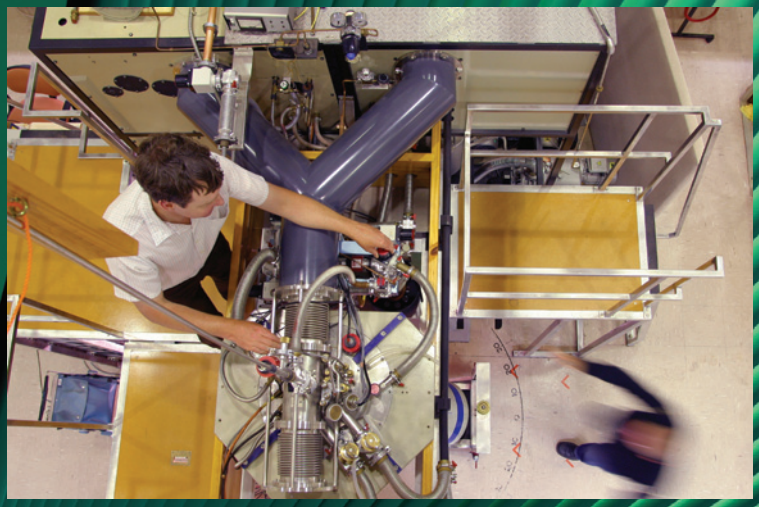
Annual Report 2013



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

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AINSE 2013 Annual Report

From the President and the Managing Director

The need for a strategic and stable plan for science education, research and training in Australia is increasingly placing the onus on organisations in the science environment to demonstrate how they add value to these developments. AINSE is well positioned in this regard. In 2013, we undertook an analysis of the trends and uncertainties in our strategic environment and as an outcome identified seven strategic directions that will drive our focus, resource allocation and how we monitor our success in this constantly changing environment. Details of AINSE's value proposition and strategic directions 2014-2018 are presented elsewhere in this Annual Report.

While these new strategic directions do not represent revolutionary changes to AINSE's previous Strategic Plan, they are focussed on providing AINSE with more agility, options and influence in delivering quality nuclear science and engineering to the Australian and New Zealand communities. Being able to effectively seize new opportunities also requires that we explore more flexible funding models for AINSE, how we connect with non-AINSE members, and in particular how we encourage industrial usage, for the purpose of promoting nuclear science and engineering. Proposed changes to the AINSE Constitution, which our member representatives will vote on at their next Council Meeting in May 2014, are designed to eliminate significant constraints that AINSE has to operate under at present.

One such example, which will benefit from an updated constitution, is ANSTO's commitment of $1.5 million for a new fund to be established in 2014 that will enable AINSE, in concert with ANSTO, to further advance the development and realise benefits of nuclear science and engineering in Australia. This commitment is separate to and distinct from the existing ANSTO funding to AINSE, and we consider it an excellent basis for leveraging additional contributions from other parties for advancing these goals. The terms of a structure and funding process are currently being negotiated with ANSTO.

For the year 2013, AINSE shows an operational surplus of $567K, which is significantly better than the budgeted $56K loss. This reversed the trend of financial losses over recent years, which had been a major objective of the Board throughout the financial year. This reversal has been achieved through improved efficiencies and thorough financial management and was complemented by additional savings in some budget lines, mainly as the result of lower than budgeted use of ANSTO equipment due to downtime. Instead of filling the gap in equipment use through uncoordinated spending in other areas, we decided to save these funds to be available in 2014 and beyond for other strategic initiatives. Pleasingly ANSTO has now returned to service much of this equipment and its usage by AINSE members is picking up considerably. The positive bottom line in 2013 has also resulted in

an increase of AINSE's total equity, hence improving its financial sustainability. It is not our intention to return surpluses of that magnitude in the future; rather it is critical that AINSE provide maximum benefit to all member institutions and this is best achieved by running a balanced budget.

The AINSE Winter School continues to be one of the highlights of the AINSE year, providing an effective mechanism to encourage undergraduates in Australian and New Zealand universities to take an interest in nuclear science and engineering and to learn how to apply these in their future research. This year, 42 students from all member universities attended the Winter School, coming from a wide cross-section of disciplines. Equally important to the science is the social programme which includes speakers to encourage discussion not just on scientific issues but also on how science and technology impact on current social issues and vice versa, as well as general aspects of a career in science and engineering. In 2013, AINSE was proud to present three high-profile guest speakers: Dr Michael James, Head of Science of the Australian Synchrotron, Dr Cathy Foley, Chief of the CSIRO's Division of Material Science and Engineering, and Dr Adi Paterson, Chief Executive Officer of ANSTO, who officially closed the winter school and awarded the students with certificates.

Some of the Winter School students each year decide to pursue a student career based on the use of nuclear science and engineering and along with other colleagues return to AINSE as Honours or PGRA Scholarship holders. In 2013, we awarded eleven Honours Scholarships, and nine new PGRA scholars joined AINSE.

One of the PGRA Scholarships awarded in 2013 is coupled with the John Ferris Memorial Award, which AINSE has established to honour the life and work of the late Dr John Ferris, who was a cherished identity at ANSTO. Following a generous contribution from John's family and many contributions from John's friends and colleagues to the AINSE Trust, a John Ferris Memorial Award was established in 2008. The award is designed to assist in supporting the best post-graduate student conducting a research project in environmental sciences. In 2013, the third John Ferris Memorial Award was presented to Lydia Mackenzie from the University of Queensland.

AINSE consistently demonstrates that it effectively supports outstanding young scientists who have chosen a career in nuclear sciences and engineering. This year, AINSE Research Fellow Dr Neeraj Sharma (University of New South Wales) has been named NSW Young Tall Poppy 2013. The NSW Young Tall Poppy Science Awards, run by the Australian Institute of Policy and Science, are designed to celebrate Australian scientific excellence and encourage young people to get involved with science. Dr Sharma is the third AINSE Research Fellow to have received a Tall Poppy Award. Dr Darren Goossens (Australian National University) was ACT Young Tall Poppy Scientist of the Year 2010 and Dr Rachel Popelka-Filcoff (Flinders University) was named South Australian Young Tall Poppy in 2012.

The year 2013 was also the first full year of implementation of our six-monthly research award structure, which, as anticipated, is providing more certainty and financial transparency for all parties involved. Overall, in 2013, AINSE has been able to support 50 % of the 236 research awards applied for in five different specialist areas.

The smooth implementation of AINSE programs would not be possible without the large contributions of the members of our Specialist Committees and the excellent and dedicated work of all staff in the AINSE secretariat: Michelle Durant, Nerissa Phillips, Sandy O'Connor, and Rachel Caldwell, who joined in 2013.

We would like to express our gratitude for the efforts of the AINSE Board: Professor Lee Astheimer, Professor Robert Burford, Dr Peter Coldrey, Professor John Dodson, Professor Lyndon Edwards, Ms Roslyn Hatton, Professor Bruce King, and Dr Rob Robinson. We wish to particularly acknowledge Professor Lee Astheimer and Professor Bruce King, who retired from the AINSE Board in 2013, and thank them for their work on behalf of AINSE.

Finally, we would like to thank our member organisations through their councillors, and ANSTO through their CEO Dr Adi Paterson, for their continued support. AINSE is a unique organisation within the Australian science system, and close interaction with and feedback from all its stakeholders is vital to its ability to add value.

Brendan Kennedy
President

Frank Bruhn
Managing Director

Vision, Mission and Strategic Priorities

The chronology of human settlement, palaeoclimate variability, and marine fisheries in the southern Cook Islands

Study site of Moturakau Islet, Aitutaki lagoon.

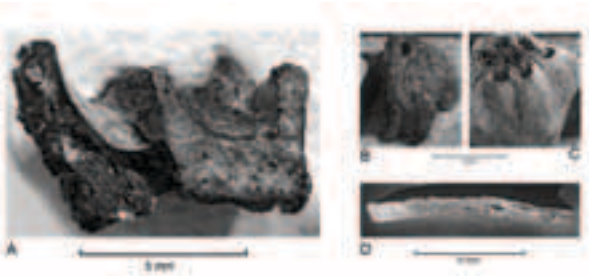
As the first island group east of Samoa and Tonga, the southern Cook Islands are a gateway archipelago that stands to inform on the timing and patterning of East Polynesian settlement. Moturakau Rockshelter on Aitutaki Island is one of a few early occupation sites in the Cook Islands, and renowned for its exceptionally large, stratified assemblage of marine archaeofauna and fishing gear. First analysed in the late 1980s, these collections are now the focus of an interdisciplinary study of palaeoclimate effects on marine fisheries and human foragers over the last millennium. High precision dates were required to refine the timing of initial site activities, major marine events (major storms and/or tsunami), and changing patterns of resource use.

The AINSE-funded analysis evaluated an extant radiocarbon chronology defined two decades ago on unidentified bulk charcoal, materials now known to include long-lived trees with the potential for inbuilt age. Archived collections were sampled for short-lived materials (e.g., coconut shell and *Pandanus* keys) and AMS-dated. Bayesian analysis of the overall date assemblage was used to identify outliers and refine age estimates for the site's 12 stratigraphic zones, while changing depositional rates were assessed using the Classical Age-Depth Model (CLAM) program.

The resulting geo-chronological model indicates that initial islet use began at a time when human

Fourteenth century shell fishhooks (photo by T. Mackrell).

Wood charcoal specialist Jennifer Huebert at work (photo by T. Mackrell).

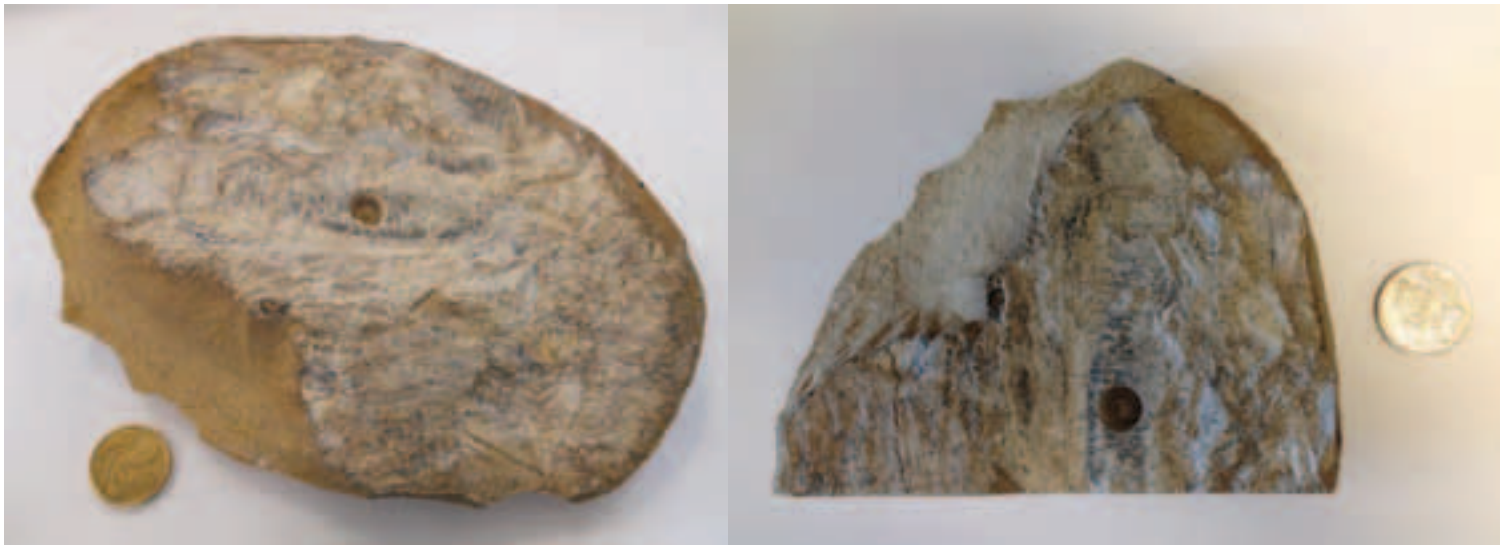


Short-lived plant remains, Pandanus (A-C) and coconut (D) (Photos by J. Huebert, T. Mackrell).

populations were dispersing across East Polynesia in the mid-11th to 13th centuries AD. The 13th to 15th centuries were a period of recurring and significant marine intrusions which disrupted cultural activities. Perhaps related, after the mid-15th century archaeofish remains and fishhooks began to decline. These changes are now being assessed against an emerging carbonate-based (corals, otoliths) palaeoclimate record.

Assoc Prof Melinda Allen (University of Auckland) led the research in collaboration with Prof David Fink and Dr Geraldine Jacobsen (ANSTO). Archaeobotanist Jennifer Huebert (UA) identified the plant samples. Dr Alex Morrison (UA) undertook the Bayesian analysis. The AINSE-supported geo-chronological model provides a crucial framework for interpreting prior analyses and supporting our on-going Royal Society of New Zealand–funded palaeoclimate study.

Exceptional preservation of fossils in carbonate concretions: a biomarker approach



Remains of past life on Earth are preserved in the rock record as morphological and molecular (biomarker) fossils. In the Gogo Formation multiple examples of remarkable preservation of reef-fauna from the Late Devonian are documented. The exact mode of preservation remained unclear until molecular fossils trapped in the fossil tissue were used to elucidate the palaeoenvironmental conditions and microorganism present at the time of preservation. In this PhD project markers of Chlorobi -a green sulfur bacteria that conducts anoxygenic photosynthesis- were identified in a carbonate concretion confirming the presence of an active sulfur cycle in the Devonian reef from Western Australia, that include intense sulfate reduction and the resulting persistent photic zone euxinia. Cholestane -a diagenetic derivative of cholesterol- unequivocally associated with the fossilized tissue suggests a crustacean source.

Further investigations confirmed not only crustacean-soft tissue is preserved within the concretion but also, intact dietary steroids (e.g. sterols and methyl sterols) are preserved for ca. 380Ma. The occurrence of intact sterols has been limited to immature sediments no older than Cretaceous (~125Ma).The discovery of 67 steroidal compounds in the Crustacean fossil, including intact and diagenetic transformation products, demonstrates the remarkable coexistence of biomolecules and geomolecules in the same sample. This exceptionally preserved suit of steroids in a diagenetic continuum -ranging from stenols to triaromatic steroids- is caused by microbially mediated eogenetic processes that promote progressive encapsulation and ongoing microbial alteration preventing further alteration of the crustacean biomass and promoting its preservation.

This work was carried out by PhD student Ines Melendez at Curtin University, along with main supervisor Kliti Grice. The work can be found in a series of publications in Geology (41, 123-126; 2013) and Scientific Reports (3 : 2768; 2013). Further investigation includes the usage of ITRAX at ANSTO in collaboration with John Dodson, to correlate the existing results with elemental variation in the concretions.

Tundzha Regional Archaeological Project 2009-2011

Shawn A Ross, Simon Connor, Scott Mooney, Andy Herries and Adela Sobotkova

Tracking the development of complex societies and environmental change in prehistoric Thrace

Uncovering the interactions between complex societies and their environments in the past may hold important clues for understanding how future societies might respond to change. The development of agriculture in the Neolithic Period was a pivotal event in human prehistory. The Thracian Plain is likely to have been one of the first areas of Europe settled by Neolithic farmers as they migrated from Western Asia.

Previous AINSE-supported research suggested that persistent aridity on the Thracian Plain, lasting until at least 7000 BC, may have delayed the introduction of agriculture to Europe. Renewed AINSE support has helped to clarify this picture further, by providing a robust radiocarbon chronology for a new record of environmental change from a site in the Stara Planina Mountains in Bulgaria. Evidence from this site bolsters the argument for region-wide aridity prior to the first farming settlements. Subsequent human activities led to the deforestation of the plains around 2000 BC, followed by the mountains at least 1000 years later. At least one tree species was extirpated in the process.

These palaeoenvironmental studies have helped researchers contextualise the archaeological data produced by surface surveys and satellite remote sensing, and will contribute significantly to the interpretation of human–environment interactions in ancient Thrace.

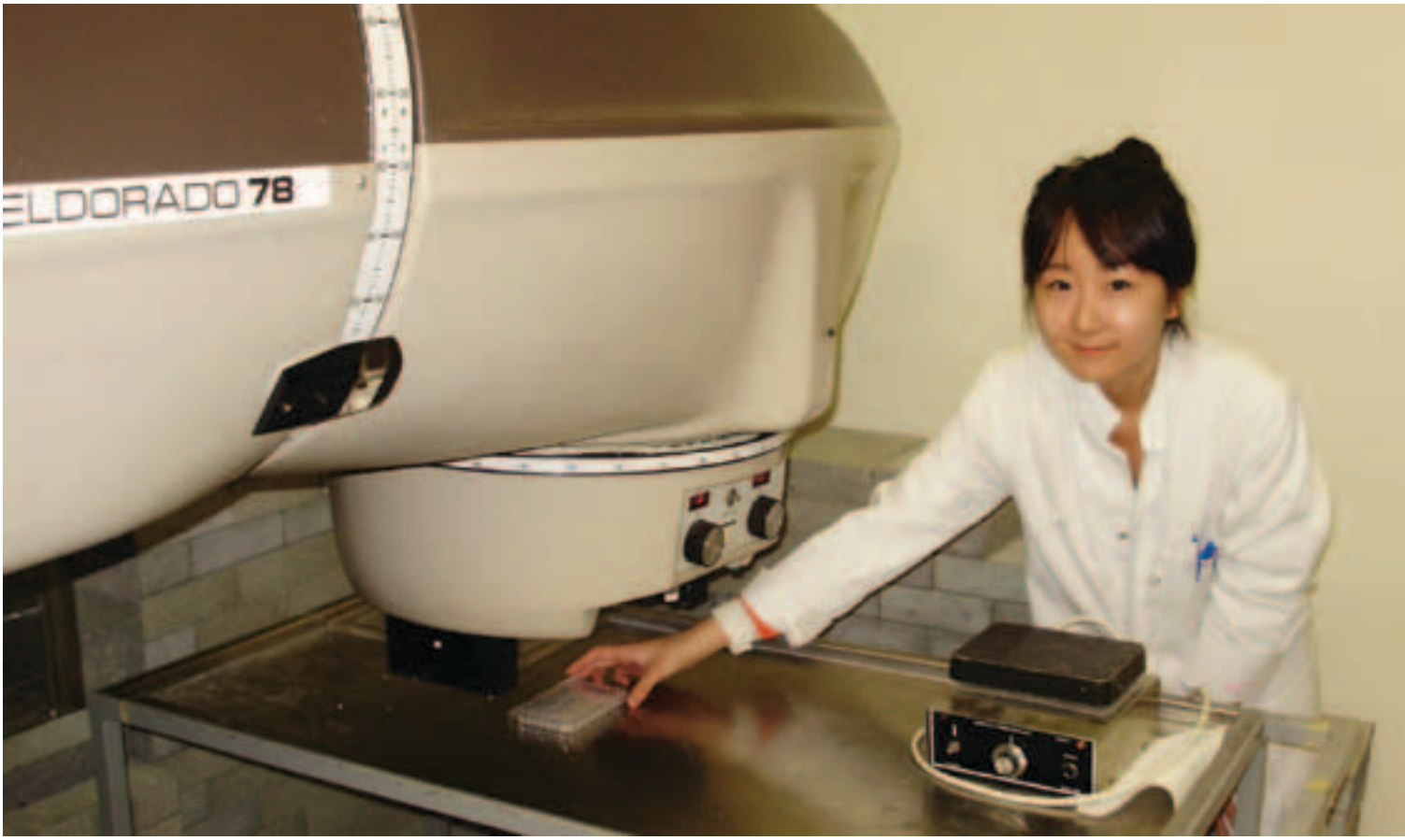
This research was undertaken as part of the Tundzha Regional Archaeological Project (TRAP), a long-running collaborative venture led by the University of New South Wales (Australia). Partners include La Trobe University, Monash University, the University of the Algarve (Portugal), the University of Michigan (USA), the American Research Center in Sofia (Bulgaria), Sofia University St Kliment Ohridski (Bulgaria), the Yambol Historical Museum (Bulgaria), the Kazanluk Museum (Bulgaria), and the Archaeological Institute and Museum at the Bulgarian Academy of Sciences. About a hundred students and volunteers from a variety of disciplines took part in the field school that accompanied the project.

Happy TRAP team members with the Stara Planina Mountains in the background

Archaeologists digging up the past on Bulgaria's Thracian Plain

Preparing to collect sediment cores from a lake in the Stara Planina Mountains.

Reduction potentials of novel nitroimidazole radiosensitizers for stereotactic body radiotherapy



Ms Cho Rong Hong prepares a sample of tumour cells for a radiosensitisation experiment.

Fractionated radiotherapy is widely used to treat many types of cancer, but is not completely effective, is an arduous, extended treatment, and has serious side effects. A new form of radiotherapy (Stereotactic Body Radiotherapy), which uses fewer doses and shortens the treatment duration, is being evaluated worldwide. However, this therapy may be compromised by low oxygen levels (hypoxia) found in many human tumours.

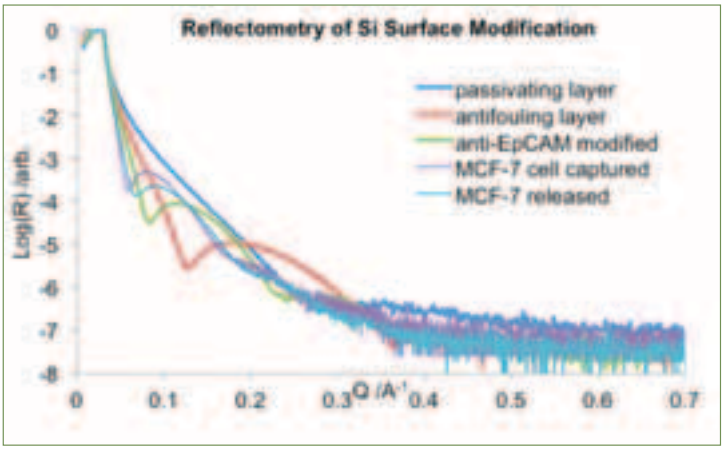
Associate Professor Michael Hay, in conjunction with a multidisciplinary team (Ms Cho Rong Hong, Drs Muriel Bonnet, Kevin Hicks, Frederik Pruijn, Jingli Wang, and Professor Bill Wilson; all University of Auckland), have identified a new class of nitroimidazole-based radiosensitiser that sensitises these hypoxic cells within solid tumours to radiation. The electron affinity of these compounds is a key parameter which dominates the *in vitro* structure-activity relationships for radiosensitisation and toxicity and correlates with the one-electron reduction potential, $E(1)$.

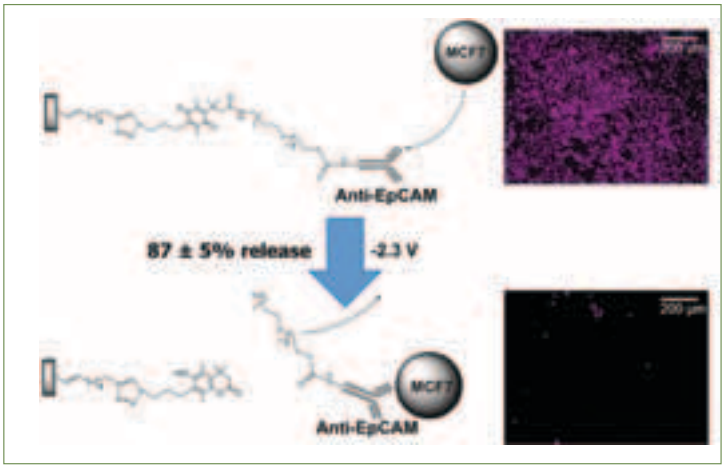
Working in collaboration with Associate Professor Bob Anderson (using the AINSE-supported Pulse Radiolysis Facility at the University of Auckland), we have used pulse radiolysis to determine the $E(1)$ values of a series of these radiosensitisers. These potentials span the range for efficient reaction with DNA radicals (-500 to -342 mV) and allowed us to identify the most appropriate compounds for further development. Several compounds have been shown to radiosensitise hypoxic cells *in vitro* and *in vivo* and the group is pursuing funding to optimise the pharmacological properties of this novel class of radiosensitiser. This combination therapy has the potential to reduce side effects through improved tumour targeting, reduce health costs and improve patient experience through fewer hospital visits.

Capture and Releasing 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.

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 -1800 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 from the University of New South Wales as part of his PhD research under the supervision of Professor Justin Gooding. Dr Simone Ciampi 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.

Improving biological parameters estimation in pre-clinical longitudinal PET imaging of the rat brain

Positron Emission Tomography (PET) is a key medical imaging technique used to obtain four- dimensional images of functional processes in the body (3D in space, 1D in time). This imaging technique can be used to study the D2 dopamine receptor system, which is involved in many neurodegenerative and neuropsychiatric disorders such as Parkinson's Disease, Alzheimers and Schizophrenia. [11C] raclopride is a PET radioligand that is used extensively to study dopamine D2 receptor availability in the striatum (a region in the brain rich in these receptors) in normal conditions as well as for studying pathologies, changes in response to treatment or pharmacological intervention.

By injecting a radiotracer, in this case [11C] raclopride we can monitor how that tracer advances in an organ of interest over a certain time period. Traditionally, a dynamic series is acquired after radiotracer injection, and the information about the distribution of the radiotracer is collected using Positron Emission Tomography (PET). In parallel, the radiotracer concentration delivered to the organ is measured, generally via blood sampling, and an input function to the system is derived. However, as it would be advantageous to be able to study the progression of these diseases, we want to eliminate the need for blood sampling and reduce the complexity of the experimental protocol. To this end, in this study, we have extended and validated a simple, single injection experimental protocol, the Partial Saturation Approach (PSA) that will estimate for both parameters of interest, B_{avail} (number of receptors) and 1/KD (the affinity of the radioligand to the receptor) by developing a data driven strategy for determining Bavail and K_D, related to the *in vivo* equilibriium of the system, and validating the strategy using a simulation model. The simulations were based on experimental mouse PSA data by Fischer *et al* and extended for a range of experimental conditions which included a range of injected dose of [11C]raclopride as well as adjusting the simulation input parameters to mimic a range of disease states. It was shown that the PSA is an appropriate method for estimating both B_{avail} and K_D for a range of receptor occupancy levels and therefore will be useful for researchers to use to study the progression of neurodegenerative disease longitudinally.

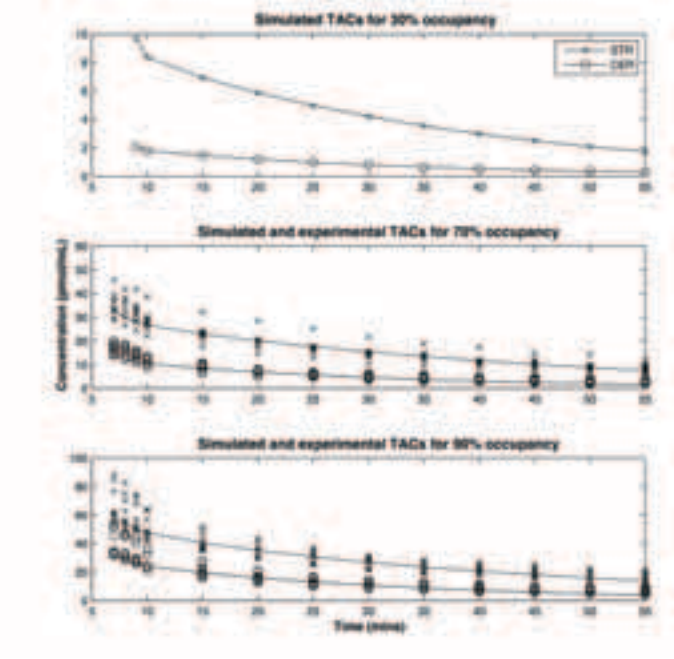


Figure 1: Simulated and experimental data from the striatum and cerebellum of the mouse brain for 3 different injected doses of [11C]raclopride.

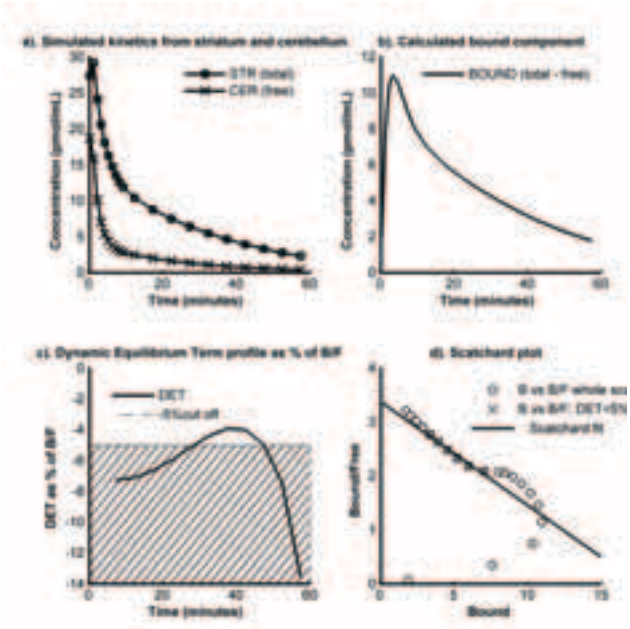


Figure 2: Data driven method for analysis, outlining the data points taken to calculate the parameter estimates B_{avail} and K_D

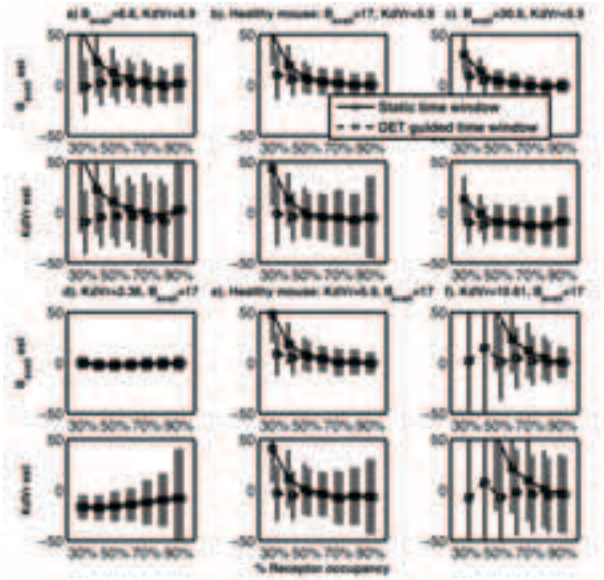


Figure 3: Results of the accuracy of the parameter estimates B_{avail} and K_D from simulated PET experiments for a range of different experimental conditions included a range of injected dose of [11C]raclopride as well as adjusting the simulation input parameters to mimic a range of disease states

Multi-proxy evidence for extreme wave events on the Mexican Pacific coast

The Pacific Coast of Mexico parallels the subduction zone of the Rivera-Cocos plates under the North America plate, and as such has been affected by many large earthquakes (Mw >7), some of which have generated tsunamis. While there are historical accounts for two events in June 1932 causing extensive damage in different areas on the Jalisco-Colima Coast, this study represented the first attempt to locate and identify the deposits laid down by these tsunamis. A multi-proxy approach was adopted to study sedimentary sequences retrieved from three sites in an estuary, lagoon and back beach, including stratigraphy, grain size distribution and characteristics, diatom analysis, geochemistry using the ITRAX core scanner and geochronology. We were thus able to positively identify the 1932 tsunami deposits in two of the sites, based on a core chronology established using ^{210}Pb and corroborated with the historical record. ITRAX data suggested the presence of shell hash in that unit and/or a different mineralogical assemblage indicative of an allochthonous source, in association with marine diatoms. An older event was also identified at one site and interpreted as a tsunami that occurred ca. 1300 AD, on the basis of a number of proxies characteristic of tsunami deposits and ^{14}C ages.

While this research focused on identifying high energy events in the sedimentary record on the Pacific Coast of Mexico, this is relevant to Australia, as the tectonically active Middle America Trench off the Pacific Coast of Mexico can generate tsunamis that might affect the south west Pacific and the east coast of Australia.

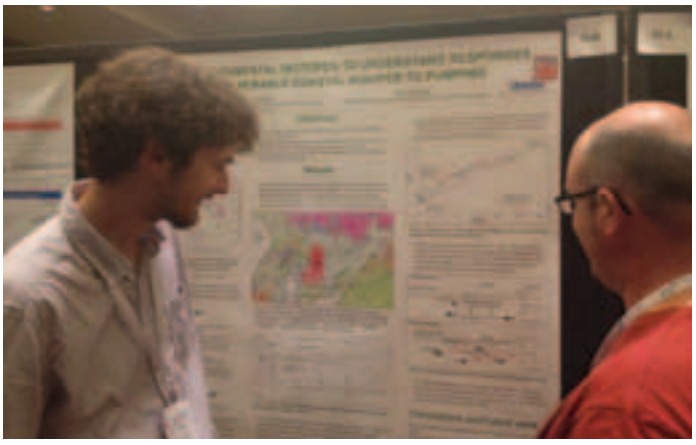
The project was a joint collaboration between Dr Catherine Chagué-Goff and Professor James Goff, University of New South Wales, Dr Teresa Ramirez-Herrera, National Autonomous University of Mexico, and Atun Zawadzki and Dr Geraldine Jacobsen, ANSTO. It was part of the Honours thesis undertaken by Lindsey Blecher, University of New South Wales.

Geochemical Investigation of mixing, flow dynamics and salinisation processes in a coastal aquifer vulnerable to seawater intrusion: Westernport Basin, Victoria

This project has assisted in understanding the response of the Western Port groundwater basin to long term pumping for irrigation, and characterized the main geochemical processes affecting water quality in the system. The radiocarbon and tritium analyses that were carried out on groundwater samples at ANSTO revealed that most of the water is relatively old - containing no detectable tritium, and having radiocarbon activities <30 pMC. This implies that the source of water that replenishes the water pumped from the aquifer each season is in fact old water from adjacent and/or deeper levels, rather than modern, seasonal groundwater recharge.

The stable isotope and other geochemical data collected indicated that marine water is a significant source of salinity particularly in groundwater near the coast; the groundwater dating suggests that the marine water may constitute 'old' marine water, from previous periods of higher sea-level (e.g. during the Holocene maximum) and/or a mixture of fresh palaeo-groundwater and more recently intruded marine water. These conclusions have important implications for the management of groundwater in the study area.

The findings of the research were presented at the 2012 International Association of Hydrogeologists' congress, and have recently been published in a journal paper in the *Hydrogeology Journal*, co-authored by Dr Matthew Currell (RMIT), Dr Dioni Cendon (ANSTO) and Mr Xiang Cheng (Department of Environment and Primary Industries). The findings also form the basis of a Master of Engineering project being conducted at RMIT by Mr Stephen Lee with ongoing collaboration with Dr Cendon.



Pictured top: Matthew Currell (RMIT University)
Pictured above: Dioni Cendon (ANSTO)

Distribution of micronutrients in SUT-1 overexpressed transgenic wheat

Micronutrient malnutrition, or hidden hunger, is a major concern in developing countries and is proposed to affect billions of people worldwide. The lack of dietary diversity and high dependence on low nutrient staple food crops is the major cause of this devastating health impact. Staple food crops such as wheat, rice and maize account for the majority of dietary calorie intake in developing countries yet contain very low levels of essential micronutrients, in particular iron and zinc.

Research has focussed on increasing the micronutrients in grain to combat this problem. One such development has shown that wheat plants overexpressing HvSUT1 gene lead to an increase in grain protein and yield but also increased grain Fe and Zn. Wheat grain is often milled to remove the outer layers prior to consuming and it is these outer layers where the majority of the micronutrients are accumulated. The remaining edible endosperm is relatively low in Fe and Zn. As such it is the focus of this research to determine if the increase in micronutrients in the HvSUT1 overexpressing grain has resulted in increased levels of these essential micronutrients in the edible regions (endosperm) of the grain.

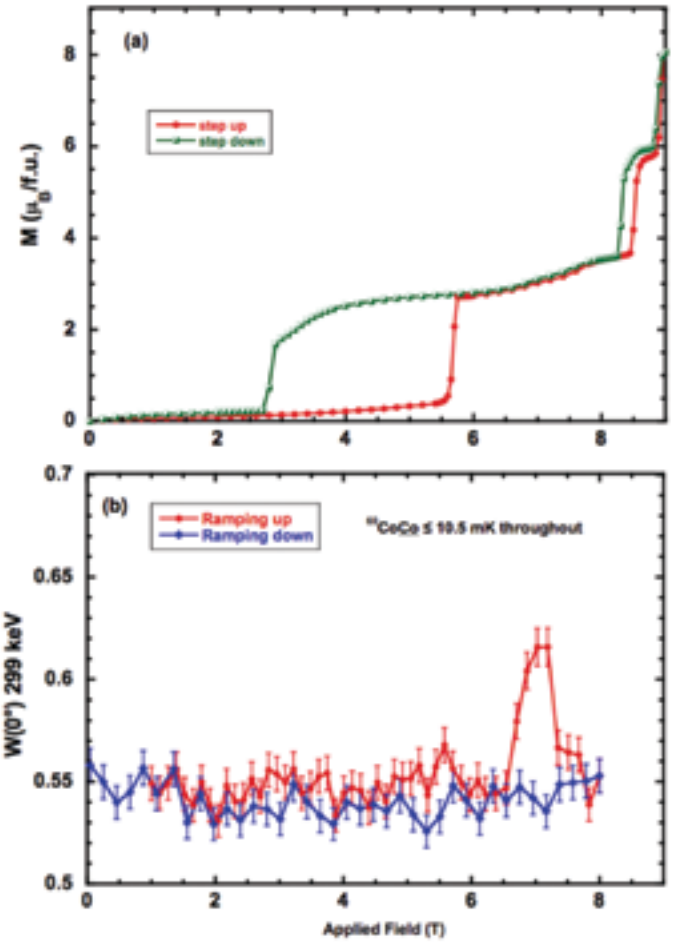
The preliminary experiments have shown μ-PIXE can be used to map the micronutrient distribution in the grain of wheat overexpressing HvSUT1. This has the potential to determine if these wheat grains have an increase in micronutrients in the edible regions of the grain. This project is collaborative research between Assoc. Prof. James Stangoulis, Lachlan Palmer and Dr Georgia Guild (Flinders University) with Dr Hans Weber (IPK-Gatersleben). μ-PIXE analysis was achieved with the assistance of Dr Rainer Siegele (ANSTO) and funding from AINSE.

Magnetic structures in $RNiAl_4$ via low temperature nuclear orientation

Low temperature nuclear orientation (LTNO) is a technique usually applied to studies in nuclear physics e.g. measurement of magnetic moments of short lived isotopes. However where the isotopes are well understood, LTNO can instead be applied to magnetic structures, with one or more magnetic species labelled via their neutron activated radioactive isotopes.

Here LTNO was applied as part of studies of the magnetic structure of the metamagnetic intermetallic compound $TbNiAl_4$ which has three phases in different magnetic fields at low temperature; simple antiferromagnetic in low field and aligned paramagnet in high field. The nature of the intermediate (low temperature, field driven) phase is the curiosity. Especially given a large negative magnetocaloric effect associated with the first phase transition. To tackle this question, apart from using standard bulk measurements, two approaches were taken: Neutron diffraction and ^{160}Tb LTNO, both used single crystals and applied fields accessing the intermediate phase region of $TbNiAl_4$. In this way, it was identified that an applied field, at low temperature, drives the system into an incommensurate antiferromagnetic phase, but one that also has an associated ferro moment, manifest in extra Bragg structural peak intensity. Moreover, this (first) field driven phase transition at low temperature shows significant hysteresis and, indeed, the neutron study also revealed that a region of mixed IC and commensurate phases exists in the hysteretic region. The LTNO therefore provides a valuable additional approach to monitor the Tb^{3+} moments in $TbNiAl_4$. The ^{160}Tb was created *in situ* by thermal neutron activation, crystals were annealed post activation, and the experimental temperature monitored using a ^{60}CoCo LTNO thermometer. These experiments reveal a deviation in average moment only for the upwards ramp direction will allow the exact dynamics of the changes in magnetic structure to be formulated.

This project forms part of a wider ongoing study of exotic magnetism in rare earth intermetallic compounds which is a collaborative effort between Dr Wayne Hutchison and colleagues at The University of New South Wales in Canberra and Professor Katsuhiko Nishimura's group at the University of Toyama in Japan.



Experiments on single crystal $TbNiAl_4$ as a function of applied magnetic field along the crystal a axis. (a) is the bulk magnetisation, while (b) is the 299 keV gamma anisotropy from ^{160}Tb in situ activated within the crystal. In the LTNO experiment, a ^{60}CoCo thermometer indicated that the cold finger temperature did not exceed 10.5 mK throughout

Development of solid state microdosimetry for the improvement of quality of life

Microdosimetry provides a method for determining radiobiological effects of radiation and requires no prior composition knowledge of the radiation field. Solid-state Silicon-on-Insulator (SOI) microdosimeters, under development at the University of Wollongong, provide a number of advantages over traditional gas Tissue Equivalent Proportional Counters (TEPC). TEPC's rely upon a low pressure tissue-equivalent gas to simulate a micron-sized volume however SOI microdosimetry has the advantage of small physical size, the ability to simulate an array of cells and no need for a gas or high voltage power supply.

Characterisation of SOI microdosimeter arrays was carried out using the Heavy Ion Microprobe at ANSTO's ANTARES accelerator using a technique known as Ion Beam Induced Charge (IBIC) collection. Charge collection maps obtained during IBIC studies demonstrated an improved yield over earlier designs. However, it also revealed the collection of diffusion charge from events occurring outside the sensitive volumes, despite the guard ring structure designed to remove charge collection from outside the sensitive volume. This affects the performance of the device as microdosimetry requires a well defined sensitive volume.

Diffusion charge collection from outside of the sensitive volume was studied in another IBIC investigation. The signal from the guard ring was gated with the sensitive volume signal and coincident events were removed from the spectrum. This technique was shown to reduce events associated with diffusion; however, the charge collection geometry is still largely unknown. A new design of solid state microdosimeters is under development based on free standing silicon cells, isolated from adjacent cells by PMMA, aims to eliminate charge diffusion and improve the definition of the sensitive volume.

This project is a collaboration between the Centre for Medical Radiation Physics, University of Wollongong (UOW) and ANSTO's Detector Laboratory. The work has been carried out by PhD student Jayde Livingstone (UOW) under the supervision of Dr. Dale Prokopovich (ANSTO), Dr. Mark Reinhard (ANSTO) and Prof. Anatoly Rosenfeld (UOW).

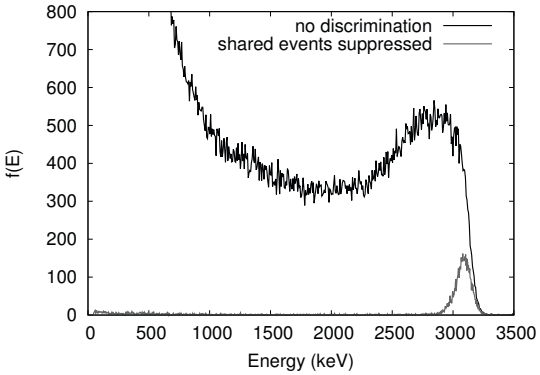


Figure 1: Comparison of energy spectra from an SOI microdosimeter with and without gating the sensitive volume signal with the signal from the guard ring electrode. The results were recorded simultaneously during irradiation with 5.5 MeV He ions. Reduced energy events associated with diffusion from outside the sensitive volume have been removed.

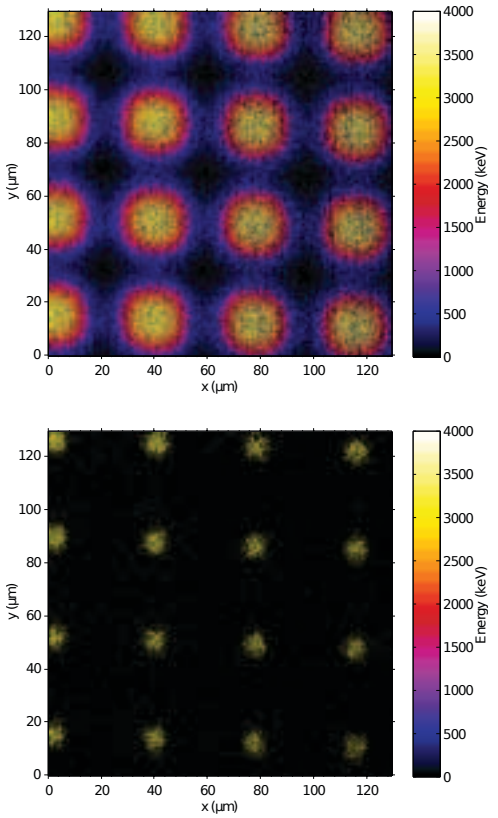
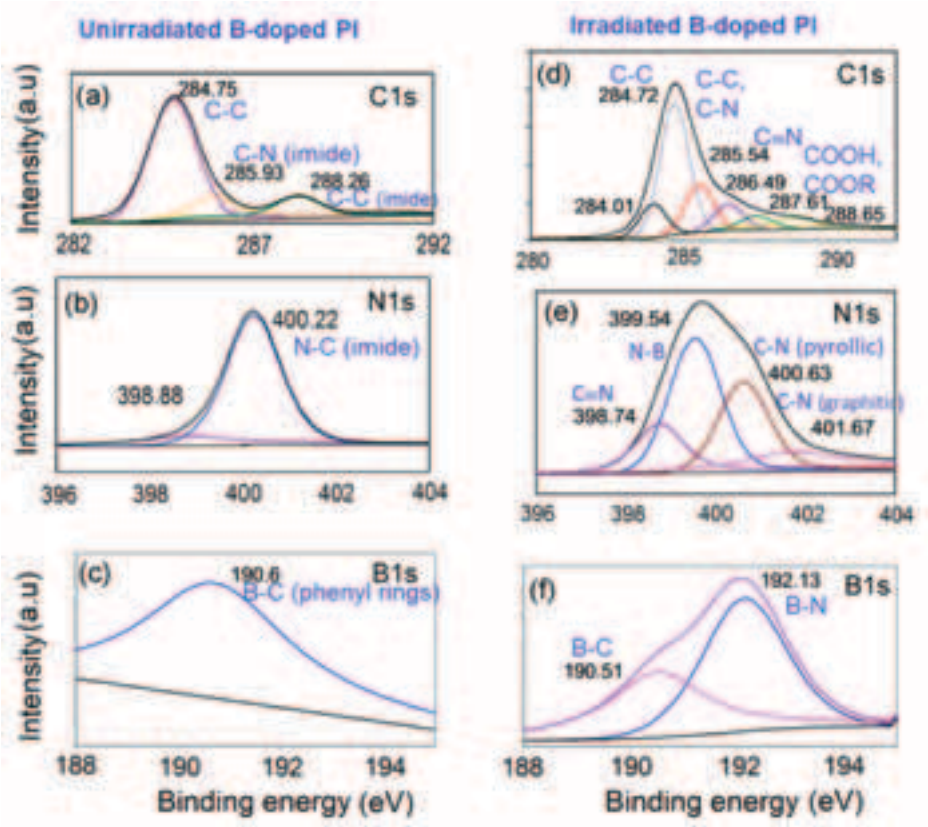


Figure 2: Median energy maps illustrating the response of an SOI microdosimeter to 5.5 MeV He ions. (a) is the response without any discrimination and (b) is the response after suppression of the events shared between the sensitive volume and the guard ring electrode. The diameter of the effective sensitive volume is observed to decrease from ~20 µm to ~8 µm which better corresponds to the 10 µm physical diameter of the ion implanted sensitive volume.

Light element doped carbon nanostructures

Carbon (sp^2) nanostructures including graphene, carbon nanotubes (CNT) and amorphous carbon are increasingly considered as potential building blocks for new generation molecular and nanoengineered electronic devices. These C-nanostructures possess unique electronic structures and exhibit physico-chemical properties different to those of bulk graphite arising from point defects and interstitials and were demonstrated to show field emission behaviour, magneto-resistive phenomena, magneto-thermocaloric and anomalous Hall effects as well as ferro- and ferri-magnetism with potential application as spintronics based fast switching valves, field emission displays, and gas and biomolecular sensors.

This project explores fabrication of light element doped graphitic nanostructured arrays embedded within polymeric medium by synthesis of specifically doped precursor-polymers together with reactive ion beam irradiation of the crosslinked polymer, a technique which separates chemical doping and synthesis from nanostructuring fabrication. Boron doping of precursor solutions of polymer monomers leads to its incorporation in sp^2 C-clusters of diameter 3-5 nm formed within nanochannels. The presence of B during the ion induced thermal transformations enhanced N substitution originating from the primary imide ring of polyimide into the C-clusters. X-ray Photoelectron Spectroscopy confirmed B substitution in the C rings and N substitution in three bonding configurations as well as the formation of B-N bonds [Figure]. Additionally Raman spectra showed a high degree of disorder and the presence of C≡N within these C-clusters as well as the graphene nature of the C-clusters. Such substitutional doping of the C-nanostructures allows tuning of the electronic structure to provide a range of potential semiconducting and magnetic device responses. This work is being carried out by Prof. David Mainwaring and Dr Pandiyan Murugaraj Swinburne University of Technology, with Dr. Rainer Siegele (ANSTO).



XPS spectra of 0.75 B-doped polyimide films, (a), (b) and (c) deconvoluted C1s, N1s and B1s signals from unirradiated polyimide; (d), (e) and (f) deconvoluted C1s, N1s and B1s signals from irradiated films indicating doped grapheme nanostructures.

Classical neutron Bragg diffraction used to explore exotic magnetism in thin film nanostructures

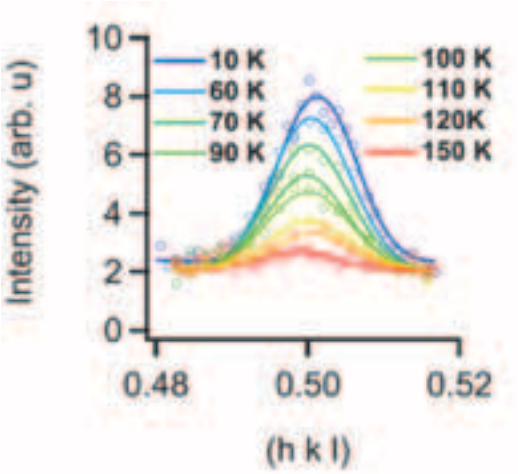


Figure1: The temperature dependent Bragg diffraction signal from the low-temperature ordering of the antiferromagnetic spin-structure in a 500 nm-thick $BiFe_{0.5}Mn_{0.5}O_3$ thin film on $SrTiO_3$ substrate.

Figure 2: David Cortie looking wide awake at 3:00 am during an experimental beam-time.

Magnetic nanostructures are tiny magnets with a length-scale constrained to about one millionth of a millimeter. Magnetic nanostructured films are already a crucial part of computer hard-drive technology and they are expected to be a key component in the next stage in the evolution of computers and electronics.

Quantum confinement and the high surface area modify the magnetic behavior of the quasi-2D film structures so that they no longer resemble those of ordinary large crystals. For this reason, many questions remain about certain atomic-scale properties such as exotic local spin structures. Effectively, these materials are the "black-boxes" of magnetism. Shedding light on these nanomagnets is not only interesting from a basic science point of view but also for possible technical applications.

Neutron-based Bragg diffraction is an ideal tool to study magnetic structure in bulk materials; however, traditional thinking dictates that it is a poor choice for studying nanomagnets because the experimental signals arising from the tiny mass of material (typically on the order of a few hundred micrograms) are extremely weak. The world-class neutron beam instrumentation at the OPAL reactor has allowed our group to resolve Bragg peaks in classical Bragg-Brentano geometry for a variety of single crystalline nanofilms. It is truly remarkable that, under carefully prepared experimental conditions, one can deploy this powerful neutron technique on such planar nanomagnets. For example, this capability was recently used to resolve the magnetic structure of Mn-doped epitaxial $BiFeO_3$ thin films in order to understand the atomic spin structure in this multiferroic family (Cortie et al. Appl. Phys. Lett. 172404, (2012)).

This work formed part of the PhD research of David Cortie supervised by Prof. Frank Klose and Prof. Xiaolin Wang as part of larger collaborations between the ANSTO, the University of Wollongong and the National Institute of Material Science, Japan. David Cortie acknowledges AINSE PGRA support.

Investigation of possible solid state hydride dynamics in a novel digermyne complex

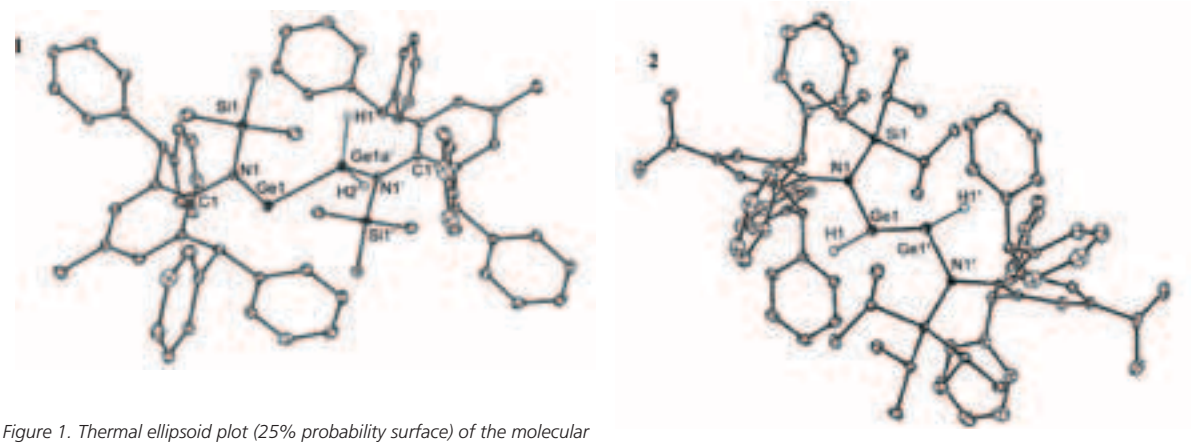


Figure 1. Thermal ellipsoid plot (25% probability surface) of the molecular structure of 1 and 2; hydrogen atoms (except hydrides) are omitted for clarity.

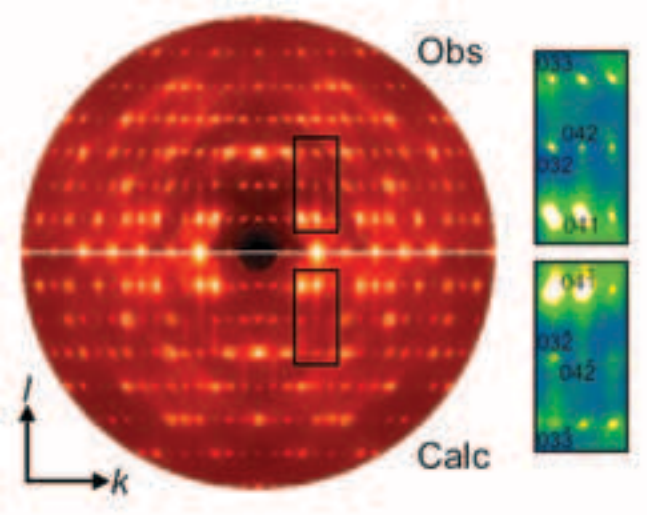
Recent advances have been made in the development of p-block chemistry, including a range digermyne(I) complexes with bulky amide ligands with H_2 activation properties both in solid state and solution, and at low temperatures. These complexes are also of interest as potential hydrogenation catalysts. The digermyne dihydride compounds 1 and 2 appear by initial X-ray crystallography studies to show differences in hydride binding around the digermyne core (Figure 1).

The ability of these complexes to uptake hydrogen in the solid state gave rise to the possibility of solid state hydride dynamics occurring around the digermyne core, which are being probed by ongoing VT single crystal neutron diffraction studies using KOALA, with future computational studies of the model in order to examine any hydride dynamics. Preliminary KOALA data on compound 2 at 100 K is indicative of the hydrides being disordered or involved in a fluxional process, which will be further pursued in 2014.

This project is a collaborative effort between the research group of Prof Cameron Jones at Monash University who prepared the compounds and identified these interesting properties, Bragg institute scientists Dr Alison Edwards and Prof Don Kearley and University of Tasmania research group of A/Prof Michael Gardiner, with PhD student Catriona Vanston undertaking the neutron experiments and analysis.

(a) Li, J.; Schenk, C.; Goedecke, C.; Frenking, G.; Jones, C. J. Am. Chem. Soc. 2011, 133, 18622–18625; (b) Hadlington, T. J., Hermann, M., Li, J., Frenking, G. and Jones, C. Angew. Chem. Int. Ed. 2013, 52, 1 – 6

Short-Range Order in Ferroelectric Triglycine Sulphate



The 0kl slice of reciprocal space from the x-ray diffuse scattering data at 322K (T ≈ TC) (top half) and the calculated diffuse scattering pattern from the model (bottom half). The inset shows the area around the diffuse streak between the 041 and 042 Bragg peaks.

The hydrogen bonded ferroelectric triglycine sulphate (TGS), $(NH_2CH_2COOH)_3.H_2SO_4$, undergoes a second-order, order-disorder phase transition at T_C = 322 K. Above T_C, one of the glycine molecules is disordered about the mirror plane. Below T_C, the orientations become ordered on one side of the mirror plane, breaking the symmetry and producing a spontaneous polarisation along the ferroelectric b-axis.

X-ray and neutron scattering data were used to investigate the local ordering that occurs in TGS close to the ferroelectric-paraelectric phase transition in order to gain insight into how the intermolecular interactions drive the transition. In particular, the role of hydrogen bonding and dipole-dipole interactions has been a matter of much conjecture in the literature.

Close to the T_C, streaks of diffuse scattering appear in the x-ray and neutron data which are due to short-range order of the polarising glycine orientations parallel to the ferroelectric *b*-axis. Monte Carlo modelling of the data revealed that hydrogen bond mediated interactions between the polarising glycine molecules drives the formation of these linear domains. While this suggests that hydrogen bonding plays the dominant role in the ferroelectric ordering of TGS, it is likely that there are also weaker correlations between the linear domains due to dipole-dipole interactions. This provides a mechanism for TGS to go from short-range ordered in 1-dimension to long-range ordered in 3-dimensions as it is cooled through T_C.

This work was part of the PhD project of Dr Jessica Hudspeth (now a post-doctoral fellow at ESRF) at the Australian National University, with Dr Darren Goossens (ANU), Dr Andrew Studer (ANSTO), Dr Matthias Gutmann (ISIS) and Professor Richard Welberry (ANU). Neutron diffuse scattering data were collected on the Wombat diffractometer at ANSTO and the SXD diffractometer at ISIS. X-ray diffuse scattering data were collected on the 11-ID-B beamline at APS.

AINSE Winter School 2013

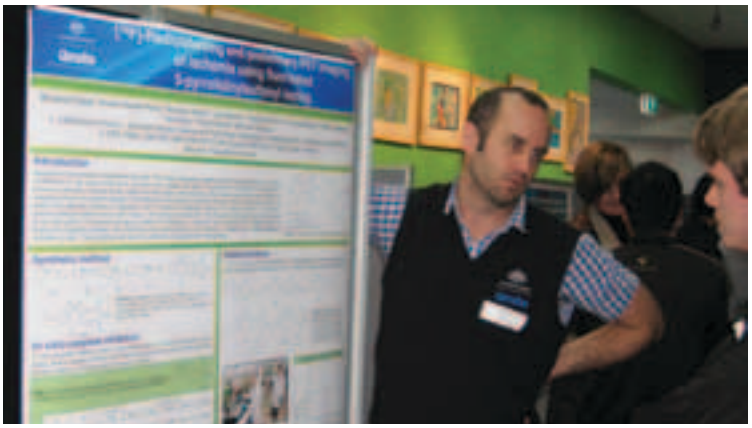
Sunday 30 June 2013 to Thursday 4 July 2013

Pictured clockwise from left: Sydney Harbour Cruise, students enjoying one of the many social activities Winter School offers.

Dr Adi Paterson, Chief Executive Officer ANSTO (left) congratulating student (Jordon Irwin) on completion and participation of Winter School 2013, with AINSE Managing Director Dr Frank Bruhn.

Winter School Convenor Professor Thomas Millar (left) with guest speaker, Dr Cathy Foley, Chief of Division, CSIRO Materials Science and Engineering, and AINSE Managing Director Dr Frank Bruhn.

ANSTO Scientist Dr Ben Fraser, Organic Chemistry Task Leader for ANSTO Life Sciences, discussing honours projects with students.



"As a result of this winter school, I definitely want to do honours and hopefully further research with ANSTO. So many inspiring people, interesting research areas and awesome instruments"

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 42 member universities, with this year's winter school having a representative from all member universities. The purpose of the Winter School is to enable undergraduate students from member universities to participate in experiments at Lucas Heights utilising some of the facilities at ANSTO. The aim is that this approach will 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.

The winter school was fortunate to have AINSE PGRA and research fellows assisting with the winter school. AINSE would like to thank Jay Chin, David Cortie, Neeraj Sharma and Rachel Popelka-Filcoff for their invaluable help.

This year, AINSE was proud to present three high-profile guest speakers: Dr Michael James, Head of Science of the Australian Synchrotron, Dr Cathy Foley, Chief of the CSIRO's Division of Material Science and Engineering, and Dr Adi Paterson, Chief Executive Officer of ANSTO.

Pictured above: Winter School 2013 participants, representing 42 universities.

Student
Jacob Downs ACU
Rebecca Chao ADE
Luke Xu AKL
Adelle Wright ANU
Naomi Keller BAL
Stewart Alexander CAN
Johncarlo Maddalena CBR
Corrine Duncan CDU
Jordon Irwin CQU
Jessica Graham-Thompson CSU
Bradley Gallagher CUR
Gabrielle Pavlovic DEA
Wade Lonsdale ECU
Timothy Solheim FLI
Khadija Alsabawi GRI
Emma Rehn JCU
Rhiannon Ashton LAT
Mahwash Jamy MAC
Katie Sizeland MAS
Peter Trewhella MEL
David Macindoe MON
Kate Grogan MUR
Samila McDonald NCT
Julie James NSW
Dylan Gaffney OTA
Christopher Read QLD
Cassandra Bein QUT
Jesse Vaitkus RMIT
Trent McIntyre SCU
Han Ho SWI
Elisabeth Tondl SYD
Ben Gaskell TAS
Nicholas Magann UNE
Rebecca Tattingham USA
Genevieve Vanderharst USC
Alyssa Madden USQ
Richard Carney UTS
Sean Ding UWA
Dale Ang UWS
Harry Warring VUW
Cameron Crombie WAI
Leanne Miller-Bassett WOL

Discipline / Area of Study	No.
Analytical & Molecular Science	1
Archaeology	4
Biology	2
Biomedical Science	1
Chemistry	10
Engineering	3
Environmental Science	3
Geology	4
Metallurgy	1
Nuclear Medicine	1
Nuclear Science	1
Pharmacology	2
Physics	9

"I am so grateful for having had the opportunity and experience and it is something that I won't forget. I am sad to be leaving ANSTO and the AINSE winter school but look forward to working with ANSTO and applying nuclear techniques to my research in the future!"

"Organisation, the food, the researchers, other students, everything was an absolutely fantastic experience. I am grateful for the opportunity and would recommend it to anyone like me."

"Thank you for an excellent opportunity to gain an understanding in nuclear research. I had a great time and I have learnt so much. AINSE has been excellent and Winter School 2013 - AMAZING!"

2013 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 2013 AINSE hosted the following two conferences:

11th AINSE-ANBUG Neutron Scattering Symposium (AANSS 2013)

2-3 December 2013
36 Students, 17 Organisations, AKL, ANSTO, ANU, DEA, LAT, MAC, MEL, MON, NSW, QLD, QUT, RMI, SWI, SYD, TAS, USC, WOL

AINSE hosted the 11th annual AANSS symposium on the 2nd and 3rd December 2013. 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'. The symposium was fortunate this year to have Emeritus Professor Anthony Klein, University of Melbourne, guest speaker, discussing "The prehistory and history of neutron scattering in Australia".

The symposium attracted a wide range of students (36 students attended) from around Australia and New Zealand who presented posters and oral presentations. Congratulations to Frederick Marlton from the Australian National University for winning the "Best Presentation Prize", and Amy Xu from the University of Auckland for winning the "Best Poster Prize". Along with organising the conference, AINSE provided 18 students with travel support.

ANSTO Breakfast

13 November 2013, Lucas Heights

A buffet style breakfast was hosted by AINSE for ANSTO scientists to thank them for the tremendous contributions and support with AINSE programs in 2013. A short presentation followed in the AINSE theatre where the AINSE programs, important AINSE dates and security passes were discussed. This breakfast was attended by 42 ANSTO staff members.

Additional Support

In addition to these events participants from member organisations were assisted with travel and accommodation to attend a number of other AINSE approved conferences. These are:

Biomarkers Conference - Lucas Heights

3-5 February 2013

3 Students, 2 Organisations, CUR, SCU

Groundwater Dating & Paleohydrology Workshop – Lucas Heights

27-28 June 2013

6 students, 3 Organisations CSI, FLI, UWA

Synchrotron and Neutron New Users Symposium 2013 – University of Sydney

26 July 2013

26 Students, 10 Organisations ADE, ANU, CSU, DEA, FLI, LAT, MEL, MON, MUR, USA

12th Australasian Environmental Isotopes Conference – University of Western Australia

10-12 July 2013

5 Students, 4 Organisations MAC, QLD, SCU, SYD

Neutron School 2013 – Lucas Heights

12-14 August 2013

7 Students, 3 Organisations, CSI, QUT, WOL

9th Australia and New Zealand Aerosol Workshop – Darling Harbour

12-13 September 2013

2 Students, 1 Organisation, QUT

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.

AINSE COUNCIL 2013 Member Organisations and Representatives at Council

Two Council Meetings were held in 2013

Abbreviations	Organisation	Membership Commenced	Councillor	Meetings Attended
ACU	Australian Catholic University	2001	Dr Brian Bicknell	0
ADE	The University of Adelaide	1958	Emeritus Professor Richard Keene	1
			Professor John Carver	1
AKL	The University of Auckland	1995	Professor James Metson	1
ANS	ANSTO, Bragg Institute	1958	Dr Robert Robinson	2
ANS	ANSTO, Institute for Environmental Research		Professor John Dodson	1
ANS	ANSTO, Institute for Materials Engineering		Professor Lyndon Edwards	2
ANU	The Australian National University	1958	Professor Keith Fifield	2
BAL	University of Ballarat	1997	Professor Peter Gell	1
			Dr Jessica Reeves	1
CAN	University of Canterbury	2005	A/Professor Greg Russell	0
CBR	University of Canberra	1996	Professor Bill Maher	0
CDU	Charles Darwin University	1995	Professor Jim Mitroy	2
CQU	CQ University	1991	A/Professor Owen Nevin	2
CSI	CSIRO	2010	Dr Patrick Hartley	1
CSU	Charles Sturt University	1995	Dr Padraig Strappe	1
CUR	Curtin University of Technology	1989	Professor Craig Buckley	1
DEA	Deakin University	1997	Professor Lee Astheimer	0
ECU	Edith Cowan University	1996	A/Professor Stephen Hinckley	2
FLI	Flinders University	1966	A/Professor Claire Lenehan	2
GNS	GNS Science	2005	Dr Christopher Daughney	2
GRI	Griffith University	1975	Professor Greg Hope	2
JAM	James Cook University	1970	A/Professor Scott Smithers	1
LAT	La Trobe University	1966	Dr Andy Herries	1
MAC	Macquarie University	1966	Professor Clive Baldock	1
MEL	The University of Melbourne	1958	Professor Jim Camakaris	0
MON	Monash University	1961	Prof Ian Smith	1
MUR	Murdoch University	1985	Dr Aleks Nikoloski	2
NCT	The University of Newcastle	1965	Professor Bruce King	1
NSW	The University of New South Wales	1958	Professor Robert Burford	2
OTA	University of Otago	2007	Professor Gary Wilson	0
QLD	The University of Queensland	1958	Professor Ian Gentle	2
QUT	Queensland University of Technology	1992	Professor Godwin Ayoko	2
RMI	Royal Melbourne Institute of Technology	1988	Professor Suresh Bhargava	1
SCU	Southern Cross University	1994	Professor Bill Boyd	1
SWI	Swinburne University of Technology	1991	Professor Elena Ivanova	2
SYD	The University of Sydney	1958	Professor Brendan Kennedy	2
SYN	Australian Synchrotron	2010	Professor Andrew Peele	0
TAS	University of Tasmania	1958	Professor Andrew McMinn	2
UNE	The University of New England	1958	Professor Annabelle Duncan	0

USA	University of South Australia	1991	Professor Namita Choudhury	2
USC	University of Sunshine Coast	2010	Professor John Bartlett	2
USQ	University of Southern Queensland	1996	A/Professor Joachim Ribbe	1
UTS	University of Technology Sydney	1988	Professor Greg Skilbeck	1
UWA	The University of Western Australia	1958	A/Professor Pauline Grierson	1
UWS	University of Western Sydney	1993	A/Professor Gary Dennis	1
VUW	Victoria University of Wellington	2010	Professor Charles Daugherty	0
WAI	The University of Waikato	2011	A/Professor Graham Saunders	1
WOL	University of Wollongong	1975	Professor Allan Chivas	2
AINSE			Dr Frank Bruhn, Managing Director	2

Alternate Representatives and other attendees

Abbreviations	Organisation	Representative	Meetings Attended
CAN	University of Canterbury	Prof Emily Parker	1
CSI	CSIRO	Dr Charlotte Conn	1
CUR	Curtin University of Technology	Emeritus Prof Brian O'Connor	1
MAC	Macquarie University	A/Professor Robert Willows	1
MAS	Massey University	Professor Geoff Jameson	1
MAS	Massey University	Professor Richard Haverkamp	1
MEL	The University of Melbourne	Dr Damian Myers	2
NCT	The University of Newcastle	Dr Silvia Frisia	1
RMI	Royal Melbourne Institute of Technology	Professor Gary Bryant	1
SCU	Southern Cross University	Dr Malcolm Clark	1
SYN	The Australian Synchrotron	Professor Michael James	2
UTS	University of Technology Sydney	A/Professor Stella Valenzuela	1
VUW	Victoria University of Wellington	Professor Denis Sullivan	1
VUW	Victoria University of Wellington	Dr Ben Ruck	1
	Independent Director	Ms Roslyn Hatton	2
	Independent Director	Dr Peter Coldrey	2
	ANSTO, Life Sciences	Dr Marie-Claude Gregoire	2

AINSE Board

Four Board Meetings were held in 2013

Executive Member	Office/Position	Organisation	Meetings Attended
Professor Brendan Kennedy	President	The University of Sydney	4
Dr Frank Bruhn	Managing Director	AINSE	4
Professor Lyndon Edwards		IME, ANSTO	4
Dr Robert Robinson		BI, ANSTO	3
Professor John Dodson		IER, ANSTO	3
Professor Bruce King		University of Newcastle	2
Professor Robert Burford		University of New South Wales	1
Professor Lee Astheimer		Deakin University	2
Dr Peter Coldrey		Independent Director	4
Ms Roslyn Hatton		Independent Director	3

AINSE Staff

Managing Director

Dr Frank Bruhn

Secretariat

Ms Michelle Durant
Ms Rachel Caldwell
Mrs Sandy O'Connor
Mrs Nerissa Phillips

Specialist Committees for 2013

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
Dr Judith Field, The University of New South Wales
Professor Glenn Summerhayes, University of Otago
Dr Jessica Reeves (c), University of Ballarat
Dr John Bennett, ANSTO
Dr Quan Hua, ANSTO
Vladimir Levchenko (a), ANSTO
Dr Sam Marx (a), University of Wollongong

Biomedical Science and Biotechnology 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, The University of Melbourne
Dr Anthonin Reilhac-Laborde, ANSTO
Dr Tien Pham, 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 Anton Middelberg – Convenor, University of Queensland
Dr Victor Streltsov, CSIRO
Professor Roland De Marco, University of Sunshine Coast
Professor Gary Bryant, RMIT University
Dr Peter Holden, ANSTO
Dr Shane Kennedy, ANSTO

Materials – Properties and Engineering Committee

Professor Robert Burford, 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
Dr David Cohen, ANSTO
Professor Lyndon Edwards, ANSTO
Mihail Ionescu (a), ANSTO
Greg Lumpkin (a), ANSTO

Other Committees

11th AINSE-ANBUG Neutron Scattering Symposium (AANSS)

Rachel Caldwell, AINSE (Conference Coordinator)
James Hester, ANSTO
Darren Goossens, Australian National University
Michael James, Australian Synchrotron
Evan Gray, Griffith University
Erich Kisi, Newcastle University
Brendan Kennedy, University of Sydney
Chris Ling, University of Sydney (Conference Chair)

Winter School Committee

Professor Thomas Millar, Convenor, University of Western Sydney
Dr Frank Bruhn, 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
Dr Vanessa Peterson, Bragg, ANSTO
Mr Rod Dowler, Discovery Centre ANSTO
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
Dr Martin Ebert, University of Western Sydney

Directors' Report

for the year ended 31 December 2013

Your Directors present their report on the Company for the financial year ended 31 December 2013.

Directors

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

Professor Brendan Kennedy

Professor Bruce King (resigned 30/05/13)

Professor John Dodson

Professor Lyndon Edwards

Dr Robert Robinson

Professor Lee Astheimer (resigned 23/12/13)

Dr Frank Bruhn

Dr Peter Coldrey

Ms Roslyn Hatton

Professor Robert Burford (commenced 31/05/13)

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

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, research fellowships, honours scholarships to people in 45 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 of 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 2013

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 2013

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 2013

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 2013

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).

Brendan Kennedy – President

Board Member since 2009

28 years experience in science research.

BEd, PhD

John Dodson – Board Member

Board Member since 2008

33 years experience as an academic in Australia, New Zealand and UK.

PhD

Lyndon Edwards – Board Member

Board Member since 2008

30 years experience in academia and scientific research in Australia and UK.

MA, DPhil(Oxon), FIMMM, CEng

Robert Robinson – Board Member

Board Member since 2008

31 years experience in scientific research and academia in Australia, USA and UK.

MA, PhD

Frank Bruhn – Managing Director

Board Member since June 2012

19 years experience in scientific research, research management and international research coordination in Germany, Australia and New Zealand.

Dipl.-Geol., Dr. rer. nat.

Peter Coldrey – Board Member

Board Member since August 2012

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

FTSE, BE,PhD, BCom

Roslyn Hatton – Board Member

Board Member since August 2012

26 years in public (ANAO) and private (Ernst & Young) sector audit and 8 years at the Commonwealth Bank in a financial accounting role.

BComm (Accounting, finance and information systems) UNSW

FCA

Robert Burford – Board Member

Board Member since May 2013

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

BSc Hons, PhD, FRACI, FIEAust, FIChemE

Claire Lenehan – Board Member

Board Member since March 2014

15 years experience in scientific research.

PhD.

Directors' Report for the year ended 31 December 2013

Meetings of Directors

During the financial year, 4 meetings of directors were held. Attendances by each director were as follows:

	Number eligible to attend	Number attended
Professor Brendan Kennedy	4	4
Professor Bruce King	2	2
Professor John Dodson	4	3
Professor Lyndon Edwards	4	4
Dr Robert Robinson	4	3
Professor Lee Astheimer	4	2
Dr Frank Bruhn	4	4
Dr Peter Coldrey	4	4
Ms Roslyn Hatton	4	3
Professor Robert Burford	2	1

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 2013, the total amount that members of the company are liable to contribute if the company is wound up is $450 (2012: $460).

Auditors Independence Declaration

The lead auditor's independence declaration for the year ended 31 December 2013 has been received and can be found on page 38 of the report.

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

Roslyn Hatton
Director

Lyndon Edwards
Director

Dated this 7th day of April, 2014

Auditor's Independence Declaration

for the year ended 31 December 2013

I declare that, to the best of my knowledge and belief, during the year ended 31 December 2013 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

27th February, 2014

Balance Sheet for the year ended 31 December 2013

	Notes	31-Dec-13 $	31-Dec-12 $
Current Assets			
Cash	2	70,040	73,083
Trade and Other Receivables	3	245,024	169,101
Investments	4	1,890,441	2,614,567
Other	5	21,266	20,362
Total Current Assets		2,226,771	2,877,113
Non-Current Assets			
Plant and Equipment	6	46,123	50,177
Total Non-Current Assets		46,123	50,177
Total Assets		2,272,894	2,927,290
Current Liabilities			
Trade and Other Payables	7	387,846	1,642,320
Provisions	8	98,808	68,375
		486,654	1,710,695
Non-Current Liabilities			
Provisions	8	7,088	4,130
		7,088	4,130
Total Liabilities		493,742	1,714,825
NET ASSETS		1,779,152	1,212,465
Equity			
Awards Reserve	11	1,747,664	2,442,251
Long Term Projects Reserve	11	-	-
Accumulated surplus/(deficit)		31,488	(1,229,786)
TOTAL EQUITY		1,779,152	1,212,465

The accompanying notes form part of these financial statements

Income Statement for the year ended 31 December 2013

	Notes	31-Dec-13 $	31-Dec-12 $
Operating Revenue			
Payments from members		3,436,510	3,208,075
External Grants	10	-	392,250
Interest Received		78,697	179,461
Profit on sale of assets		-	2,000
Other		16,883	57,675
Total Operating Revenue		3,532,090	3,839,461
Operating Expenses			
Wages & Salaries		408,820	363,135
Superannuation		45,258	57,486
AINSE Awards			
Students		611,189	719,505
Research Fellowship		477,608	641,541
Research Awards		1,116,086	1,944,703
Conference Subsidies		95,760	251,829
External Grants	10	-	400,000
Other Expenses		210,682	178,394
Total Operating Expenses		2,965,403	4,556,593
Surplus/(Deficit) for the year		566,687	(717,132)
Accumulated funds brought forward		(1,229,786)	(1,112,609)
Accumulated Surplus (Deficit)		(663,099)	(1,829,741)
Add (Less): transfer (to)/from Reserves			
Long Term Projects Reserve		-	500,000
Awards Reserve	11	694,587	99,955
Accumulated surplus/(deficit) at end of financial year		31,488	(1,229,786)

The accompanying notes form part of these financial statements

Statement of Cash Flows for the year ended 31 December 2013

	Notes	31-Dec-13 $ Inflows/(Outflows)	31-Dec-12 $ Inflows/(Outflows)
CASH FLOWS PROVIDED BY (USED IN) OPERATING ACTIVITIES			
Receipts from operations		16,883	57,675
Receipts from members		3,354,545	3,182,226
Receipts from grants		-	392,250
Interest received		88,343	198,959
		3,459,771	3,831,110
Grants payments		(2,300,643)	(3,957,578)
Payments to suppliers and employees		(1,886,297)	(421,098)
		(4,186,940)	(4,378,676)
Net cash flows provided by (used in) operating activities	13	(727,169)	(547,566)
CASH FLOWS PROVIDED BY (USED IN) INVESTING ACTIVITIES			
Proceeds from sale of property, plant and equipment		-	17,273
Purchase of property, plant and equipment		-	(45,613)
Net cash flows provided by (used in) investing activities		-	(28,341)
Net increase (decrease) in cash held		(727,169)	(575,907)
Cash at beginning of reporting period		2,687,650	3,263,557
Cash at end of reporting period	2/4	1,960,481	2,687,650

Statement Of Changes In Equity for the year ended 31 December 2013

	Awards Reserve $	Long Term Projects Reserve $	Accumulated surplus/(deficit) $	Total $
Balance at 1 January 2012	2,542,206	500,000	(1,112,609)	1,929,597
Surplus / (Deficit) attributable to company	-	-	(717,132)	(717,132)
Transfers (to)/from reserves	(99,955)	(500,000)	599,955	-
Balance at 31 December 2012	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

The accompanying notes form part of these financial statements

Notes to the Financial Statements for the year ended 31 December 2013

Note 1: Statement of Significant Accounting Policies

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

Basis of Preparation

The financial report is a general purpose financial report that has been prepared in accordance with Australian Accounting Standards, Australian Accounting Interpretations, other authoritative pronouncements of the Australian Accounting Standards Board and the Corporations Act 2001.

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

The financial report has been prepared on an accruals basis and is 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 Limited is exempt from income tax under section 50-5 of the Income Tax Assessment Act 1997 as the Company as 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 reliable. 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	5 - 35%
Motor Vehicles	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 its 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 income statement.

Notes to the Financial Statements for the year ended 31 December 2013

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 income statement.

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.

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.

Notes to the Financial Statements for the year ended 31 December 2013

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.

Grants in relation to the acquisition of capital equipment are accounted for through the Balance Sheet account; Revenue in Advance. Any expenditure made during the year reduces the balance, with any surplus or deficit on completion of the grant to be recognised in the Income Statement. This policy has been adopted as the purpose of these grants is to commission the purchase of equipment, with control of the asset upon completion to vest with ANSTO.

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 balance sheet 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.

Notes to the Financial Statements for the year ended 31 December 2013

	31-Dec-13 $	31-Dec-12 $
2. CASH		
Operating Account	69,040	72,083
Petty Cash	1,000	1,000
	70,040	73,083
3. TRADE AND OTHER RECEIVABLES		
Current		
Trade Debtors	1,100	11,243
Other Receivables	243,924	157,858
	245,024	169,101

There are no balances within trade and other receivables which contain assets that are not impaired and past due. It is expected these balances will be received when due. Impaired assets are provided for in full where applicable.

4. INVESTMENTS		
Cash Deposit Account	1,890,441	2,614,567
	1,890,441	2,614,567
5. OTHER CURRENT ASSETS		
Current		
Prepayments	10,550	-
Interest Accrued	10,716	20,362
	21,266	20,362
6. PLANT AND EQUIPMENT		
Plant & Equipment		
At Cost	15,780	9,738
Accumulated Depreciation	(4,627)	(3,653)
Total Plant and Equipment	11,153	6,085
Motor Vehicles		
At Cost	45,613	45,613
Accumulated Depreciation	(10,643)	(1,521)
Total Motor Vehicle	34,970	44,092

Notes to the Financial Statements for the year ended 31 December 2013

	Plant & Equipment	Motor Vehicles	Total
Movements in Carrying Amounts	$	$	$
Balance at 1 January 2012	7,059	21,734	28,793
Additions	-	45,613	45,613
Disposals	-	(15,273)	(15,273)
Depreciation Expense	(974)	(7,982)	(8,956)
Balance at 31 December 2012	6,085	44,092	50,177
Additions / Accrual	6,042	-	6,042
Disposals	-	-	-
Depreciation Expense	(974)	(9,122)	(10,096)
Balance at 31 December 2013	11,153	34,970	46,123

	31-Dec-13	31-Dec-12
	$	$
7. TRADE AND OTHER PAYABLES		
Trade Payables	7,260	447,888
Sundry Payables and Accrued Expenses	380,586	1,194,432
	387,846	1,642,320
8. PROVISIONS		
Current		
Short-Term Employee Benefits	98,808	68,375
	98,808	68,375
Non-Current		
Long-Term Employee Benefits	7,088	4,130
	7,088	4,130
	105,896	72,505

9. SEGMENT REPORTING

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

Notes to the Financial Statements for the year ended 31 December 2013

10. AUSTRALIAN RESEARCH COUNCIL GRANTS

a) Operating Grants	ISIS LE0882725	ITRAX LE100100141	Total
2012	$	$	$
Grant Revenue	200,000	-	200,000
Member Contributions	192,250	-	192,250
Total Income	392,250	-	392,250
External Payments	(400,000)	-	(400,000)
AINSE Contribution	-		-
Total Expenses	(400,000)	-	(400,000)
Net Surplus (Deficit)	**(7,750)**	**-**	**(7,750)**
2013			
Grant Revenue	-	-	-
Member Contributions	-	-	-
Total Income	-	-	-
External Payments	-	-	-
AINSE Contribution	-	-	-
Total Expenses	-	-	-
Net Surplus (Deficit)	-	-	-

b) Capital Grants	Be Filter LE0989127	ITRAX LE100100141	Total
	$	$	$
Balance at 1 January 2012	20,000	247,749	267,749
External Grant	-	-	-
Member Contributions	-	-	-
AINSE Contribution	-	-	-
External Payments	(20,000)	(247,749)	(267,749)
Balance at 31 December 2012	-	-	-
External Grant	-	-	-
Member Contributions	-	-	-
AINSE Contribution	-	-	-
External Payments	-	-	-
Balance at 31 December 2013	-	-	-

Notes to the Financial Statements for the year ended 31 December 2013

	31-Dec-13	31-Dec-12
	$	$
11. MOVEMENT IN RESERVES		
Awards Reserve		
Opening Balance at 1 January	2,442,251	2,542,206
Transfer from P&L	(694,587)	(99,955)
Balance as at 31 December	1,747,664	2,442,251

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 (2012: 12 months in advance), Fellowships and Postgraduate awards.

Long Term Projects Reserve		
Opening Balance at 1 January	-	500,000
Transfer from P&L	-	(500,000)
Balance as at 31 December	-	-

12. AUDITORS REMUNERATION		
Remuneration of the auditor of the entity for:		
Auditing or reviewing the financial report	12,300	10,600
Other Services	3,805	3,550
	16,105	14,150

13. RECONCILIATION OF CASH PROVIDED BY OPERATING ACTIVITIES TO PROFIT FROM ORDINARY ACTIVITIES		
Profit/(Loss) from Ordinary Activities	566,687	(717,132)
Changes in Assets & Liabilities		
(Increase)/Decrease in other debtors and prepayment	(82,869)	(6,351)
Increase/(Decrease) in creditors and accruals	(1,254,474)	210,734
Increase/(Decrease) in employee provisions	33,391	(41,773)
	(1,303,952)	162,610
Non-Cash Items		
Depreciation	10,096	8,956
Gain on sale of asset	-	(2,000)
	10,096	6,956
Net cash provided by (used in) operating activities	(727,169)	(547,566)
Cash at the end of the financial year, as shown in the cash flow statement, is reconciled to the items in the balance sheet as follows:		
Cash	70,040	73,083
Investments	1,890,441	2,614,567
	1,960,481	2,687,650

Notes to the Financial Statements for the year ended 31 December 2013

14. 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 2013.

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 balance sheet 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:

	Fixed Interest Rate Maturing							
	Weighted Average Effective Interest Rate		Floating Interest Rate		Non-interest bearing		Total	
	2013	2012	**2013**	2012	**2013**	2012	**2013**	2012
	%	%	$	$	$	$	$	$
Financial Assets								
Cash and cash equivalents	3.41%	4.77%	1,959,481	2,686,650	-	-	1,959,481	2,686,650
Receivables	-	-	-	-	245,024	169,101	245,024	169,101
Total Financial Assets			1,959,481	2,686,650	245,024	169,101	2,204,505	2,855,751
Financial Liabilities								
Trade and other payables	-	-	387,846	1,642,320	-	-	387,846	1,642,320
Provisions	-	-	-	-	105,896	72,505	105,896	72,505
Total Financial Liabilities			387,846	1,642,320	105,896	72,505	493,742	1,714,825

Notes to the Financial Statements for the year ended 31 December 2013

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:

	2013		2012	
	Carrying amount	Net Fair Value	Carrying amount	Net Fair Value
Financial assets	$	$	$	$
Cash	1,960,481	1,960,481	2,687,650	2,687,650
Receivables	245,024	245,024	169,101	169,101
	2,205,505	2,205,505	2,856,751	2,856,751
Financial liabilities				
Trade and other payables	387,846	387,846	1,642,320	1,642,320
Provisions	105,896	105,896	72,505	72,505
	493,742	493,742	1,714,825	1,714,825

Fair values are materially in line with carrying values.

15. 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

16. KEY MANAGEMENT PERSONNEL COMPENSATION

	Short-term Benefit	Post Employment	Total
	$	$	$
2013			
Total compensation	217,909	6,352	224,261
2012			
Total compensation	235,820	(44,423)	191,397

Key management personnel compensation includes a rate of $1,000 per meeting provided to Independent Board Members

17. 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 2013 the number of members was 45 (In 2012 the number of members was 46).

Directors' declaration

for the year ended 31 December 2013

The Directors of the Company declare that:

1. The financial statements and notes, as set out on pages 39 to 50, are in accordance with the Corporations Act 2001:

(a) Comply with Accounting Standards and the Corporations Regulations 2001; and

(b) Give a true and fair view of the financial position as at 31 December 2013 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

Lyndon Edwards
Director

Dated this 7th day of April , 2014

Independent audit report to the members

for the year ended 31 December 2013

Report on the Financial Report

We have audited the accompanying financial report of AINSE Limited (the Company), which comprises the balance sheet as at 31 December 2013 and the income and expenditure statement, 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 and fair presentation of the financial report in accordance with Australian Accounting Standards (including the Australian Accounting Interpretations) and the Corporations Act 2001. This responsibility includes establishing and maintaining internal control relevant to the preparation and fair presentation of the financial report that is free from material misstatement, whether due to fraud or error; selecting and applying appropriate accounting policies; and making accounting estimates that are reasonable in the circumstances.

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 27th February 2014 would be in the same terms if provided to the directors as at the date of this auditor's report.

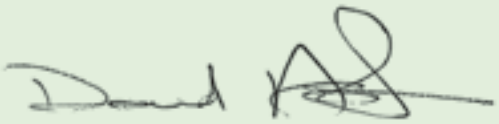
Audit Opinion

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 2013 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 7th day of April, 2014

Auditor's Disclaimer

for the year ended 31 December 2013

The additional data presented in the Detailed Statement of Income & Expenditure on pages 55 & 56 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 2013. 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 7th day of April, 2014

Detailed Statement of Income and Expenditure for the year ended 31 December 2013

		31-Dec-13		31-Dec-12
		$		$
Operating Revenue				
Payments from members		3,436,510		3,208,075
External Grants		-		392,250
Interest Received		78,697		179,461
Profit on sale of assets		-		2,000
Sponsorships				
Radiation Conference	-		900	
AANSS	2,250		4,046	
SPERA	-		1,045	
		2,250		5,991
Conference Registrations		13,883		51,478
Other Income		750		206
Total Operating Revenue		3,532,090		3,839,461
Operating Expenses				
Wages & Salaries		408,820		363,135
Superannuation		45,258		57,486
AINSE Awards				
Postgraduate Awards				
ANSTO Facility Costs	310,409		373,374	
Travel and Accommodation	35,096		35,610	
Stipends	256,561		306,122	
		602,066		715,106
Winter School		9,123		4,399
Research Fellowships		477,608		641,541
Research Awards				
ANSTO Facility Costs	928,408		1,630,027	
Minor Equipment and Materials	9,650		41,550	
Travel and Accommodation	151,378		173,031	
Other Costs	26,650		100,095	
		1,116,086		1,944,703
Conference Subsidies		95,760		251,829
External Grants		-		400,000
Conference Management		6,248		3,347
Publications and Promotions		9,363		10,067
Meetings and Committees		85,873		49,471

Detailed Statement of Income and Expenditure for the year ended 31 December 2013 (continued)

		31-Dec-13 $		31-Dec-12 $
AINSE Secretariat				
Audit Fees	12,960		12,100	
Bank Charges	530		2,568	
Depreciation	10,096		8,956	
Advertising and Printing	208		-	
Office Supplies	4,677		4,644	
Postage and Telephone	2,291		1,119	
Insurance	12,128		9,897	
Entertaining	659		711	
Books and Software	283		340	
Office Equipment and Repairs	1,372		5,644	
Administration and Staff Training	10,904		2,136	
Travel and Accommodation	8,602		18,602	
Vehicle Expenses	9,620		11,113	
Consultancy Fees	8,512		28,415	
Staff Recruitment	261		2,297	
FBT Expense & Payments	686		3,320	
Legal expenses	22,690		-	
Miscellaneous	2,719		3,647	
		109,198		115,509
Total Operating Expenses		2,965,403		4,556,593
Surplus/(Deficit) for the year		566,687		(717,132)

AINSE Honours Scholarships

In 2013 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 14 applications from 7 Universities.

The ten successful students and their projects were:

Geraldine Bacca Trevino, The University of New South Wales

Removing organic impurities on nanocubes surfaces by Gamma-ray irradiation

Levi Farrand, James Cook University

Reconstructing the landscape in the Cradle of Humankind using terrestrial cosmogenic nuclides

Stephanie Florin, The University of Queensland

AMS Radiocarbon dating of ancient hearths associated with burials, early occupation, grindstones and ground edge axes at Malakunanja II

Jonathan Frecker, The University of New South Wales

Combining 222-Rn and natural heat as tracers to quantify ground and surface water interactions and constrain uncertainty in the exchange rates

Corey Goodwin, University of Canberra

In vitro repair of gamma irradiated DNA for forensic analysis

Zixin Huang, The University of Sydney

Relationship between electrochemical and magnetic states in Li- and Na-based transition metal battery cathode materials

Karina Judd, The University of New South Wales

Geochemical mapping of the inundation limit of three historical tsunamis in New Zealand

Peter Monaghan, University of Wollongong

Development of New 8-Hydroxyquinoline Derivatives as PET Imaging Agents and Therapeutics for Alzheimer's disease

Sarah Stace, The University of New England

Gamma-Ray-Initiated Emulsion Polymerisation

Crystal Wood, University of Wollongong

A Holocene history of the mid latitude westerlies interpreted from dust deposition

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.

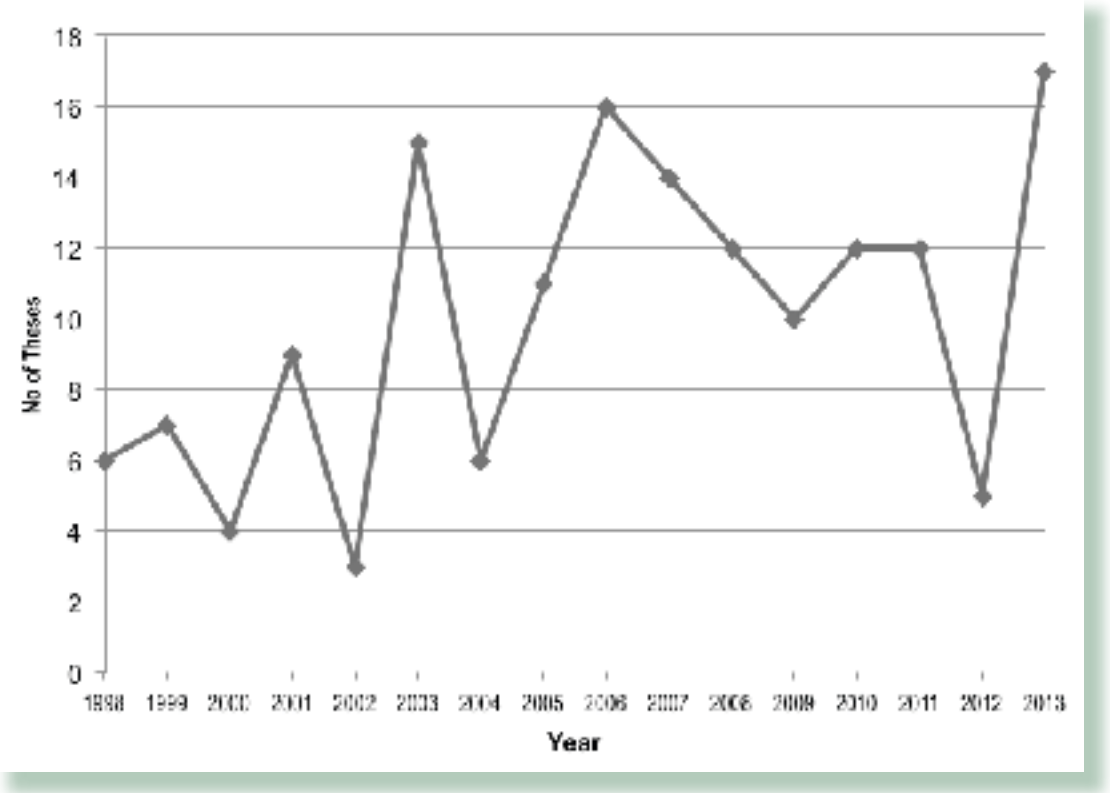
Nine new AINSE postgraduate research projects were supported by a PGRA in 2013, and 23 were finalised with the receipt of 17 theses, bringing the total number of current scholars to 30. Through its PGRA program, AINSE has now helped train 338 students in aspects of nuclear science and associated techniques 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.

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 2013

The effects of late-pleistocene sea-level and environmental change on submerged fossil reefs on the Great Barrier Reef and Tahiti

Elizabeth Abbey, Earth and Environmental Sciences, The University of Sydney. Commenced 1/07/2008

Fabrication and characterisation of plasma polymer thin films from monoterpene alcohols for applications in organic electronics and biotechnology

Kateryna Bazaka, Engineering, James Cook University. Commenced 1/07/2008

Location of sugars in bilayer and non-bilayer lipid phases: relevance to membrane preservation during desiccation

Ben Kent, Applied Physics, RMIT University. Commenced 1/07/2006

Holocene palaeoenvironmental reconstruction of four coastal sites in Southern New South Wales, Australia: Implications for the Australian megatsunami hypothesis

Claire Courtney, Biological, Earth and Environmental Sciences, The University of New South Wales. Commenced 1/07/2009

Fabrication of single- and mixed-phase titanium dioxide photocatalysts

Dorian Hanaor, Materials Science, The University of New South Wales. Commenced 1/07/2008

The landscape response to earthquakes

Jamie Howarth, Geography, University of Otago. Commenced1/07/2008

Short-range order in ferroelectric triglycine sulphate

Jessica Hudspeth, Chemistry, The Australian National University. Commenced 1/07/2009

Electric-field-induced strain and fatigue mechanisms in lead-free ferroelectrics

Hugh Simons, Materials Science & Engineering, The University of New South Wales. Commenced 1/07/2009

AuCuA1 shape memory alloys for use in opto-mechanical nanoactuators

Vijay Bhatia, Institute for Nanoscale Technology, University of Technology Sydney. Commenced 1/07/2010

Structures and properties of coordination polymers containing tetracyanidometallate units

Jessica Chadbourne, Chemistry, The University of Sydney. Commenced 1/07/2009

Investigation of the effects of image signal-to-noise ratio on TSPO PET quantification of neuroinflammation

Christopher Constable, Faculty of Health Sciences-Medical Radiation Science, The University of Sydney. Commenced 1/07/2009

Photoresponsive self-assembled nanomaterials for on-demand drug delivery

Wye Khay Fong, Pharmacy, Monash University. Commenced 1/07/2009

The Hydrogeology, hydrogeochemistry and hydrology of granitic landscapes in the upper Wimmera catchment, Western Victoria, Australia

Sarah Hagerty, Environmental Science, La Trobe University. Commenced 1/07/2007

Mephedrone in the rat: Mechanisms of action and adverse consequences

Craig Motbey, Psychology, The University of Sydney. Commenced 1/07/2009

Surfactant Adsorption and structure at ionic liquid interfaces

Deborah Wakeham, Chemistry, The University of Newcastle. Commenced 1/07/2010

Diffuse scattering study of short-range order in lead zinc niobate

Ross Whitfield, Chemistry, The Australian National University. Commenced 1/07/2009

Understanding and controlling anomalous thermal expansion behaviour in coordination framework materials

Yue Wu, Chemistry, The University of Sydney. Commenced 1/07/2008

Postgraduate scholars, and their projects, who were supported during 2013

The use of environmental isotopes Pb-210, Ra-226, Cs-137 and C-14 to reconstruct historical sedimentation rates and calibrate a model of estuary evolution

Kellie Adlam, Geosciences, The University of Sydney. Commenced 1/7/2011

Interfacial properties of stimuli-responsive peptide biosurfactants and their interaction with chemical surfactants 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, The 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, The University of Sydney. Commenced 1/7/2012

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

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

Neutron scattering on functional transition metal oxide thin films

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

Development of defect perovskites for use as cathode materials in lithium Ion batteries

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

A Coherent Inelastic Neutron Scattering Investigation of Polycrystalline Magnesium Deuteride

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

From helicon discharges to fusion plasmas: Dynamics of wave-particle-plasma interaction between electromagnetic modes

Lei Chang, Plasma Research Lab, The Australian National University. Commenced 1/7/2012

Structure-function relations in polymer-protein conjugates for enhanced drug design

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

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

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

Alignment of nanostructures templated from lyotropic liquid crystals

Weiwei Cong, Institute for Frontier Materials, Deakin University. Commenced 1/7/2012

Low dimensional spintronic materials studied with neutron reflectometry

David Cortie, Inst Superconducting & Electronic Mat, University of Wollongong. Commenced 1/7/2010

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

Catchment to regional-scale water and salinity impacts of changing land use in south-west Victoria

Joshua Dean, Environmental Geoscience, La Trobe University. Commenced 1/7/2010

Exploiting the water-energy nexus: using saline water electrolysis to provide energy security and desalinated water from renewable energy sources

Dario Alejandro Delgado Aguilar, Chemical & Mathematical Sciences, Murdoch University. Commenced 1/7/2012

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

Supramolecular solids as hydrogen storage materials

Gregory Hall, Chemistry, Monash University. Commenced 1/7/2010

Morphodynamics of coral reef environments and associated sedimentary bodies

Daniel Harris, School of Geosciences, The University of Sydney. Commenced 1/7/2010

Investigations of bulk nanostructure in protic ionic liquids

Robert Hayes, Environment & Life Sciences, The University of Newcastle. Commenced 1/7/2011

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

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

Radiocarbon activities in soil particle-size fractions at different depths: insight on C dynamics in two NSW forest soils

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

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

Probing the effects of oxidative stress on cellular membrane interactions

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

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 the Sunshine Coast. Commenced 1/7/2013

Thickness-dependant resistivity of ultra-thin polymeric films and their application as novel selective gas sensors

Junqiao Lee, Chemistry, Curtin University of Technology. Commenced 1/7/2010

Development of solid state nano and microdosimetry for improvement of quality of life

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

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

Lydia Mackenzie, Geography, Planning & Environment Management, The 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

Geochemistry of highly sulfidic ancient deposits: A high resolution study of exceptional fossil preservation within carbonate concretions

Ines Melendez, Chemistry, Curtin University of Technology. Commenced 1/7/2012

Coordination Frameworks: Host-guest chemistry and associated structural dynamics

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

Fixation of atmospheric CO_2 during the carbonation of ultramafic rocks: constraints on timing of carbonation and quantification of contributions from different carbon sources derived from U-Th disequilibrium dating in conjunction with radiocarbon dating

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

Towards single cell isolation

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

Structural, magnetic and electronic properties of technetium oxides.

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

Dual, receptor and DNA auger radiotherapy targeting strategy using lipid-coated nanoparticles

Annabelle Rodd, Pathology, The University of Melbourne. Commenced 1/7/2012

Low temperature synthesis of well-ordered titania nanoparticles for applications in green catalysis

Jan-Yves Ruzicka, Chemistry, University of Canterbury. Commenced 1/7/2009

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

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

Investigation of the effect of ion irradiation on the superconducting properties of Un-doped and doped $BaFe_2As_2$ single crystals

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

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

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

A crystal structural investigation of lead containing jarosite solid solutions

Henry Spratt, Chemistry, Queensland University of Technology. Commenced 1/7/2010

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, The University of Queensland. Commenced 1/7/2011

Nanostructure at complex suractant-polymer interfaces

Kristian Tangso, Drug Delivery Disposition & Dynamics, Inst Pharmaceutic, 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, The Australian National University. Commenced 1/7/2013

Surface waters, groundwaters, geology, and water-rock interactions in the Lawn Hill region of far NW Queensland

Mira van der Ley, School of Biological Earth and Environmental Sciences, The University of New South Wales. Commenced 1/7/2010

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

UV-B screening compounds in the moss ceratodon purpureus: using radiocarbon dating and novel compounds to describe past Antarctic climates

Melinda Waterman, Biological Sciences, University of Wollongong. Commenced 1/7/2010

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

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

Improving biological parameters estimation in pre-clinical longitudinal PET imaging of the rat brain

Catriona Wimberley, Brain & Mind Research Institute, The University of Sydney. Commenced 1/7/2012

Aluminium mobility and geochemistry in Acid Sulfate Soils using novel isotope exchange techniques and Accelerator Mass Spectrometry

Yliane Yvanes-Giuliani, Civil and Environmental Engineering, The 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 The 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 The 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 Sciences.

2007 Duncan McGillivray The 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 The 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 The 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 The 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, projects of novice users allow for a facility charge.

The disciplines involved during 2013 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 2013 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 173 projects were allocated funding in 2013. They had a total value of $1,158,939 involving 37 of the forty-five members.

Australian Catholic University

ALNGRA13021	Duncan Cook	$7,550
Radiocarbon dating a young speleothem record of monsoon variability from ancient southern Cambodia		
	Total	**$7,550**

University of Adelaide

ALNGRA13014	John Tibby	$20,195
Climates of the last glacial-interglacial transition: exploiting unprecedented high resolution sediment records from North Stradbroke Island		
ALNGRA13065	Dusan Losic	$11,085
Study of molecular transport through carbon nanotubes using radio tracer (RT) technology		
	Total	**$31,280**

The University of Auckland

ALNGRA13013	Paul Augustinus	$21,415
Landscape evolution in the upper Huange He (Yellow River) catchment, NE Qinghai-Tibetan Plateau		
ALNGRA13501	Paul Augustinus	$3,460
Refining the eruptive history of the Auckland Volcanic Field: implications for volcanic hazards		
ALNGRA13523	Paul Augustinus	$6,935
Identifying and quantifying human impacts on the environment: the sediment records from northern New Zealand lakes		
ALNBRG132163	David Williams	$4,596
Polymer biosensor substrates		
ALNBRG132716	Gang Chen	$7,299
In situ phase development of Ni and Ti/TiH_2 elemental compacts during vacuum sintering using n-diffraction		
ALNBRG132800	Tilo Soehnel	$7,785
High-Resolution Powder Diffraction studies on $Cu_5Sb_{1-x}M_xO_6$		
ALNBRG132802	Tilo Soehnel	$5,314
The Study of Structure and Magnetism of $Cu_xCo_{1-x}Sb_2O_6$ Phase Transition		
ALNBRG132863	Yacine Hemar	$1,075
SAXS investigation of semi-solid food emulsions		
ALNBRG132974	Tilo Soehnel	$3,571
Studies of crystal and magnetic structure of $(M'M'')_3Si_2Sn_7O_{16}$ (M = Mn, Fe, Co)		
ALNBRG 133300	Duncan McGillivray	$565
Probing the structure of immobilised hydramacin-1		
	Total	**$62,015**

The Australian National University

ALNGRA13502	Christian Reepmeyer	$6,675
Pleistocene antiquity? Radiocarbon dating the rock-art of Red Lily Lagoon		
ALNBRG131707	John Carver	$20,300
The interaction of 14-3-3 proteins with their target proteins (for future SANS)		
	Total	**$26,975**

The University of Ballarat

ALNGRA13008	Jessica Reeves	$5,665
Lake Keilambete: investigating the glacial in southeast Australia's rain gauge		
ALNGRA13044	Peter Gell	$11,975
Holocene climate variability recorded in floodplain lakes: testing the response of Moorna Lake, NSW		
	Total	**$17,640**

University of Canberra

ALNGRA13002	Duanne White	$8,850
How much have we already lost? Deglaciation timing of North-East Greenland		
ALNGRA13039	Dennis McNevin	$3,055
In vitro repair of gamma irradiated DNA for forensic analysis		
	Total	**$11,905**

CSIRO

ALNGRA13055	Lisa Golding	$11,650
Bioavailability to aquatic biota of nanoparticulate cerium dioxide in comparison to micron sized cerium dioxide		

ALNBRG132793	Darren Fraser	$7,178
Residual stresses in the titanium manufacturing processes of Cold Spray and Electron Beam Melting		
	Total	**$18,828**

Charles Sturt University

ALNGRA13519	Padraig Strappe	$7,405
In Vitro and *in Vivo* assessment of a positron emission tomography (PET) reporter gene with application to stem cell therapy for diabetes		
	Total	**$7,405**

Curtin University of Technology

ALNGRA13001	Alison Blyth	$17,045
Low abundance compound specific radiocarbon dating of organic matter preserved in cave deposits		
ALNGRA13034	Massimiliano Massi	$2,000
Synthesis and zirconium-89 radiolabeling of substituted calix[4]arenes as potential immunoPET imaging agents		
ALNGRA13524	Ross Edwards	$12,945
Black Carbon in Central Asian and Arctic Glaciers: ^{14}C dating and apportionment of fossil fuel combustion and biomass burning		
ALNGRA13535	Akira Otsuki	$4,450
SAXS and SEM analysis of mineral fine particles selectively liberated using an electric field		
	Total	**$36,440**

Deakin University

ALNGRA13064	Ludovic Dumee	$8,400
Patterned functionalization, stitching and decoration of carbon nanotube and graphene porous composites by gamma-irradiation		
ALNGRA13066	Nishar Hameed	$6,665
Scattering studies of graphene based flexible nanocomposite films		
	Total	**$15,065**

Edith Cowan University

ALNGRA13532	Steven Hinckley	$3,895
Gamma Pre-Irradiation Effects in Optical Fibre Bragg Grating Sensors for Radiation Dosimetry		
	Total	**$3,895**

Flinders University

ALNGRA13019	Mick Morrison	$7,535
Archaeological, dendrochronological and palaeoclimatic investigations of culturally modified Erythrophleum trees at Weipa		
ALNGRA13023	Rachel Popelka-Filcoff	$4,285
Understanding Climate Variability in South Australia Through Trace Elemental Analysis of Archaeological Shell		
ALNGRA13026	Pamela Sykes	$11,610
Neural development in pKZ1 mice and response to microglial activation in the presence of radiation		
ALNGRA13068	Amanda Ellis	$8,854
Reclamation of copper from natural Australian zeolites post-water treatment		
ALNGRA13503	Amy Roberts	$5,830
An Investigation into the Compositional Variation of Ceramics from Caleta Vitor in the Atacama Region of Northern Chile using Neutron Activation Analysis (NAA)		

ALNGRA13504	Wendy van Duivenvoorde	$5,380
Dating the archaeological remains of the Butuan Boats, Philippines		
ALNGRA13505	Wendy van Duivenvoorde	$620
Dating the Kyrenia ship's ancient anchor remains		
ALNGRA13525	Gavin Prideaux	$7,200
Resolving the age of potentially late-surviving 'megafauna' on Kangaroo Island using AMS radiocarbon dating of tooth enamel		
	Total	**$51,314**

Griffith University

ALNGRA13052	Jon Knight	$13,280
Predicting mangrove basin change in response to sea-level rise under different tidal regimes		
ALNGRA13070	Jisheng Han	$6,990
An investigation on ^{4}H-SiC based Trench MOSFET by SIMS		
ALNGRA13506	Caitlin Curtis	$4,020
AMS dating of Egyptian ibis bones to study DNA evolution		
ALNGRA13520	Sally-Ann Poulsen	$8,084
Synthesis and Characterisation of PET Agents for Imaging of Hypoxic Tumors		
ALNGRA13526	Justine Kemp	$4,330
A two thousand year record of river floods from SE Queensland using ITRAX-XRF core scanning technology		
ALNBRG133041	Evan Gray	$606
Hydrogen-modified TiO_2 for enhanced performance of Li-ion batteries		
ALNBRG133043	Evan Gray	$822
Measurement of the equilibrium degree of atomic short-range order in $Cu_{83.6}Mn_{16.4}$ from diffuse scattering		
	Total	**$38,132**

James Cook University

ALNGRA13015	Christa Placzek	$12,065
Reconstructing the landscape in the Cradle of Humankind using terrestrial cosmogenic nuclides		
ALNGRA13017	Sean Ulm	$5,175
Using Foraminifera to Refine Understandings of Archaeological Site Formation Processes: A Case Study from Thundiy, Bentinck Island, Southern Gulf of Carpentaria		
ALNGRA13022	Christa Placzek	$5,038
Timescales of sediment movement by seismic activity in the Atacama Desert, Northern Chile		
ALNGRA13507	Michael Bird	$2,210
Did human occupation of Australia irrevocably alter tropical terrestrial ecosystems?		
ALNGRA13508	Nigel Chang	$6,335
Shell dating of prehistoric Thailand: Part II		
ALNGRA13527	Michael Bird	$6,240
Past and present tropical vegetation dynamics and their impact on soil organic carbon pools		
	Total	**$37,063**

La Trobe University

ALNGRA13033	Peter Barnard	$11,670
N-heterocyclic carbene and macrobicyclic ligands for the development of Tc-99m and Cu-64 based Molecular Imaging Agents		
	Total	**$11,670**

Macquarie University

ALNGRA13528	Matthew Kosnik	$5,860
Isotopic techniques to determine sedimentation rates, bioturbation, and time-averaging in the One Tree Reef Lagoon		
ALNBRG132910	Sandra Piazolo	$8,906
In-situ deformation of ice III: The effects of air bubbles and second phase particles		
	Total	**$14,766**

The University of Melbourne

ALNGRA13006	Jonathan Tyler	$12,550
Sub-decadal climate variability during the last 3000 years: ITRAX geochemical records from western Victorian maar lake sediments		
ALNGRA13011	Kale Sniderman	$2,395
Are northern- and southern-hemisphere climates synchronised on orbital timescales? Development of a high resolution, Early Pleistocene sediment chronology using ITRAX micro-XRF analyses		
ALNGRA13032	Craig Hutton	$7,370
Continuous flow microreactor synthesis of ^{18}F-labeled peptides for PET imaging		
ALNGRA13047	Patrick Baker	$15,690
Building a multi-proxy, single-archive tree-ring record for climate reconstruction using Agathis robusta from north Queensland		
ALNGRA13509	Ian Thomas	$6,810
High resolution pollen based reconstruction of saline lake sediments in the Wimmera District of Western Victoria		
ALNGRA13510	Jonathan Tyler	$10,275
Sub-decadal climate variability during the Holocene: radiocarbon age constraints for ITRAX geochemical data from West Basin Lake, Victoria		
ALNGRA13529	Michael-Shawn Fletcher	$14,415
Using ITRAX, radiocarbon and lead-210 dating to track the evolution of the El Nino-Southern Oscillation in southeast Australia		
ALNBRG132211	Martin Boland	$579
Investigation of interactions between prion proteins and model lipid membranes		
ALNBRG132782	Christopher Ritchie	$7,936
Further investigations of a hydrogen bond templated polyoxometallate nanocluster		
ALNBRG132860	Colette Boskovic	$2,059
Ligand Field Splitting of Lanthanoid-Polyoxometalate Single Molecule Magnets		
	Total	**$80,079**

Monash University

ALNGRA13076	Gil Garnier	$7,035
Model cellulose surfaces for study of protein/cellulose interactions		
ALNGRA13521	Patrick Perlmutter	$2,520
New selective imaging agents for neurotransporters		
ALNGRA13536	Yao Dong	$10,497
Investigating the effects of cholesterol on the behaviour of non-lamellar liquid crystalline systems		
ALNGRA13537	Lizhong He	$8,960
Linking foaming performance with interfacial properties of proteins films: adsorption kinetic of surface-active proteins		
ALNBRG122269	Daniele Pellicia	$369
Sub-micrometer neutron waveguides for high resolution imaging		

ALNBRG132723	David Turner	$4,060
Single crystal neutron diffraction of hydrogen-bonded materials		
ALNBRG132736	Christopher Ritchie	$771
Residual stress analysis of selective laser manufactured Hastelloy-X samples		
ALNBRG132912	Jielong Su	$2,667
Deuterated bacterial cellulose as a tool for the study of interactions between protein, rentention agents and cellulose		
ALNBRG132918	Trevor Hicks	$208
Measurement of the magnon dynamics in a single crystal of $FePS_3$		
ALNBRG132972	Raafat Ibrahim	$1,535
Residual Stress Measurement in Aluminothermic Rail Welds		
	Total	**$38,622**

Murdoch University

ALNGRA13067	Manickam Minakshi	$10,320
Synthesis and Characterization of Olivine $LiNiPO_4$		
	Total	**$10,320**

The University of Newcastle

ALNBRG132785	Erich Kisi	$1,011
In situ study of stress distribution in particulate systems: 3 Effects of non-cylindrical dies		
ALNBRG132871	Scott Donne	$3,131
Kinetics of thermally induced structural rearrangement of MnO_2 for lithium ion batteries		
ALNBRG132977	Erich Kisi	$800
In situ study of oxide-carbide exchange reactions		
ALNBRG133071	Erich Kisi	$23
Neutron Tomography of steel spheres compressed in a die		
ALNBRG133037	Erich Kisi	$946
Understanding Stress Distributions in Granular Materials		
	Total	**$5,911**

The University of New South Wales

ALNGRA13028	Justin Gooding	$6,457
Capture and Releasing Biological Receptor Molecules Using Electrochemically-Switchable Surfaces		
ALNGRA13045	Catherine Chague-Goff	$285
Geochemical mapping of the inundation limit of three historical tsunamis in New Zealand		
ALNGRA13053	Adam Hartland	$22,800
Hidden terrestrial stores of organic carbon: are groundwater aquitards a globally significant carbon sink?		
ALNGRA13056	Gabriel Rau	$5,434
Combining 222-Rn and natural heat as tracers to quantify ground and surface water interactions and constrain uncertainty in the exchange rates		
ALNGRA13063	Dewei Chu	$1,200
Removing organic impurities on nanocubes surfaces by Gamma-ray irradiation		
ALNGRA13071	Dewei Chu	$1,200
Reversible transition of graphene from hydrophobic to hydrophilic		
ALNGRA13072	Annemieke Mulders	$3,000
Investigation of the multiferroic coupling in ^{162}Dy enriched orthorhombic $DyMnO_3$ by neutron diffraction and inelastic neutron scattering		
ALNGRA13073	Clemens Ulrich	$4,000
X-ray reflection studies of superconducting thin films		

ALNGRA13530	James Goff	$11,188
Applying C-14 (AMS) and ITRAX to inform New Zealands pre-written tsunami history		
ALNGRA13533	Dewei Chu	$3,300
Controlling resistive switching paths in metal oxides thin films by H^+ ion irradiation		
ALNGRA13540	Wayne Hutchison	$1,200
$TbNiAl_4$, solving a magnetic structure puzzle		
ALNGRA13542	Timothy Schmidt	$18,000
Deuteration for Advanced Optical Materials		
ALNBRG132737	Wayne Hutchison	$4,065
Magnetic Transitions and Magnetocaloric Behaviour in $Mn_{1-x}FexCoGe$ compounds with x = 0.0 - 0.1		
ALNBRG132813	Naren Narayanan	$640
Determination of the crystal and magnetic structures of the spin A½ kagome staircase compound $Cu_3V_2O_8$ (CuVO)		
ALNBRG132853	Annemieke Mulders	$776
The effect of oxygen isotopic substitution on the magnetic and multiferroic phase transitions of $DyMnO_3$		
ALNBRG132914	Sean Cadogan	$1,093
The magnetic structures of $R_2Fe_2Si_2C$ (R=Ho, Er and Dy)		
ALNBRG132959	Wayne Hutchison	$755
Study of magnetic structures in single crystal $TbRu_2Al_{10}$ in applied field		
ALNBRG132983	Naren Narayanan	$565
Neutron powder diffraction (NPD) experiments on 163Dy isotope enriched multiferroic $DyMn_{16}O_3$ and $DyMn_{18}O_3$		
	Total	**$85,958**

University of Otago

ALNGRA13007	Mark McCoy	$7,600
Human Exploitation of Marine Resources in Historical Perspective: A case study of shellfish harvesting in New Zealand (AD 1250-1850)		
ALNGRA13018	Glenn Summerhayes	$7,650
Austronesian expansion! A New Guinea corridor?		
ALNGRA13511	Sean Fitzsimons	$9,405
Understanding the timing and magnitude of landscape responses to large earthquakes on the Alpine Fault, New Zealand		
	Total	**$24,655**

The University of Queensland

ALNGRA13003	Chris Clarkson	$9,720
AMS Radiocarbon dating of ancient hearths associated with burials, early occupation, grindstones and ground edge axes at Malakunanja II		
ALNGRA13012	Jian-xin Zhao	$3,300
AMS ^{14}C dating of painted rock art in Guizhou province, southwest China		
ALNGRA13042	Daryl Joyce	$11,155
Disinfestation of Calypso mango using irradiation		
ALNGRA13059	Taras Plakhotnik	$23,630
Ultra Bright Luminescent Nano-diamonds		
ALNGRA13512	Jessica Thompson	$7,165
Geochronology of Middle to Late Pleistocene artefact-bearing sediments along northern Lake Malawi		
ALNGRA13513	Marshall Weisler	$2,480
Redating the Earliest Site in the Hawaiian Islands: Implications for East Polynesian Colonisation Models		

ALNGRA13514	Craig Woodward	$7,987
Validation of the ^{210}Pb chronology from Little Llangothlin Lagoon using a plutonium activity profile		
ALNGRA13531	Kevin Welsh	$3,490
Reconstructing palaeo-Monsoon in northern Australia using AMS ^{14}C dating of lake cores and ITRAX to determine a weathering signal		
ALNBRG132292	Paul Burn	$1,872
Diffusion of Analyte Vapours Within Selective Explosive-Sensing Films		
ALNBRG132317	Ian Gentle	$1,847
Diffusion Kinetics in Multilayer Small Molecule Organic Films for Organic Photonics		
ALNBRG132971	Yuming Xiong	$3,802
The effect of the Al_2O_3 reinforcement particles on the residual stress accumulation of the Al+Al_2O_3 MMCs coatings produced by cold spray		
ALNBRG133035	David Fengwei Xie	$10,668
Ionic liquid assisted gelatinisation process of starch studied by simultaneous Rapid Visco Analysis and small-angle neutron scattering		
	Total	**$87,116**

Queensland University of Technology

ALNGRA13048	Zoran Ristovski	$9,650
Characterisation of the elemental composition of sea spray particles collected during the Surface Ocean Aerosol Production (SOAP) 2012 voyage		
ALNGRA13069	Tuquabo Tesfamichael	$17,425
Developing low temperature metal oxide thin film nano-sensors		
ALNGRA13515	Lynda Petherick	$2,480
Palaeoclimatic and palaeoenvironmental variability during the late Quaternary in subtropical Australia		
ALNGRA13539	Stephen Hughes	$655
Using neutron tomography to image the flow of water in a siphon		
	Total	**$30,210**

RMIT University

ALNGRA13075	Gary Bryant	$8,690
Deuterated DOPC for Neutron Membrane Diffraction studies of penetratin-membrane interactions		
	Total	**$8,690**

Southern Cross University

ALNGRA13054	Malcolm Clark	$14,910
The reversibility of As(V) on Far North Coast soils, implications for mobility from cattle dip sites		
	Total	**$14,910**

Swinburne University of Technology

ALNGRA13060	David Mainwaring	$22,400
Light element doped carbon nanowire arrays in polymeric thin films by ion beam irradiation		
ALNBRG132745	Ryan Cottam	$1,962
To investigate the deformation behaviour of porous shape memory alloy foams using neutron diffraction		
ALNBRG132747	Ryan Cottam	$653
To evaluate changes in the diffraction pattern of several bulk metallic glasses during in-situ straining and fatigue and relate the changes to damage mechanism and accumulation		
ALNBRG133057	Ryan Cottam	$419
Structural integrity comparison between the leading additive manufacturing technologies.		
	Total	**$25,434**

The University of Sydney

ALNGRA13005	Jim Specht	$10,890
Resolving the date of stilt villages, Papua New Guinea		
ALNGRA13009	Martin Polkinghorne	$3,800
A ^{14}C chronology of sculpture production sites at Angkor, Cambodia		
ALNGRA13024	David Pattison	$8,470
Does the chemical structure of selenol antioxidants affect their ability to scavenge protein radicals?		
ALNGRA13025	Daniel Bax	$5,500
Gamma-ray irradiation to sterilise peptide and protein coated polymeric surfaces		
ALNGRA13027	Kerry-Anne Rye	$10,000
Characterisation of the anti-inflammatory effects of HDL and apolipoprotein A-I on inflammation-induced lymphangiogenesis using immuno-positron emission tomography		
ALNGRA13035	Philip Morgan	$3,650
Protein modification by gamma irradiation in the presence of oxygen: characterising oxidation products to understand the mechanisms leading to damage		
ALNGRA13036	Corinne Caillaud	$7,500
Synthesis and validation of a new PET radiotracer, 18FSB-rHuEPO, to study in vivo the metabolic effect of human recombinant EPO (rHuEPO) in lean and obese animals		
ALNGRA13038	W Bret Church	$4,400
Determination by small angle x-ray scattering of the structure of the HAMLET-like anti-cancer complexes during their creation		
ALNGRA13040	W Bret Church	$2,200
Determination by small angle x-ray scattering of the phase of dilute oleic acid at high pH		
ALNGRA13041	W Bret Church	$3,300
Investigation of a novel contrast reagent for small angle x-ray contrast variation scattering		
ALNGRA13522	Corinne Caillaud	$12,250
Using radio radiolabelled 18FSFB-rHuEPO to identify target tissues, quantify rHuEPO/EPO binding and ascertain functional receptor expression\		
ALNGRA13534	Rajesh Ganesan	$3,390
Defect creation and annealing by energetic ion impacts		
ALNGRA13538	Richard Christopherson	$18,125
Application of biological nuclide labelling to probe the transduction of vibrational energy of enzymes to chemical potential for catalysis		
ALNGRA13541	Ann Kwan	$17,400
Preparation of selectively labelled and deuterated hydrophobin proteins for solid-state NMR		
ALNBRG132453	Deanna D'Alessandro	$6,000
Deuteration of ligands for the synthesis of Metal-Organic Frameworks for neutron diffraction investigations for PP2548		
ALNBRG132762	Brendan Kennedy	$42
Structures and Phase Transitions in Ba-U oxides		
ALNBRG132772	Chris Ling	$7,667
Relationship between electrochemical and magnetic states in Li- and Na-based transition metal battery cathode materials		
ALNBRG132920	Siegbert Schmid	$37
Investigation of Prussian blue type compounds as cathode materials for rechargeable batteries		

ALNBRG132969	Siegbert Schmid	$37
Investigation of metal ion distribution and phase behaviour of spinel-type $LiMn_{2-x}Ti_xO4$ series		
ALNBRG133092	Andrew Dolan	$2,667
Head group and anion effects in the self-assembly of cationic surfactants in ionic liquids		
	Total	**$127,325**
University of Tasmania		
ALNGRA13049	Andrew McMinn	$9,855
Using ^{210}Pb to determine phytoplankton range extensions in southeast Australian in the recent past		
ALNGRA13051	Chris Johnson	$12,100
Using owl middens to reconstruct long-term change in the mammal fauna of Tasmania		
	Total	**$21,955**
The University of New England		
ALNGRA13062	Chris Fellows	$7,460
Gamma-Ray-Initiated Emulsion Polymerisation		
	Total	**$7,460**
University of the Sunshine Coast		
ALNGRA13074	Muhammad Alam	$6,885
Calibration Free Electrochemical Sensing at the Interface between Two Immiscible Electrolyte Solutions		
	Total	**$6,885**
University of Technology Sydney		
ALNGRA13029	David Booth	$3,000
Using innovative micro-CT approaches to aging sharks and other fishes		
ALNGRA13030	Stella Valenzuela	$5,750
Phytanyl Lipid Deuteration for Neutron Reflection Investigations of Tethered Bilayer Membranes		
ALNGRA13031	Stella Valenzuela	$6,262
Investigating the Role of Cholesterol in the Metamorphic Protein CLIC1's Membrane Interactions		
ALNBRG132287	Stella Valenzuela	$20,300
Deuteration of CLIC1 proteins for use in neutron scattering		
	Total	**$35,312**
The University of Western Australia		
ALNGRA13043	Pauline Grierson	$12,350
Dating of sediments to aid in reconstruction of hydroclimatic variability in northwest Australia		
ALNBRG132707	Simon Grabowsky	$5,637
Towards the understanding of proton-transfer reactions by means of topological catastrophes - Part 3		
	Total	**$17,987**
University of Western Sydney		
ALNBRG132911	Fidelis Mashiri	$1,442
Residual stresses in high strength steel tubes for civil engineering applications		
	Total	**$1,442**

Victoria University of Wellington

ALNGRA13010	Brent Alloway	$4,840
Establishing a record of Holocene volcanism in Samoa from lake sediments: implications for the re-evaluation of volcanic hazard		
ALNGRA13050	Brent Alloway	$6,000
Establishing a record of late Holocene volcanism in Samoa from lake sediments: implications for the re-evaluation of volcanic hazard		
	Total	**$10,840**

The University of Waikato

ALNGRA13516	Peter Kamp	$9,610
Thermochronology of Eastern Tibet		
ALNGRA13543	Michael Mucalo	$11,828
Use of Neutron Activation Analysis for Validation of a Novel Analytical Technique for Measurement of Metal Loadings in Catalytic Materials		
	Total	**$21,438**

University of Wollongong

ALNGRA13004	Samuel Marx	$12,750
A Holocene history of the mid latitude westerlies interpreted from dust deposition		
ALNGRA13016	Katherine Szabo	$13,300
Species shifts in Kimberley middens: the timing and nature of environmental changes		
ALNGRA13020	Jan-Hendrik May	$3,800
A paired-dating approach to constrain late Pleistocene to Holocene incision in the Flinders Ranges, SA		
ALNGRA13037	Christopher Richardson	$5,780
Development of New 8-Hydroxyquinoline Derivatives as PET Imaging Agents and Therapeutics for Alzheimer's disease		
ALNGRA13046	Kerrylee Rogers	$10,278
Isotopic techniques to quantify sedimentation and carbon flux within Cararma Inlet: Assessing the effects of climate change on shoreline geomorphology and carbon sequestration		
ALNGRA13057	Marco Petasecca	$14,534
Development of 3D dosimeters for space, avionic and radiation protection applications		
ALNGRA13058	Dean Cutajar	$16,447
Optimisation of angular independent dosimeters for radiotherapy quality assurance through IBIC characterisation		
ALNGRA13061	Anatoly Rozenfeld	$11,234
Characterisation of large area, thinned SOI microdosimeters for proton and heavy ion therapy		
ALNGRA13517	Richard Fullagar	$3,080
Dating the use of ancient stone tools		
ALNGRA13518	Colin Woodroffe	$7,440
Carbonate production on the southernmost reefs		
ALNBRG132691	Rian Dippenaar	$250
The texture of zirconium and titanium after high-temperature cyclic plastic deformation		
ALNBRG132721	Lisa Thoennessen	$212
Texture development of a beta titanium alloy following the thermomechanical treatment steps		

ALNBRG132722	Jianli Wang	$1,215
Field dependent neutron diffraction study for $PrMn_2Ge_{2-x}Si_x$ systems with x=0-2.0		
ALNBRG132913	Nicholas Hoye	$334
Effect of processing methods on residual stress in Ti aerospace components produced by additive manufacturing		
ALNBRG132925	Evan Constable	$2,667
Dynamic mechanism of spin reorientation transition in $NdFeO_3$ by inelastic neutron scattering		
ALNBRG132946	Jianli Wang	$1,123
Crystallographic and Magnetic structures of Fe_2CrGa and Fe_2CrAl alloys		
	Total	**$104,444**

TOTAL AINSE AWARDS FUNDING APPROVED IN 2013	**$1,158,939**

AINSE Supported Publications 2013

Journal Publications 162

Books, Book Chapters, Theses 48

Conference Proceedings / Abstracts 23

Early View Online 7

University of Adelaide

Harvey N; James K (2012) 'Gaining new ground: Thinopyrum junceiforme, A model of success along the South eastern Australian Coastline. Adelaide, South Australia', PhD Thesis, University of Adelaide, Adelaide, http://digital.library.adelaide.edu.au/dspace/handle/2440/80586

Nanson R A; Vakarelov B K; Ainsworth R B; Williams F M; Price D M (2013) 'Evolution of a Holocene, mixed-process, forced regressive shoreline: The Mitchell River delta, Queensland, Australia', *Marine Geology*, 339, 22–43, 10.1016/j.margeo.2013.04.004

Xia F; Brugger J; QianG; O'Neill B; Zhao J; Pullen S; Olsen S; Pring A (2012) 'Single pass flow through reaction cell for high temperature and high pressure in situ neutron diffraction studies of hydrothermal crystallization processes', *J Appl Crystallogr*, 45, 166-173, 10.1107/S0021889812002300

The University of Auckland

Akers P; Dingley A J; Nelson A R J; Heinrich F; McGillivray D J (2013) 'Studying the fusogenic killing mechanism of hydramacin-1', *11th AINSE-ANBUG Neutron Scattering Symposium* (AANSS), p21, AINSE Lucas Heights, December 2013.

Allen M S; Morrison A E (2013) 'Modelling site formation dynamics: geoarchaeological, chronometric and statistical approaches to a stratified rockshelter sequence, Polynesia', *Journal of Archaeological Science*, 40, 4560-4575, 10.1016/j.jas.2013.06.008

Allen M S; Ussher E (2013) 'Starch analysis reveals prehistoric plant translocations and shell tool use, Marquesas Islands, Polynesia', *Journal of Archaeological Science*, 40, 2799–2812, 10.1016/j.jas.2013.02.011

Shane P; Atkin T (2011) 'Paleoclimate studies of Auckland maar crater records', PhD Thesis, The University of Auckland, New Zealand.

Jovic V; Chen W; Sun-Waterhouse D; Blackford M G; Idriss H; **Waterhouse G I N** (2013) 'Effect of gold loading and TiO_2 support composition on the activity of Au/TiO_2 photocatalysts for H_2 production from ethanol–water mixtures', *Journal of Catalysis*, 305, 307–317, 10.1016/j.jcat.2013.05.031

Jovic V; Al-Azri Z H N; Chen W; Sun-Waterhouse D;Idriss H; **Waterhouse G I N** (2013) 'Photocatalytic H_2 Production from Ethanol–Water Mixtures Over Pt/TiO_2 and Au/TiO_2 Photocatalysts: A Comparative Study', *Top Catal*, 56, 1139–1151, 10.1007/s11244-013-0080-8

Xun G (2013) 'Modelling the pH-and lipid-dependent activity of the antimicrobial protein amoebapore A', PhD Thesis, The University of Auckland, New Zealand.

The Australian National University

Chang L; Breizman B N; Hole M J (2013) 'Gap eigenmode of radially localized helicon waves in a periodic structure', *Plasma Phys Contr* F, 55, 025003, 10.1088/0741-3335/55/2/025003

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Member Codes

CODE	UNIVERSITY	CODE	UNIVERSITY
ACU	Australian Catholic University	MUR	Murdoch University
ADE	The University of Adelaide	NCT	The University of Newcastle
AKL	The University of Auckland	NSW	The University of New South Wales
ANS	ANSTO	OTA	University of Otago
ANU	The Australian National University	QLD	The 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	The 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	The University of New England
GNS	GNS Science	UTS	University of Technology, Sydney
GRI	Griffith University	UWA	The 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	The University of Waikato
MEL	The University of Melbourne	WOL	University of Wollongong
MON	Monash University		

Specialist Areas

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

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