
	Total	**$10,770**

University of Wollongong

ALNGRA14007	Allan Chivas	$3,720
Lacustrine history of Lake Llancanelo, Argentina, climate teleconnections with Australia and tephra history.		
ALNGRA14048	Simone Ciampi	$11,550
Can oriented electric fields tweak chemical transformations? Gaining control of chemical reactivity at interfaces.		

ALNGRA14045	Dean Cutajar	$12,650
Radiation hardness of medical devices for radiation therapy quality assurance.		
ALNGRA14010	PhilFlentje	$9,768
Age constraints on the Process Rates of escarpment evolution, Illawarra Region, NSW, Australia.		
ALNBRG143084	Zaiping Guo	$272
In-situ study of phase transitions in the Nax(Fe1/2Mn1/2)O_2 cathode for use in rechargeable sodium-ion batteries.		
ALNBRG143187	Muhamad Faiz Md Din	$1,062
Neutron study on effect of the substitution in NdMn2-xTxSi2 compounds (T= Ti, Cr, and Cu) - Magnetic structure and entropy change.		
ALNGRA14042	Marco Petasecca	$20,250
Advanced microdosimetry detector utilizing 3D MEMS technology.		
ALNGRA14038	Kerrylee Rogers	$5,000
Establishing carbon retention in submerged mangrove using stable isotope analysis.		
ALNBRG143178	Lisa Thoennessen	$367
In-situ studies on the alpha-phase precipitation mechanism in near-beta titanium alloys.		
ALNBRG143451	Zhiyang Wang	$1,137
Texture development in potassium strontium niobate ($KSr_2Nb_5O_{15}$) piezoceramics prepared by templated grain growth.		
	Total	**$65,776**

TOTAL AINSE AWARDS FUNDING APPROVED IN 2014 **$1,265,320**

AINSE Supported Publications 2014

University of Adelaide

Cameron Barr, Josh Tibby, Peter Gell, Jonathan Tyler, Atun Zawadzki and Geraldine Jacobson (2014) "Climate variability in south-eastern Australia over the last 1500 years inferred from the high-resolution diatom records of two crater lakes", *Quaternary Science Reviews*, 95, 115-131, 10.1016/j.quascirev.2014.05.001

Fang Xia, Jing Zhao, Barbara E. Etschmann, Joël Brugger, Christopher J. Garvey, Christine Rehm, Hartmut Lemmel, Jan Ilavsky, Young-Soo Han and Allan Pring (2014) "Characterization of porosity in sulfide ore minerals: A USANS/SANS study", *American Mineralogist*, 99, 2398-2404, 10.2138/am-2014-4845

Olivier Lavigne, Erwin Gamboa, Vladimir Luzin, Michael Law, Michael Giuliani and Walter Costin (2014) "The effect of the crystallographic texture on intergranular stress corrosion crack paths", *Materials Science and Engineering*, 618, 305-309, 10.1016/j.msea.2014.09.038

University of Auckland

Chen G, Liss K and Cao P (2014) "In situ observation and neutron diffraction of NiTi powder sintering", *Acta Materialia*, 67, 32-44, 10.1016/j.actamat.2013.12.013

M. Bonnet, Cho Rong Hong, Yongchuan Gu, Robert F. Anderson, William R. Wilson, Frederik B. Pruijn, Jingli Wang, Kevin O. Hicks and **Michael P. Hay** (2014) "Novel nitroimidazole alkylsulfonamides as hypoxic cell radiosensitisers", *Bioorganic & Medicinal Chemistry*, 22, 2123–2132, 10.1016/j.bmc.2014.02.039

Tomoki Yabutani, **Geoffrey I. N. Waterhouse**, Dongxiao Sun-Waterhouse, James B. Metson, Akiko Iinuma, Le Thi Xuan Thuy, Yohei Yamada, Toshio Takayanagi and Junko Motonaka (2014) "Facile synthesis of platinum nanoparticle-containing porous carbons, and their application to amperometric glucose biosensing", *Microchimica Acta*, 181, 1871-1878, 10.1007/s00604-014-1270-1

Jan Rothballer, Frederik Bachhuber, Stefan M. Rommel, **Tilo Söhnel** and Richard Weihrich (2014) "Origin and effect of In–Sn ordering in $InSnCo_3S_2$: a neutron diffraction and DFT study", *Royal Society of Chemistry*, 4, 42183-42189, 10.1039/C4RA03800B

Jacqueline Knobloch (2014) "Probing the effects of oxidative stress on biomimetic cellular membrane interactions", PhD Thesis, University of Auckland.

Gang Chen (2014) "Powder metallurgical titanium alloys (TiNi and Ti-6Al-4V): injection moulding, press-and-sinter, and hot pressing", PhD Thesis, University of Auckland.

Australian National University

Karlson L R, **Greene R S B**, Scott K M, Stelcer E and O'Loingsigh T (2014) "Characteristics of aeolian dust across northwest Australia", *Aeolian Research*, 12, 41-46, 10.1016/j.aeolia.2013.11.003

J Hudspeth, D Goossens and T Welberry (2014) "Approaches to modelling thermal diffuse scattering in triglycine sulfate, $(NH_2CH_2COOH)_3{\cdot}H_2SO_4$", *Journal of Applied Crystallography*, 47, 544-551, 10.1107/S1600576713034547

Chang L (2014) "The impact of magnetic geometry on wave modes in cylindrical plasmas", PhD Thesis, The Australian National University.

S.R. Haskey, B.D. Blackwell and D.G. Pretty (2014) "Clustering of periodic multichannel time series data with application to plasma fluctuations", *Computer Physics Communications*, 185, 1669-1680, 10.1016/j.cpc.2014.03.008

S. R. Haskey, N. Thapar, B. D. Blackwell and J. Howard (2014) "Synchronous imaging of coherent plasma fluctuations", *Review of Scientific Instruments*, 85, 033505-1-033505-6, 10.1063/1.4868504

S R Haskey, M J Lanctot, Y Q Liu, J M Hanson, B D Blackwell and R Nazikian (2014) "Linear ideal MHD predictions for n = 2 non-axisymmetric magnetic perturbations on DIII-D", *Plasma Physics and Controlled Fusion*, 56, 35005, 10.1088/0741-3335/56/3/035005

M.J. Lanctot, R.J. Buttery, J.S. de Grassie, T.E. Evans, N.M. Ferraro, J.M. Hanson, **S.R. Haskey**, R.A. Moyer, R. Nazikian, T.H. Osborne, D.M. Orlov, P.B. Snyder, M.R.Wade and the DIII-D Team (2013) "Sustained suppression of type-I edge-localized modes with dominantly n = 2 magnetic fields in DIII-D", *Nuclear Fusion*, 53, 83019, 10.1088/0029-5515/53/8/083019

Richard Gillespie, Rachel Wood, Stewart Fallon, Thomas W. Stafford Jr and John Southon (2014) "New ^{14}C dates for Spring Creek and Mowbray Swamp megafauna: XAD-2 processing", *Archaeology in Oceania*, Online, 1-6, 10.1002/arco.5045

S R Haskey, B D Blackwell, B Seiwald and J Howard (2014) "Visible light tomography of MHD eigenmodes on the H-1NF stellarator using magnetic coordinates", *Nuclear Fusion*, 54, 83031, 10.1088/0029-5515/54/8/083031

J. D. King, E. J. Strait, R. L. Boivin, D. Taussig, M. G. Watkins, J. M. Hanson, N. C. Logan, C. Paz-Soldan, D. C.Pace, D. Shiraki, M. J. Lanctot, R. J. La Haye, L. L. Lao, D. J. Battaglia, A. C. Sontag, **S. R. Haskey** and J. G. Bak (2014) "An upgrade of the magnetic diagnostic system of the DIII-D tokamak for nonaxisymmetric measurements", *Review of Scientific instruments*, 85, 83503-1-83503-8, 10.1063/1.4891817

University of Canterbury

Joy K, Fink D, Storey B and Atkins C (2014) "A 2 million year glacial chronology of the Hatherton Glacier, Antarctica and implications for the size of the East Antarctic Ice Sheet at the Last Glacial Maximum", *Quaternary Science Reviews*, 83, 46-57, 10.1016/j.quascirev.2013.10.028

Ruzicka J (2014) "Synthesis of titanium dioxide nanoparticles: phase, morphology and size control", PhD Thesis, University of Canterbury.

Omar El-Hadad and **Gregory T. Russell** (2014) "Effect of cyclodextrin on the g-radiolysis initiated emulsion polymerization of styrene", *Polymer*, 55, 4447-4458, 10.1016/j.polymer.2014.07.002

University of Canberra

Larissa Schneider, **William A. Maher**, Jaimie Potts, Anne M. Taylor, Graeme E. Batley, Frank Krikowa, Anthony A. Chariton and Bernd Gruber (2015) "Modeling food web structure and selenium biomagnification in lake macquarie, New South Wales, Australia, using stable carbon and nitrogen isotopes", *Environmental Toxicology and Chemistry*, 34, 608-617, 10.1002/etc.2847

Larissa Schneider, **William Maher**, Jaimie Potts, Graeme Batley, Anne Taylor, Frank Krikowa, Anthony Chariton, Atun Zawadzki, Henk Heijnis and Bernd Gruber (2014) "History of metal contamination in Lake Illawarra, NSW, Australia", *Chemosphere*, 119, 377-386, 10.1016/j.chemosphere.2014.06.058

Larissa Schneider, **William Maher**, Jaimie Potts, Bernd Gruber, Graeme Batley, Anne Taylor, Anthony Chariton, Frank Krikowa, Atun Zawadzki and Henk Heijnis (2014) "Recent history of sediment metal contamination in Lake Macquarie, Australia, and an assessment of ash handling procedure effectiveness in mitigating metal contamination from coal-fired power stations", *Science of the Total Environment*, 490, 659-670, 10.1016/j.scitotenv.2014.04.055

Charles Darwin University

Sarah E. Hobgen, Bronwyn A. Myers, Rohan P. Fisher and Robert J. Wasson (2014) "Creating a Sediment Budget in a Data Poor Context: An Example from Eastern Indonesia", *Geografiska Annaler: Series A, Physical Geography*, 96, 513-530, 10.1111/geoa.12076

CSIRO

Nathan A.S Webster, Mark I. Pownceby, Ian C. Madsen, Andrew J. Studer, James R. Manuel and Justin A. Kimpton (2014) "Fundamentals of Silico-Ferrite of Calcium and Aluminum (SFCA) and SFCA-I Iron Ore Sinter Bonding Phase Formation: Effects of CaO:SiO2 Ratio", *Metallurgical and Materials* Transactions B, 45, 2097-2105, 10.1007/s11663-014-0137-5

Curtin University

Blyth A, Jex C, Baker A, Kahn S and Schouten S (2014) "Contrasting distributions of glycerol dialkyl glycerol tetraethers (GDGTs) in speleothems and associated soils", *Organic Geochemistry*, 69, 1-10, 10.1016/j.orggeochem.2014.01.013

Ryan Chester, Manzar Sohail, Mark I. Ogden, Mauro Mocerino, Ernö Pretsch and Roland De Marco (2014) "A calixarene-based ion-selective electrode for thallium(I) detection", *Analytica Chimica Acta*, 851, 78-86, 10.1016/j.aca.2014.08.046

Alison Blyth and Colin I. Smith (2014) "Applications of Liquid Chromatography- Isotope Ratio Mass Spectrometry in: Geochemistry and Archaeological Science", *Royal Society of Chemistry*, Chapter 11, 313-323, 10.1039/9781782625025-00313

Daniel D'Alessio, Alexandre N. Sobolev, Brian W. Skelton, Rebecca O. Fuller, Robert C.Woodward, Nigel A. Lengkeek, Benjamin H. Fraser, Massimiliano Massi and Mark I. Ogden (2014) "Lanthanoid "BottleBrush" Clusters: Remarkably Elongated Metal-Oxo Core Structures with Controllable Lengths", *Journal of the American Chemical Society*, 136, 15122-15125, 10.1021/ja506677h

Deakin University

Rakha K, Beladi H, Timokhina I, Xiong X, Kabra S, Liss K and Hodgson P (2014) "On low temperature bainite transformation characteristics using insitu neutron diffraction and atom probe tomography", *Materials Science & Engineering A*, 589, 303-309, 10.1016/j.msea.2013.09.055

Ludovic F. Dumee, Chunfang Feng, Li He, Francois-Marie Allioux, Zhifeng Yi, Weimin Gao, Connie Banos, Justin Davies and Lingxue Kong (2014) "Tuning the grade of graphene: Gamma ray irradiation of free-standing graphene oxide films in gaseous phase", *Applied Surface Science*, 322, 126-135, 10.1016?j.apsusc.2014.10.070

Federation University

Huihua Liu, Deeptangshu Chaudhary, Colin Campbell, Jason Roberts, Stephen Buckman and James Sullivan (2014) "Investigations into the free-volume changes within starch/plasticizer/nanoclay systems using Positron Annihilation Lifetime Spectroscopy", *Materials Chemistry and Physics*, 148, 349-355, 10.1016/j.matchemphys.2014.07.054

Rachael Martin, Kim Dowling, Dora Pearce, James Sillitoe and Singarayer Florentine (2014) "Health Effects Associated with Inhalation of Airborne Arsenic Arising from Mining Operations", *Geosciences*, 4, 128-175, 10.3390/geosciences4030128

Giri Kattel, Peter Gell, Marie-Elodie Perga, Erik Jeppesen, Rosie Grundell, Sandra Weller, Atun Zawadzki and Linda Barry (2015) "Tracking a century of change in trophic structure and dynamics in a floodplain wetland: integrating palaeoecological and palaeoisotopic evidence", *Freshwater Biology*, 60, 711-723, 10.1111/fwb.12521

Flinders University

Rachel S. Popelka-Filcoff, Alan Mauger, Claire E. Lenehan, Keryn Walshe and Allan Pring (2014) "HyLogger™ near-infrared spectral analysis: a non-destructive mineral analysis of Aboriginal Australian objects", *Analytical Methods*, 6, 1309-1316, 10.1039/c3ay41436a

Benjamin A.Chambers, Brandon I. MacDonald, Mihail Ionescu, Alec Deslandes, Jamie S.Quinton, Jacek J. Jasieniak and Gunther G.Andersson (2014) "Examining the role of ultra-thin atomic layer deposited metal oxide barrier layers on CdTe/ITO interface stability during the fabrication of solution processed nanocrystalline solar cells", *Solar Energy Materials & Solar Cells*, 125, 164-169, 10.1016/j.solmat.2014.02.018

Cameron Wood, **Peter G. Cook**, Glenn A. Harrington, Karina Meredith and Rolf Kipfer (2014) "Factors affecting carbon-14 activity of unsaturated zone CO_2 and implications for groundwater dating", *Journal of Hydrology*, 519, 465-475, 10.1016/j.jhydrol.2014.07.034

Cameron Wood, **Peter G. Cook** and Glenn A. Harrington (2015) "Vertical carbon-14 profiles for resolving spatial variability in recharge in arid environments", *Journal of Hydrology*, 520, 134-142, 10.1016/j.jhydrol.2014.11.044

Griffith University

G. K. Parker and **S. A. Holt** (2014) "Characterization of the Deposition of n-Octanohydroxamate on Copper Surfaces", *Journal of The Electrochemical Society*, 161, D277-D286, 10.1149/2.070405jes

James Cook University

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ACU	Australian Catholic University	MUR	Murdoch University
ADE	University of Adelaide	NCT	University of Newcastle
AKL	University of Auckland	NSW	University of New South Wales
ANS	ANSTO	OTA	University of Otago
ANU	Australian National University	QLD	University of Queensland
BAL	University of Ballarat	QUT	Queensland University of Technology
CAN	University of Canterbury	RMI	RMIT University
CBR	University of Canberra	SCU	Southern Cross University
CDU	Charles Darwin University	SYN	Australian Synchrotron
CQU	CQUniversity	SYD	University of Sydney
CSU	Charles Sturt University	SWI	Swinburne University of Technology
CSI	CSIRO	TAS	University of Tasmania
CUR	Curtin University of Technology	USA	University of South Australia
DEA	Deakin University	USC	University of the Sunshine Coast
ECU	Edith Cowan University	USQ	University of Southern Queensland
FLI	Flinders University	UNE	University of New England
GNS	GNS Science	UTS	University of Technology, Sydney
GRI	Griffith University	UWA	University of Western Australia
JAM	James Cook University	UWS	University of Western Sydney
LAT	La Trobe University	VUW	Victoria University of Wellington
MAC	Macquarie University	WAI	University of Waikato
MAS	Massey University	WOL	University of Wollongong
MEL	University of Melbourne		
MON	Monash University		

Specialist Areas

AGS	Archaeology and Geosciences
BBS	Biotechnology and Biomedical Sciences
ENV	Environmental Science
MPE	Materials - Properties and Engineering
MSD	Materials - Structures and Dynamics

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