FACULTY
OF SCIENCE

THE UNIVERSITY OF SYDNEY

SCHOOL OF PHYSICS

ALUMNI Update

SEPTEMBER 2011

EUREKA WINNERS

Pictured above with Dean of Science, Prof. Trevor Hambley (left) & Vice Chancellor, Dr Michael Spence (right) are Dr Chris Dey, Dr Joy Murray, A/Prof. David Moss & Prof. Ben Eggleton.

Congratulations to the five Eureka Prize 2011 winners from the School of Physics. Awarded were Professor Ben Eggleton, ARC Federation Fellow and Director, CUDOS and IPOS, for *Leadership in Science,* Associate Professor David Moss, a Senior Researcher with IPOS, for *Innovation in Computer Science*, and Dr Chris Dey, Professor Manfred Lenzen and Dr Joy Murray from the Integrated Sustainability Analysis Research Group (ISA) for *Innovative Solutions to Climate Change*. The prizes were presented at a prestigous gala event held on Tuesday 6 September.

Vice Chancellor Dr Michael Spence, who attended the ceremony, congratulated all the winners and said he was delighted the University had been so widely represented in this year's awards. "These awards are wonderful recognition for their work over many years. The University of Sydney takes great pride in their achievements. They epitomise our commitment to undertake research that makes an original contribution to knowledge and understanding. Our commitment to sustainability research is clear: it is fantastic to see the multi-disciplinary team led by Manfred Lenzen, Christopher Dey and Joy Murray recognised for their work in this area.

"It is also pleasing to see our researchers recognised for leadership and communication. We are determined to see our research go beyond the boundaries of our campus and have a real affect on broader society; we want to solve problems and innovate. Ben Eggleton has shown exemplary leadership in this area." All of the University of Sydney finalists at the Eureka Prizes took out the top prize in their category. Presented annually by the Australian Museum, the Eureka Prizes reward excellence in the fields of scientific research and innovation, science leadership, school science and science journalism and communication.

$5M CHAIR FOR AIN

A generous $5million gift from one of Australia's leading businessmen will enable the University of Sydney to make major advances in the exciting new field of nanoscience.

The gift from John Hooke CBE, pictured, former Chairman and CEO of Amalgamated Wireless Australasia (AWA) will endow a new academic chair in the School of Physics and the Australian Institute of Nanoscience which is to be built at the University of Sydney.

The Chair is to be named the John Hooke Chair of Nanosciences. Nanoscience involves interdisciplinary research on manipulating matter on the nanoscale, which has the potential to deliver more energy-efficient communications and advances in medical imaging and treatment of diseases through nano-devices based on quantum physics and photonics.

John, who has been a Council Member of the Science Foundation for Physics since 2003, graduated from the University of Sydney with the degree of Bachelor of Science majoring in Physics, followed by a Bachelor of Engineering with First Class Honours and University Medal.

After university he joined Amalgamated Wireless Australasia Ltd where he was involved in the production of the first transistors. He rose through the company to became Chairman and Chief Executive of AWA from 1974-1988.

"I have always been extremely passionate about science and how it may benefit society," he said. "Australian industry requires new technologies and a new generation with the skills to work across disciplines from science to engineering to medicine," says Mr Hooke. "Nanoscience has so many applications and possibilities, it's really a revolution and I am delighted to be able to help this exciting new endeavour at the University of Sydney,"

The Vice Chancelor, Dr Michael Spence stated, "John Hooke has made an extremely generous and farsighted donation which will allow us to take important steps in cutting edge research,"

The new Australian Institute of Nanoscience (AIN) at the University of Sydney is to be housed in a purpose built facility adjacent to and integrated with the School of Physics. Work on the new building is due to commence early in 2012 and it is expected to be completed in 2014.

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WWW.PHYSICS.USYD.EDU.AU/ABOUT/BUILDING.SHTML

NMI AWARD

Research into the most sensitive measurement of force yet recorded has earned Dr Michael J. Biercuk, (pictured left) in the School of Physics' Quantum Science Group, the National Measurement Institute (NMI) Prize for Excellence in Measurement Techniques by a scientist under 35. In collaboration with the Ion Storage Group at the US National Institute of Standards and Technology, Dr Biercuk demonstrated that it is possible to use trapped atomic ions as extremely sensitive detectors of applied forces and electromagnetic fields by using a device consisting of about 60 beryllium ions confined in a Penning Trap, which stores charged particles using electric and magnetic fields.

Any movement caused by an applied force was measuredwith a laser. The resulting measurement of forces withsensitivity at the level of 390 yoctonewtons with just one second of measurement eclipsed the previous record by three orders of magnitude. The yoctonewton represents one septillionth (10^{-24}) of a newton, the unit of force which is named after physicist Sir Isaac Newton.

"This award recognises Dr Biercuk's contribution to research in the most sensitive measurement of force to date - the yoctonewton," said Innovation Minister Senator Kim Carr, who announced the award on Friday.

"This is an incredibly small force - about a million million billion times smaller than the force exerted by a feather lying on a table. And the measurement is a thousand times more sensitive than anything previously possible," said Senator Carr.

The discovery provides an opportunity to address new challenges in materials science, nanotechnology and industrial sensing. For example, forces at the yoctoscale correspond to the weight of tiny nanoparticles consisting of just a few dozen atoms, or the effects of tiny electric fields on charges in nanoscale materials. "By characterising the detector's sensitivity, a term with technical importance, rather than just the minimum force we could detect, we touched on an important area for industrial applications - the speed with which a measurement can be performed," said Dr Biercuk.

"Even if it isn't necessary to measure force at such a tiny level as the yoctoscale, our technique could simply be used to speed up the detection of larger forces. Compared to previous record-setting techniques, our measurement scheme would allow measurement of the same force about one million times faster.

This ability to measure tiny forces at a dramatically enhanced measurement speed is a key demonstration that may spark new interest in ion-based sensors for applications such as the characterisation of nanomaterials and standoff detection for the mining and defence industries." Dr Biercuk said he was very pleased that the exciting new field of quantum science is having impacts on a variety of disciplines, including measurement science.

CAASTRO LAUNCHED

Pictured at the CAASTRO launch are from left, Dean of Science, Prof. Trevor Hambley, Prof. Bryan Gaensler, HE Prof. Marie Bashir AC CVO, Prof. Margaret Shiel, ARC Director, Dr Alan Finkel AM, CAASTRO Advisory Board and Prof. Lister Staveley-Smith, CAASTRO Board.

The new ARC Centre of Excellence for All-sky Astrophysics, CAASTRO, was launched on 12 September at the Sydney Observatory in front of the who's who of astronomy. Headquartered in the School of Physics, CAASTRO is taking a revolutionary new approach to astronomy by using an all-sky perspective to answer the big questions about our universe. CAASTRO brings together unique expertise across six Australian universities, as well as local and international partners.

Led by the University of Sydney, in collaboration with the Australian National University, the University of Melbourne, the University of Western Australia, Curtin University and Swinburne University of Technology, CAASTRO brings together radio astronomy, optical astronomy, theoretical astrophysics and computation to investigate three interlinked themes: the Evolving Universe, the Dynamic Universe, and the Dark Universe.

"CAASTRO is a major new initiative that is revolutionising the way we see the universe," says CAASTRO Director, Professor Bryan Gaensler, "The traditional approach to astronomy has had a lot of success, but we're now running up against a whole range of questions these old approaches can't answer,"

"The big unsolved questions in astronomy demand entirely new approaches, requiring us to look at the whole sky at once, rather than studying single objects in the sky in isolation. You really need to look at how everything works together to truly understand what is going on out there and that's what CAASTRO will do with our all-sky approach to astronomy," he says.

CAASTRO research will use wider fields of view, with bigger data sets, processed more deeply and more subtly, than anyone has attempted before, In the last few years, Australia has invested more than $400 million in new wide-field telescopes and the high-performance computers needed to process the resulting torrents of data. Using these new tools, Australia now has the chance to be at the vanguard of the upcoming information revolution in all-sky astronomy.

Professor Gaensler says CAASTRO's strength is that it will be a collaborative structure that for the first time combines the relevant expertise and resources into a single coherent unit. "In addition to our revolutionary science, we've decided right from the outset that CAASTRO should also put a high priority on training the next generation of scientists, and engaging with schools and the public with outreach activities,"

LEARN MORE: WWW.CAASTRO.ORG

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