“What you see depends on what you look for, and if you really open your eyes, something new may come into view.”

Nobel Laureate Professor J. Robin Warren AC
Rector's Welcome to the 2014 Research Day

Welcome to the 11th UNSW Canberra Research Day – a day where a group of Higher Degree Research students will stand before you and a panel of distinguished judges to present their research. For their efforts, students stand to win substantial cash prizes.

The purpose of Research Day is to acknowledge, and be inspired by the achievements of our research students, which are significant but not often made public.

It is a great honour to have Nobel Laureate Professor Robin Warren AC to give the keynote address and open the UNSW Canberra Research Day. Professor Warren is an Australian pathologist and researcher who with his colleague Barry Marshall proved that the bacterium Helicobacter pylori is the cause of stomach ulcers. Warren and Marshall were awarded the Nobel Prize in Medicine in 2005 for their groundbreaking discovery that has saved countless lives around the world as stomach ulcers can develop into cancer.

As a campus of UNSW - one of Australia’s leading research intensive universities – UNSW Canberra places a strong emphasis on excellence and commitment to discovery. The research outputs of UNSW Canberra at the Australian Defence Force Academy are exceptional. UNSW Canberra produces a level and quality of research that exceed the UNSW average. At the same time, our teaching and learning continues to exceed the Go8 standard.

I would like to thank Professor Hans Riesen, Associate Dean (Research) and the Research Student Unit for their organisation of this important day.

I’d like to also give a special welcome to our judges today: Honorary Associate Professor Stephen Fortescue, Professor Nasser Khalili and Prof Laura Poole-Warren.

The high quality research activities being showcased today could not happen without our students, their supervisors and support staff. I acknowledge all of our supporters and encourage you all to further build on our excellent research record.

Professor Michael Frater
Rector
UNSW Canberra
### Research Day Program

**Tuesday, October 28, 2014 – Lecture Theatre North, LT10**

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<td>9.30am - 9.45am</td>
<td>Opening Welcome - Associate Dean (Research), Professor Hans Riesen</td>
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<td>9.45am - 10.45am</td>
<td>Keynote Address – Professor J. Robin Warren (includes time for question)</td>
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<td>10.45am - 11.05am</td>
<td>Morning Tea</td>
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<td>11.05am - 12:35pm</td>
<td>Student presentations - (15 mins each including questions)</td>
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<td>12.35pm - 1.20pm</td>
<td>Lunch</td>
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<td>1.20pm - 2.15pm</td>
<td>Student presentations - (15 mins each including questions)</td>
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<td>2.15pm - 2.45pm</td>
<td>Presentation of prizes &amp; Afternoon Tea</td>
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<td>2.45pm</td>
<td>Closing - Associate Dean (Research), Professor Hans Riesen</td>
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Presentations will be judged by a panel comprising:

- **Honorary Associate Professor Stephen Fortescue**, former Deputy President of the University's Academic Board and Director of Postgraduate Research for the Faculty of Arts and Social Sciences, UNSW
- **Professor Nasser Khalili**, Associate Dean (Research) for the Faculty of Engineering and Head of Geotechnical Engineering in the School of Civil and Environmental Engineering.
- **Professor Laura Poole-Warren**, Pro-Vice-Chancellor (Research Training) & Dean of Graduate Research UNSW

### Presentation Schedule

Presentations are limited to ten minutes (plus five minutes question time).

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Improved design process for low wind speed wind turbine blades

Rosemary Barnes
School of Engineering & Information Technology

Wind power is a growing source of the world’s energy, but to continue its growth the cost needs to become more competitive with traditional energy sources. Wind energy from high wind speed sites is already competitive with other options, but these favourable sites are filling up. As a result, wind farms are increasingly being located on sites with low wind speeds. Lower wind speeds means less energy, though, which increases the cost of electricity. Recently, manufacturers have begun to offer turbines designed specifically for low wind speed conditions, with longer blades to reach more wind. But these longer blades use more material than the standard blades, so they cost more. This is partly due to the fact that they are longer, but also because of some design challenges that arise from making the blades long and slender. The aim of my research is to redesign low wind speed blade structures to use less material, and thereby reduce the cost.

To do this, I have considered the different design requirements of low wind speed blades compared to high wind speed blades. I created computer models of a high and a low wind speed blade, and simulated the various loads they face to compare how each structure responds. For the high wind speed blade, I found the most significant design challenge is to make it stiff enough that it doesn’t bend too much in an extreme gust of wind and hit the tower. This is significant for low wind speed blades too, but I found that they face an additional design challenge. Because the blades are longer than high wind speed blades, they bend a lot more under their own weight. This is problematic, because turbines are constantly rotating and after many cycles of bending over the blades’ lifetime they can break.

Once I established the differences between high and low wind speed blade structural requirements, it became clear that the low wind speed blade structure could be improved. The standard wind turbine blade design consists of an internal structural spar that carries all the major loads, and an external shell that creates the aerodynamic shape needed to turn the turbine and generate electricity. This design has evolved over the past few decades for high wind speed turbines, and so it is quite efficient for those conditions. But the design does not work as well for low wind speed conditions. So I developed a new design process, which utilises mathematical optimisation techniques to systematically arrive at a structural design tailored to specific design requirements. When this is applied to a low wind speed blade design problem, the result is very different to the standard design. In the improved design, the structural function is moved away from a structural design tailored to specific design requirements. When this is applied to a low wind speed blade design problem, the result is very different to the standard design. In the improved design, the structural function is moved away from the internal spar into the external shell. The mass of the blade has been reduced, and the amount the blade bends under its own weight is significantly decreased. The implications of these results are that low wind speed blades can be made cheaper and more durable, which means that more wind farms can be located on sites with low wind speeds.

My Argument: The CCYL is a Multi-Function Institution in Chinese Communist Development. It services as an institution for assisting the organizational development and members increase of the CCP operating political socialization of the Chinese Youth for the CCP, and assisting the young leadership breading for the CCP. But in different developmental period, the main function was different. In the early Communist Movement, the CCYL was the cover of the CCP and service the purpose of assisting the organizational development and members increase of the CCP. And in the Period of Mao Zedong, the CCYL was re-organized into the mass organization for operating political socialization of Chinese youths, but it was destroyed in the Cultural Revolution. When it comes to the Period of Deng Xiaoping, as a part of Chinese institutionalization, the CCYL was designed to be the instituted arrangement for fulfilling the leadership renewal of the CCP. Although this design was disturbed by the Tiananmen Crisis, but in the period of Jiang Zemin and Hu Jintao, this instituted arrangement received consolidation.

The Achievement of This Research:

1. This research Project has established the Dataset of the CCYL cadres in the Central Committee of the CCP (From Congress 1st to Congress 18th). And it was recruited as the official Dataset of the CCYL Cadres by the Central School of the CCYL.

2. The whole thesis received the offer of publication from book publisher of German (English Version) and China (Chinese version) respectively.

3. The Literature Review of My thesis was published in “Journal of Politics and Law”. 

Research significance: As the Second Largest Economic Entity, the influence of China is undeniable. And the leadership issue is in the Central Role of China’s politics. From the case of Chinese Communist Youth league, we can deepen our knowledge of China’s Politics, and especially the leadership renewal of China.

Conventional wisdom: China researchers are used to analyse Chinese Communist Youth League (CCYL) in the angle of Factionalism and Corporatism. However, none of them can realize the real role of the CCYL. Specially, from the viewpoint of Factionalism, the CCYL is regarded as the base of specific Faction in China’s leadership politics. It is CCYL Faction/ Tuanpai which under the leadership of Hu Jintao.

From the angle of Corporatism, the CCYL is the corporation which is constituted by Chinese Youths. It serves the purpose of Political socialization of Chinese Youths.
The impact of trade liberalization on wage inequality: Evidence from China

Qiong Huang
School of Business

As many other developing countries, China has experienced a rapid growth in wage inequality after adopting the policy of trade liberalization in the late of last century. While a vast number of studies have examined the impact of trade policy on wage inequality, the empirical evidence from China is rare. This research fills in this gap by providing empirical evidence of the impact of trade liberalization policy on wage inequality in China as well as examining the underlying mechanisms behind the relationship. The study is conducted through a two-step empirical analysis. The first step of empirical analysis draws on a panel data from 13 industries between 1978 and 2011 and examines the changes in the wage structure between the traded and non-traded sectors before and after significant episodes of trade liberalisation (entry of the World Trade Organisation). The second step analysis provides microeconomic evidence on the impact of trade policy on wage inequality by using a cross-sectional data from studying 681 manufacturing firms surveyed in 2012. The empirical results shows that trade liberalization unambiguously lowers wage inequality in China sectors through three channels: 1) increasing returns to employees working in the traded sector; 2) improving firm productivity; and 3) enhancing firm profits. Therefore, this research suggests that, although wage gaps increases after adopting free trade policy in China, the direct contribution of trade liberalization on the growth of wage inequality is insignificant.

Temperature and Velocity Measurements of Leading Edge Separation in Rarefied Hypersonic Flow

Temayne Kaseman
School of Engineering & Information Technology

Analysis of rarefied hypersonic flow over a tick-mark shaped model via non-intrusive laser-based diagnostic techniques is presented. As part of a blind validation study, this work is a continuation of 40 years of validation experiments that have brought computational fluid dynamics (CFD) codes from fledgling idea to core design tool in the aerospace industry. Improvements to these codes provide better simulations of aircraft components, and hence a more thorough understanding of aerodynamic behaviour prior to component fabrication. Ultimately, better CFD codes improve aircraft designs and reduce program costs. The rarefied hypersonic flows considered in the present study are particularly interesting because the flow density sits between the applicable density ranges of two general CFD methods. For the method applicable in high density flows, assumptions inherent to the calculations begin to break down as density decreases, and for the method applicable in low density flows, the number of calculations required to achieve a solution becomes impossibly large as density increases. Both of these issues are believed to be correctable with appropriate modifications, but when both approaches are applied to the same rarefied hypersonic flow problem, conflicting flow predictions are produced, as shown in Figure 1. With lack of agreement between the two CFD methods, confidence in their prediction accuracy is reduced and validation becomes necessary. This presentation will focus on the choice of test model geometry and the two laser diagnostic techniques used to obtain 2D images of flow structure, temperature, and velocity. Preliminary comparisons of the simulations with flow visualization results, an example of which is shown in Figure 2, indicate that neither CFD method is correctly modelling the flow, and will also be discussed.
The Role of Space in Extraordinary Rendition. Why are suspected terrorists transferred across the globe?

Oriane Simon  
School of Physical, Environmental & Mathematical Sciences

My presentation highlights the importance of transfers in extraordinary rendition. The prisoners' transfers are a striking aspect of extraordinary rendition – the practice of abduction, transfer, detention, interrogation, and torture of suspected terrorists by US officials. Transfers, here, refer to the movement of prisoners from place to place often across country borders. Investigating transfers renders visible and accentuate the different spaces upon which extraordinary rendition draws to function. I argue that transfers support extraordinary rendition in that they prepare victims for subsequent interrogation and torture and impede judicial claiming. Firstly, the transfers are used as a means of sensory deprivation and sensory assault. Transfers are embodied experiences, which lead to disorientations of the body and mind of victims. At the extraordinary rendition ordeal of Binyam Mohamed, a released victim, I illustrate how the transfers affected both his body and mind. The disorientations made Binyam Mohamed uncertain and more sensitive to torture. Secondly, transfers multiply territories and controlling actors. The transfers increase the amount of work for judicial claims and fragment judicial accountability across different actors. Transfers across state borders illustrate that there is no convergence of state's territory and state's legal order, which are essential to the judicial system. Territory and legal order constitute multiple, heterogeneous, and non-convergent spaces, which require constant (re-)performing. Recognising the importance of transfers in extraordinary rendition highlights the importance of the participation of states besides the US.

Entrepreneurship in Post-conflict Sri Lanka: Micro-level Evidence from Two Cities

Kapila Maddumage  
School of Business

Sri Lanka ended a 25 years of a separatist conflict in 2009 when the government defeated the separatist force with a decisive military victory. The cessation of conflict provides avenues for entrepreneurship that could not have emerged during the conflict. Importance of promoting entrepreneurship in developing countries is acknowledged due to its role in job creation, poverty reduction and economic development. Additionally, entrepreneurship is important as it fosters peace and prosperity in the conflict-affected countries. However, little is known about the role of entrepreneurship in socio-economic revival in a post-conflict setting. Further, most empirical studies on conflict-affected countries often rely on household-level data, mainly due to sparse of enterprise-level data in such settings. Departing from this strand of literature, the current research addresses this issue by using enterprise-level data to explore motivations for business start-ups and their contributions to economic revival in post-conflict Sri Lanka. The data was collected using a purpose-designed survey administered to 243 emerging entrepreneurs in two post-conflict cities of Jaffna and Kilinochchi in 2012. Analyses were drawn from the data using the probit regressions, Least Absolute Deviation (LAD) and Ordinary Least Square (OLS) regressions. The study found that entrepreneurship in the post-conflict setting is “necessity-driven”, that is, individuals are motivated to start businesses to earn an income for living due to absence of other alternative employment opportunities. Further, entrepreneurs are subject to financial constraints. Faster growth was also experienced by businesses in the construction and related manufacturing sector which were the first sector to emerge following the restoration of peace in 2009.
Efficient Incorporation of Sparsity Prior for X-ray CT Reconstruction and EEG source Localization

Sajib Kumar Saha
School of Engineering and Information Technology, UNSW Canberra, Australia

X-ray CT reconstruction and EEG source localization are considered as indispensable components of many medical diagnostic and treatment techniques. From a mathematical point of view CT reconstruction and EEG source localization represent high dimensional mathematical inverse problems. In this work we solve these inverse problems more efficiently to make them comparatively safe and reliable. Traditional CT scanners capture X-ray projections sequentially and minimize the effect of internal organ movement during capture by taking more projections than necessary. The innovative sensor setup in this work captures the directional information along with the photon intensity using the Lightfield Imaging concept with multiple X-ray sources per projection. To produce successful CT reconstruction with minimum number of projections an innovate sparsity prior reconstruction modality is proposed. Only four angular projections are needed to reconstruct a slice, which are also captured simultaneously, thus pioneers superfast scans along with possible radiation dose reductions.

To localize the sources of electrical activity inside human brain (from Electroencephalographic (EEG) data) more concisely and reliably, the proposed approach considers grouping of the electrical current dipoles inside human brain based on their functionality. In this we consider Brodmann’s areas as a tentative basis for grouping dipoles.

The Infinite Matryoshka Doll: Postmodernism and the Planetary in the novels of David Mitchell

Kelly Frame
School of Humanities and Social Sciences

David Mitchell is a contemporary British novelist who has achieved significant critical and commercial success in the past fifteen years. He is the author of six novels: Ghostwritten, number9dream, Cloud Atlas, Black Swan Green, The Thousand Autumns of Jacob de Zoet, and The Bone Clocks. Four of his works have been nominated for the Man Booker Prize, and his third novel, Cloud Atlas, was adapted into a major motion picture in 2012. Despite the critical acclaim and increasing academic interest in David Mitchell, there has been no sustained critical engagement with his fiction. The purpose of my thesis is to provide the first close textual analysis of Mitchell’s entire oeuvre as well as to assess his innovation and significance for contemporary literature. My central research question is: how are postmodern literary techniques reconciled with a vision of the planetary in the novels of David Mitchell? Within the existing scholarship on Mitchell, his literary innovation. His significance is in this reconciliation of postmodern techniques and a planetary consciousness, I argue, is the crux of Mitchell’s work is best described in postmodern terms. Furthermore, I make the claim that his vision of the world, rather than a cosmopolitan utopia, exhibits a planetary consciousness. He depicts humanity as fundamentally interconnected through the flows of capital, globalisation, predacity; as “narrative beasts” ever-engaged with literature and stories; and as the common inhabitants and detractors of the planet.

A review of postmodern theorists such as Jean-Francois Lyotard, Jean Baudrillard, Fredric Jameson and Linda Hutcheon informs my argument that postmodern literary techniques are characteristic of Mitchell’s writing. His novels are replete with instances of intertextuality, pastiche, parody, metafiction; he frequently experiments with language, offers a juxtaposition of “high” and “low” literary forms, experiments with fragmented narrative structures (such as the “Matryoshka” or Russian Doll structure of Cloud Atlas), and presents polyphony of narrative voices. Thus, I argue, the style and technique of Mitchell’s work is best described in postmodern terms.

To localize the sources of electrical activity inside human brain (from Electroencephalographic (EEG) data) more concisely and reliably, the proposed approach considers grouping of the electrical current dipoles inside human brain based on their functionality. In this we consider Brodmann’s areas as a tentative basis for grouping dipoles.

1 This proof-of-concept work was funded by NewSouth Innovation.
2 This work has been performed in CSIRO, Melbourne (Supervisors from CSIRO: Timur E. Gureyev, Ya.I. Nesterets).
Opening a new window on reptiles

Dustin Welbourne
School of Physical, Environmental & Mathematical Sciences

All wildlife research, whether aimed at addressing fundamental questions of evolution and ecology or aimed at addressing wildlife management issues, requires the detection of animals in space and time. A clear taxonomic bias exists in wildlife research because some species, for instance reptiles, are small and cryptic, making them difficult to detect. This substantial knowledge gap in global biodiversity now hampers fundamental understanding and management practices. Hence, there is a desperate need to improve the methods in which reptile species are detected.

Detecting reptiles in situ has traditionally meant trapping and/or physically searching for fauna in the wild. The camera trap, a device that captures pictures of passing fauna, has provided great advantage to studies on mammals and birds; but, due to limitations in the technology has seen limited use for detecting reptiles. In this presentation, a new method is presented that solves this problem.

Using existing off-the-shelf technology, and employing the camera trap in a novel way, camera traps can be used to detect reptiles as effectively as traditional techniques. Furthermore, mammals can be detected simultaneously more effectively than traditional methods. This research has global implications and provides a means to obtain much needed data in a cost efficient manner.

Poster Competition

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The Judges

Honorary Associate Professor Stephen Fortescue, BA(Hons), PhD ANU
Former Deputy President of the University's Academic Board and Director of Postgraduate Research for the Faculty of Arts and Social Sciences. He is a political scientist in the School of Social Sciences and International Studies, whose research is focused on the contemporary Russian policy-making process and the Russian mining and metals industry.

Stephen's most recent monograph is Russia’s Oil Barons and Metal Magnates (2006, Palgrave) which offers an analysis of the role of the so-called oligarchs in the post-Soviet Russian political economy. His next book is to be on the relationship between personalist and institutionalized politics in Russian policy-making, with taxation as the main case study. He publishes regularly on a wide range of issues related to Russian mining and metals. He currently supervises research students working on the Russian gas industry, environmental policy in Russia, and on various business and politics topics not related to Russia.

Professor Nasser Khalili, BSc Teh., MSc Birm., PhD UNSW
Associate Dean (Research) for the Faculty of Engineering and Head of Geotechnical Engineering in the School of Civil and Environmental Engineering. His research interests include:
- Unsaturated Soil Mechanics
  Development of a general framework describing the behaviour of unsaturated soils.
- Computational Mechanics
  Application of numerical modelling techniques applied to geotechnical engineering problems.
- Mechanics of Multi Phase Multi Porous media
  Modelling of flow and deformation in single and multi-porosity media saturated by one or more fluids.

Professor Laura Poole-Warren, PhD UNSW
As the Dean of Graduate Research, she has executive responsibility for the Graduate Research School, the unit responsible for administration of the 4000 graduate plus research candidates enrolled at UNSW. The other major part of her leadership role is in developing and implementing strategy and policy relating to higher degree research at UNSW and interacting with major partners such as the Group of Eight, Universitas 21 and China 9 Universities.

After commencing as a lecturer at UNSW in 1995, she built a successful research group focussed on biomaterials and tissue engineering. A particular focus of her research is on incorporating functional biological molecules into polymers with emphasis on hydrogels, electroactive polymers and nanocomposites.

Professor Poole-Warren continues to lead a research group in biomedical engineering focusing on design and understanding of biosynthetic polymers for medical applications.

Fields of research: Biomaterials, Polymers and Plastics, Regenerative Medicine (incl. Stem Cells and Tissue Engineering)

Keynote Speaker

Professor J. Robin Warren, Nobel Laureate,
The Nobel Prize in Physiology or Medicine 2005.

Prize motivation: "for their discovery of the bacterium Helicobacter pylori and its role in gastritis and peptic ulcer disease"

Field: bacteriology, disease transmission, gastroenterology

Helicobacter

During the 1970s, I wrote up a few interesting cases and developed an interest in the new gastric biopsies that were becoming frequent. I also attempted to develop improved bacterial stains for use with histological sections, as I describe more completely in my Nobel lecture. Then, in 1979, on my 42nd birthday, I noticed bacteria growing on the surface of a gastric biopsy. From then on, my spare time was largely centred on the study of these bacteria. Over the next two years, I collected numerous examples and showed that they were usually related to chronic gastritis, usually with the active change described by Richard Whitehead in 1972. I attempted, with some difficulty, to obtain a negative control series, by collecting cases reported as normal gastric biopsies. This was more difficult than I expected, because all gastric biopsies were coded the same, wherever they came from in the stomach. Almost all so-called normal biopsies were from the corpus. Normal biopsies from the gastric antrum were very rare, but I eventually found 20 examples, and none showed the bacteria. With this material available, I began to prepare a paper for publication.

In 1981, I met Barry Marshall, and we agreed to undertake a more complete clinico-pathological study. He could cover the clinical aspects and provide improved biopsies, specimens for culture, clinical history and endoscopy findings. This resulted in our papers of 1983 and 1984, linking the infection to duodenal ulcer and culturing a new organism. My letter to the Lancet in 1983 was a summary of the paper that I was preparing when I first met Barry Marshall. After this Barry and I continued our association, but he moved to the Fremantle Hospital. I was involved with the pathology related to several studies: Professor Goodwin, improving the accuracy of culture to diagnose the infection; Dr Ivor Surveyor, producing the breath test for diagnosis; and doctors Marshall and Morris, attempting to fulfil Koch's postulates to demonstrate that the bacteria was a pathogen.

**Definition of Research**

For the purposes of the DEEWR collection, the essential characteristic of research activity is that it leads to publicly verifiable outcomes which are open to peer appraisal.

Research and experimental development comprises:
- creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of humanity, culture and society, and the use of this stock of knowledge to devise new applications;
- any activity classified as research and experimental development is characterised by originality; it should have investigation as a primary objective and should have the potential to produce results that are sufficiently general for humanity’s stock of knowledge (theoretical and/or practical) to be recognisably increased. Most higher education research work would qualify as research and experimental development.

Research includes pure basic research, strategic basic research, applied research and experimental development. Activities that meet the definition of research include:
- provision of professional, technical, administrative or clerical support and/or assistance to staff directly engaged in research and experimental development;
- management of staff who are either directly engaged in research and experimental development or are providing professional, technical or clerical support or assistance to those staff;
- activities of students undertaking postgraduate research courses;
- development of postgraduate research courses; and
- supervision of students undertaking postgraduate research courses.

Activities that do not support research should be excluded. Such activities may include:
- preparation for teaching;
- scientific and technical information services;
- general purpose or routine data collection;
- standardisation and routine testing;
- feasibility studies (except into research and experimental development projects);
- specialised routine medical care;
- commercial, legal and administrative aspects of patenting, copyright or licensing activities; or
- routine computer programming, systems work or software maintenance (research and experimental development into applications software, new programming languages and new operating systems would normally meet the definition of research).

**Prizes**

**Best Research Presentations**
- Overall Winner: $800
- Winner: Science, Technology, Engineering, & Mathematics: $500
- Winner: Business, Humanities and Social Sciences: $500

**Poster Competition**
- Overall Winner: $500
- Winner: Science, Technology, Engineering, & Mathematics: $300
- Winner: Business, Humanities and Social Sciences: $300

**Research Day 2013**

Research Day 2013 – Presenters, Judges and Staff
Research Day 2013 Presenters

Research Day 2013 Best Presentation 1st – Evan Smith

Research Day 2013 Best Presentation 2nd – Yifei Cui

Research Day 2013 Best Presentation Equal 2nd – Karthik Ram Ramakrishnan

Research Day 2013 Best Presentation Equal 2nd – Ali Reza Yoneipour

Research Day 2013 Poster Competition Popular Vote – Mohsen Habibi Tehran

Research Day 2013 Poster Competition Judges Selection – Sajib Kumar Saha

Research Day 2013 Poster Competition Popular Vote – Dr Sean Farrell gift presentation by Prof John Arnold

Research Day 2013 – Dr Anne Evans gift presentation by Prof John Arnold

Research Day 2013 Presentation Honourable Mention – William Westerman
Contact us
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