



Alumni News

WINTER 2009

Kepler Takes Off

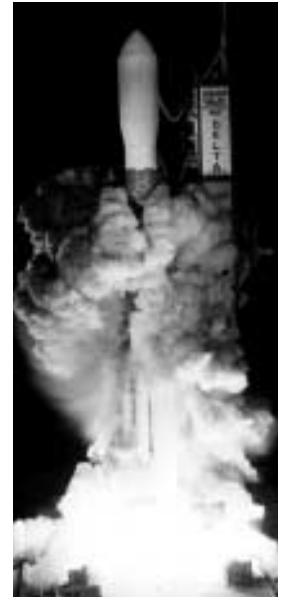
In March 2009 NASA successfully launched its next big space project – Kepler – a space telescope, (pictured right) which aims to detect Earth-like planets around other stars. Using Kepler, NASA expects to answer a very fundamental question: are planets the size of Earth with about one year orbits common around Sun-like stars? From its earth-trailing orbit around the Sun, the spacecraft stares at a single patch of sky near the constellation Cygnus (the Swan) and measures the variations in brightness of 170,000 stars simultaneously and continuously for a period of at least 3.5 years.

The Kepler mission will not only be able to search for planets around other stars, but also yield new insights into the parent stars themselves. Kepler's measurements of changes in stellar brightness will

also be used to study stars and their interiors. To help with this project, NASA has recruited a number of astero-seismologist, who specialise in studying stars through interpretation of their oscillations, which are generated by continuous 'star quakes'.

Dr Dennis Stello, an astrophysicist at The University of Sydney, is working on the Kepler project. "The technique used by Kepler to detect the planets – called the transit method – relies on the slight dimming of a planet-hosting star as the orbiting planet moves across the star, blocking part of the light for several hours. It is like measuring the brightness change of a car's headlight caused by a small flea moving in front of it".

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Sydney's Photonic Future is Bright

The Institute of Photonics and Optical Science (IPOS), the newest institute in the University of Sydney and the only one of its kind in Australia, was officially launched on Thursday 23 April 2009 by Senator Anne McEwen, Chair of the Senate Standing Committee on Environment, Communications and the Arts, and University of Sydney Vice-Chancellor and Principal, Dr Michael Spence.

Prior to the launch, Senator McEwen, was treated to a first hand tour of the School of Physics with a focus on the photonics laboratories. These included the new labs especially designed to enable the broad spectrum of research, which spans all areas of optics and photonics from fundamental to applied, including the ground breaking areas of meta-materials and cloaking, speeding up and greening the Internet, structural health monitoring, as well as the pioneering fields of astrophotonics, medical and quantum photonics.

"IPOS has broken new ground in terms of what we have achieved and the amazing future directions in which we are now headed," says Professor Ben Eggleton, ARC Federation Fellow and IPOS Director. "We're discovering new ways with photonics and optics that we never imagined." Eggleton says that by working across

diverse areas such as physics, mathematics, chemistry and microscopy, ideas that were once thought to be in the realm of fiction, such as invisibility or remote surgery, are now becoming reality. He adds, "Photonics has only just touched on what it's capable of and being part of a broad team pushes us to truly explore new concepts and ideas even further. 'What if?' is a very exciting phrase."

At the same time as pioneering new ways to use photonics, Eggleton says that IPOS has met their core objective to increase the Internet to operate at terabit per second capacity and are now researching clever ways to ensure the power the net uses won't be a source of future energy crises. "It's always exciting to solve a problem, such as speeding up the net, but at the same time you have to be responsible for the impact it will place on our resources. For instance two Google searches equate to one kettle being boiled so you can imagine what our tech savvy society is doing to the world's power sources by constantly uploading images and movies. We're now looking at how optics can save energy and our planet."

Eggleton has ambitious hopes that a major new building will be constructed within the next decade to house both IPOS/Physics staff

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Professor Anne Green
Director & Head of School

Headline

So far 2009 has been a busy year for the School of Physics and it doesn't show any sign of calming. This isn't surprising given the International Year of Astronomy (IYA) is of particular significance to a School that houses nearly 70 academic staff and postgraduate students, who are members of the Sydney Institute for Astronomy. Our astronomers and astrophysicists have been part of events such as the splendid Music and the Cosmos (held in May to a packed house of 600 alumni and friends) and are also involved with new missions into space such as the Kepler Space Telescope.

The new Institute of Photonics and Optical Science (IPOS) was officially launched on 23 April by Senator Anne McEwen, Chair of the Senate Standing Committee on Environment, Communications and the Arts and Vice-Chancellor of the University, Dr Michael Spence. Astrophotonics is just one of the many areas being explored by IPOS, which is a collaboration incorporating Physics, Chemistry, Mathematics, the Electron Microscopy Unit and Engineering. With the Federal Government's announcement of a \$43 billion investment in the national optical fibre broadband network, the timing for IPOS and its research goals is perfect. This newest University of Sydney Institute surely has a dynamic and exciting future.

The massive refurbishment of the School's basement area to build new optics and mesoscopic science laboratories is finally complete. The Applied Physics area on Level 4 has also been spectacularly redone. Both these areas will help to accommodate the 15 staff and students from the now disbanded Optical Fibre Technology Centre, who are now welcomed as members of the School of Physics and, of IPOS.

The Science Foundation for Physics is currently putting the finishing touches on the 35th Professor Harry Messel International Science School (ISS) – *Genes to Galaxies*. One hundred and forty five Year 11 and 12 students will arrive from all over Australia and from ten other countries. It is always exhilarating to meet the students as they arrive and we welcome them to two weeks of science and social activity. In this, the 55th Year of the Science Foundation, it is sure to be a very special ISS.

Warm wishes

Professor Anne Green
Head, School of Physics

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Stello explains, "Stars like our sun can 'ring like a bell' due to standing sound waves inside them, which makes the whole star oscillate. The oscillations will cause small periodic variations of the stellar brightness which the Kepler data will reveal. From the analysis of these oscillations we can perform 'stellar seismology' in a similar way geologists probe Earth's interior through the study of sound waves in the Earth's interior caused by earthquakes." Dr Stello and the rest of the asteroseismology group at the University of Sydney are members of the large international team – the Kepler Asteroseismic Science Consortium – working on these aspects of the Kepler mission.

For many of the stars where accompanying planets will be detected, the astronomers expect to use stellar seismology to determine the parent star's size, which will aid the determination of the size of the planets. "We will further be able to measure the age, the chemical composition as well as rotation rate of the stars, and we expect to answer a host of questions about stars in our galaxy: How do stars they evolve? Is the Sun a typical star? How does matter behave under the extreme conditions in stars? Do stars that host planets have the same age as the Sun and the Earth?"

The quality of the Kepler data and the large number of stars observed are expected to lead to a huge step forward in understanding of stellar evolution. Stello says, "With Kepler's accurate measurements of stellar oscillations we expect for the first time to watch directly the change in stars as they age; and that during only a few years, which is the blink of an eye in a stars life."

The team at the University of Sydney is leading the efforts to understand stars much older than the Sun, and stars located in stellar clusters. "We are tremendously excited to extend our seismic techniques to measure ages of stars much older than the Sun," says Dr Stello.

After the commissioning phase the science operation is expected to start in May 2009, and the first data will be analysed later this year. For more information visit: www.physics.usyd.edu.au/~stello/Kepler.html

In Brief

You may not know it but the School of Physics has around 1,600 students walking through the corridors every year. Many are interested to see what careers our alumni have gone onto achieve. We would love to have your current business cards to frame and put up on our walls. The set we currently display is from the 1990s (and those clever physics students are twiggling!). All new cards can be sent to Alison Muir, Science Foundation for Physics, School of Physics (A28), The University of Sydney NSW 2006. We look forward to seeing a diverse range of careers!



ALUMNI PROFILE

Dr Jacqui King

Animal Breeding Management is a distance education stream of the postgraduate coursework Animal Science program at the faculty of Veterinary Science, generously sponsored by Meat and Livestock Australia and Australian Wool Innovation.

Dr Jacqui King, (pictured right) a former scholar of the Professor Harry Messel International Science School, is yet another of the wonderful applicants who was awarded a scholarship this year by Meat and Livestock Australia and Australian Wool Innovation this year. She represents the busy working professional and family person as so many of our students do – and we are very grateful for her time in putting together this short article as she juggles all these roles with studying three units this semester – a formidable feat indeed!

Jacqui is also the first of our students to take up an elective unit offered by the Master of Animal Science in Advanced Reproduction Techniques – an intensive one month unit of study which deals in on-campus study and practical application in the area of Reproduction. This while also studying two units of study on-line – Jacqui is justifiably exhausted but loving it she tells us!

"I am married to Damien, a pharmacist, and have two little boys Campbell (5) and Finlay (3 and a bit). We live on the Sunshine Coast in QLD and have a small holding there with anywhere up to a dozen stud Charbray cows, three horses, two dogs and a cat. We also have a herd of Charbrays at Damien's mum's property in the hinterland of the Sunshine Coast, and maintaining that herd is our main past-time.

Professionally I am a Chartered Accountant and

Veterinarian and completed my Masters of Business Administration in 2004. I worked in the accounting field in Australia and overseas (Poland, Ireland, UK) for fourteen years, before going back to school to become a vet. I completed this in 2006 and worked in private practice for the two years afterwards.

Now that Campbell is off to school, and with my desire to focus my veterinary career into the field of genetics and reproduction, I commenced postgraduate studies in Animal Breeding Management through the University of Sydney. Having been at it for only a month, I am finding the benefits of being able to study in the field where my interests lie absolutely incredible. I am "buzzing" on a daily basis and reading my books in between ad-breaks of my favourite shows, when I am supposed to be having a break.

The areas in which our lecturers are researching are ground-breaking in this field, and that we get to share in the results is amazing and inspiring. The biggest challenge for me is balancing my "other" careers with the study. Being mum and wife, accountant for Damien's pharmacy, and vet for our animals provides challenge enough. Now there is another dimension. Without Damien's support I couldn't be doing it. Fortunately as a pharmacist with an MBA (that's where we met!) he understands the importance of further study and we work together to get through it."

This article is reprinted with kind permission from the Veterinary Science, Animal Science (Animal Breeding Management) Newsletter. For more information on this program visit: www.vetsci.usyd.edu.au/animal_breeding/



"I remember getting the scholarship to the ISS and was so excited – I still have the photograph that the school took of me for the school newsletter. It certainly didn't let me down. The lectures were amazing, especially the fact that Prof. Julius Sumner Miller lectured to us. It was also wonderful to meet all of the other students who were from other states and many other countries.

I became a Chartered Accountant originally, and only recently (2001) went back into science, my true calling, and became a vet.

I felt very privileged to attend The University of Sydney at the time, and am thrilled to be back there doing postgraduate studies with the department of Veterinary Science."

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and research infrastructure. Head of School, Professor Anne Green agrees, "The University of Sydney's School of Physics is very fortunate to be doing so well in all areas of physics. Of course while we welcome the swelling numbers of undergrads, hons, postgrads and postdocs the question does arise as to where do we put everyone? The Physics Annexe is just about bursting at the seams with world-class researchers in all areas of physics. In 2010 IPOS will launch a new Masters in Photonics program and so we hope to have even more outstanding students onboard." Green pauses for a moment and smiles, "Admittedly of all problems we could have being very popular isn't too bad."

IPOS is a collaboration with research and teaching expertise across the Schools of Physics, Electrical and Information Engineering, Mathematics, Chemistry and the Electron Microscope Unit coming together to work in this far reaching science. IPOS also includes the activities of the ARC Centre of Excellence in Ultrahigh bandwidth Devices for Optical Systems (CUDOS) in the School of Physics, the former Optical Fibre Technology Centre, those of the Fibre Optics and Photonics Laboratory in the School of Electrical and Information Engineering, and astronomical instrumentation (Astrophotonics) programs of the Sydney Institute of Astronomy in the School of Physics. For more information on IPOS and/or to view the IPOS DVD visit: <http://www.usyd.edu.au/ipos/>



Senator Anne McEwen on the IPOS lab tour



Genes to Galaxies Hurtling towards the 35th ISS

The ISS2009, *Genes to Galaxies*, provides ample opportunity to participate in a variety of special events associated with the ISS and allied organisations. The School of Physics played an instrumental role in the science of the Apollo lunar missions, in fact we have one of two permanent experiment remaining on the lunar surface. Fittingly an exhibition, *Small Step, Giant Leap: Celebrating Apollo at 40*, will be officially opened at The University of Sydney's SciTech library on Monday 20 July by Senator Kim Carr, Federal Minister for Science.

Later on that 40th Anniversary night Julius Sumner Miller Fellow, Dr Karl Kruszelnicki and his fellow Sleek Geek and ABC radio presenter, Adam Spencer, will present their take on the conspiracy theories of the moon landing on 20 July 1969 – more details are listed on the back page.



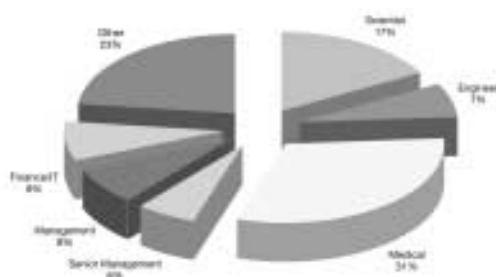
It is an exciting time as the approach to the 35th Professor Harry Messel International Science School (ISS) - *Genes to Galaxies* is now only weeks away and 145 students arrive on our doorstep for a non-stop science experience! With scholar selections now complete the Science Foundation for Physics (SFP) team and everyone in Physics is looking forward to meeting the 'Class of ISS2009' who come from all over Australia and around the globe.

For the first time, in honour of Emeritus Professor Harry Messel AC CBE, SFP founder and creator of the International Science School, we will be joined by two scholars from Rivers Manitoba in Canada, hometown of Professor Messel. The chosen ISS scholars are Year 12 students Cassandra Pryzner and Josie Paddock. As the inaugural Canadian students the girls are looking forward to their visit down under. They're especially looking forward to hearing thirteen guest lecturers ranging from the USA, France and Australia who will deliver seventeen lectures right across the *Genes to Galaxies* spectrum.

SFP President, Trevor Danos, has just returned from an overseas trip where he was guest of honour at a Canadian celebration (Manitoban style) to honour their two chosen students. In the USA Trevor had the distinction of being the only non-scientist to be invited to speak at the USA Science Bowl National

Championship. His talk, *The Scientific Revolution: From Copernicus to Galileo to Newton and Beyond* was very well received. Trevor also had the honour of presenting the winning team with their Certificate of Scholarship to attend the ISS.

Back in Sydney the SFP has worked with the Young Scientists of Australia (YSA) to ensure a packed ISS program consisting not only of challenging science talks and activities but also fabulous social events. These include the ISS Talent Quest (yes the ISS has hams as well as virtuosos!), the well-loved bush dance as well as film nights and city tours (aka shopping trips). Study sessions are also under the direction of the YSA. The Sydney Harbour Cruise will ensure





Outreach

Outreach has already had a very busy year kicking off with the Siemens Science Experience in January. This annual event encourages budding forensic scientists to explore evidence from a murder scene, including radioactive hair samples and unidentifiable windscreen material. The average age of these 'science detectives' is 14 so they have a great time trying to work out not only who did it but more importantly how 'it' was done.

Our ever-popular Kickstart program on HSC physics is experiencing a steady increase in numbers from previous years. Other programs such as Gifted and Talented (For Year 8 and 9 students) and Degree in a Day (For Year 12 students) all have an astronomy flavour as acknowledgment of 2009 being the International Year of Astronomy. April's Gifted and Talented session covered everything from stellar evolution and angular resolution to the difficulties of keeping a space ship at regular temperatures in outer space, explored using the plethora of lecture demonstration gear here in the School of Physics.

In May Kickstart will again travel to Wagga Wagga, Dubbo and Armidale with a brand new team of demonstrators. Thanks to the AIP for supporting us with public talks on the 2008 Nobel Prize in Dubbo and Armidale, to be delivered by resident experts, Drs Chris Stewart and Kevin Varvell.

The Outreach team would like to acknowledge the terrific improvements in the second year lab made by Physics new lab



Kickstart demonstrators checking equipment

technician, Brian Ford and the hard work and innovations of Physics lecture demonstration manager Nathan Apps. Thank you both!

Keep your eye on the School of Physics website for continual news of our research and opportunities to attend public talks by local and visiting academics. Feel free to spread the word to friends and family who might like also attend public talks and other science events and activities. Visit: www.physics.usyd.edu.au to keep updated.



to this event please contact: Alison Muir on +61 2 9036 5194 or email: a.muir@physics.usyd.edu.au to ensure your details are registered.

The Science Foundation for Physic celebrates its 55th anniversary year in 2009 and we are looking forward to a very special ISS indeed.

Opposite and left: ISS scholars from *ISS2003 Zero to Infinity*, and a chart highlighting ISS alumni career diversity.

Below: Nruithya Madappa on her way to receive the Len Bassar Award in 2007. Nruithya returns as an ISS Staffie in 2009. She is currently a student at Stanford University, USA.

scholars and escorts receive the much-desired tour of the harbour while dancing the night away – is there any other way when you're a teenager?

A more formal event is the ISS Gala Reception to be held on Wednesday 22 July 2009 from 6.00pm-8.00pm in the Great Hall. Dr Karl Kruszelnicki is the MC to this special event which includes the presentation of the two ISS awards – The Len Bassar Award for Scientific Leadership – an Australian Government prize and the Mulpha ISS Leadership Award. More importantly it's a great way to meet first hand the current cohort of ISS scholars.

If you would like to ensure you receive an invitation





MyScience UPDATE

Encouraging more science to be taught to primary-aged students became a priority for the Science Foundation for Physics (SFP) and so, in 2006, an innovative program, MyScience, brought scientists into classrooms to act as mentors to groups of primary students undertaking an investigations.

The scientists provided advice on a scientific question, which could be investigated with simple equipment to provide an achievable outcome. Both mentors and classroom teachers were provided with special training in investigations for primary-aged students.

Students and mentors communicated with each other between visits using Mentor Place software provided by IBM. All investigations would be written up by students and entered into a local competition, the NSW Science Teachers Association 'Young Scientist Awards'.

The increasing number of MyScience participants winning prizes in the competition each year shows the immediate impact of this innovative program. In 2009 a number of these winners also gained recognition in the national BHP Billiton Science Awards. MyScience is in the process of being rolled-out nationally and there are expressions of interest in a number of overseas countries.



MyScience winners Kindergarten to Year 2

This year the MyScience consortium has concentrated on consolidating material that will eventually be made available to 'local hubs' (organising committees) wishing to run their own MyScience program.

Within the University of Sydney a group representing the SFP, Faculty of Science and Faculty of Education and Social Work has come together to plan a rollout of MyScience in the catchment area for the University. It is anticipated that a combination of science and education students working along side researchers in the mentor program will both sustain the program in the long-term and produce a new generation of primary teachers well trained in the art of science investigations. For more information on MyScience visit: <http://myscience.edu.au/>

Science Foundation's 55th Anniversary Year



The Science Foundation for Physics (SFP) is celebrating its 55th Anniversary this year. Since its establishment in 1954 by Professor Harry Messel, the SFP has supported the School of Physics as well as promoting science to the broader community through its science education programs and communication initiatives such as the Julius Sumner Miller Fellow, Dr Karl Kruszelnicki. Since 2005 the SFP has initiated the Indigenous Science Scholars Program as part of the Professor Harry Messel International Science School (ISS) to encourage more young Indigenous Australians to study science and continue onto tertiary study; and MyScience, which uses scientist mentors to help primary school teachers feel more confident in teaching science and to help primary school students better understand science. MyScience was awarded a Business and Higher Education Round Table (B-HERT) award in 2008.

However being a non-profit organisation we appreciate and need the ongoing support of our alumni and friends to ensure our important work can continue. There are many ways you can help such as a monthly credit card deduction, a gift to our Physics Annual Fund or by leaving a bequest. To donate directly to the SFP please visit www.physics.usyd.edu.au/foundation and download the donation form to be faxed to Alison Muir on +61 2 9351 7726 or mailed to Alison at The Science Foundation for Physics, The School

of Physics (A28), The University of Sydney NSW 2006 Australia (N.B. cheques should be made payable to The University of Sydney). Overseas alumni based in the UK can donate through the UK Trust and in the USA supporters can donate through the USA Foundation - visit www.usyd.edu.au/supportsydney/index.shtml.

Alison can also help you with information on bequests and memorial gifts.

We sincerely appreciate each and every donation. Thank you to all our donors!

Alumni Update

Alumni Update, the School of Physics monthly e-newsletter, provides a brief overview of current events, activities, research and programs run within the School and by the Science Foundation for Physics. It's a great way to find out about forthcoming public talks so you can book early.

If you'd like to have a look at past issues visit: www.physics.usyd.edu.au/foundation To ensure you're on our e-database email: Alison Muir - a.muir@physics.usyd.edu.au



IRINA KABAKOVA

POSTGRADUATE STUDENT PROFILE

Irina Kabakova is a postgraduate student studying photonics and optical science at the School of Physics. Irina is originally from Russia and has settled into Sydney life with aplomb. Alumni News caught up with Irina as she took a break from the lab to enjoy the sunshine.

Alumni News: What made you interested in studying photonics and optical science?

Irina Kabakova: I always preferred optics to electronics, even during undergraduate I did not like much Electromagnetism. I liked 2-d year optics labs with diffraction and all these lenses and mirrors. Also I was always amused how with the help of microscope or good objective you could see objects at submicron scale.

AN: Do you think that this is an area that will have a big impact on society? If so, in what way?

IK: Yes, I think so. Look how optical fibres have changed the world already in last 20 years, and I am sure that's not the end.

AN: What kind of a career to do you want to have and why?

IK: I do not make long term plans, but I consider research as the main activity for the next few years. I like research since it is very creative and flexible activity, and of course very exciting for those who like science, like to ask questions and are patient enough.

AN: What prompted you to study in Australia?

IK: The ARC Centre of Excellence CUDOS is based within the University of Sydney and it is a group that has a high ranking as research centre in photonics around the world. So my motivation was mainly to work in one of the best research groups and get as much experience as I can.

AN: Is studying at the University of Sydney very different to studying in your country? In what way?

IK: All studying are similar and lots of work if you are studying hard.



Regarding your question, the program here is much more compact and therefore more intense. I like labs here, they are well set up and good fun (I am laboratory demonstrator in presence). I also like how the uni awards initiative and talented students and allows lots of possibilities to do individual small research projects even for undergraduate.

AN: Finally, any advice for potential postgraduate students wanting to study physics?

IK: Go for it and don't expect it to be easy. Physics is worthwhile studying as it gives you perfect skills and understanding about the world. Also you will not get bored with Physics!



The Apollo Moon Landing: Did they or didn't they?

The Sleek Geeks debate!



Dr Karl Kruszelnicki and
Adam Spencer Monday 20
July 2009 Footbridge
Theatre 6:00pm – 7:00pm

To mark the 40th anniversary of the Apollo 11 lunar landing, Sleek Geeks Dr Karl and Adam Spencer (*pictured above right*) will deliver a special presentation to tackle the myths surrounding man's first voyage to the moon. In 2001, the American Fox TV Network broadcast a program called "Conspiracy Theory: Did We Land on the Moon?" X-Files star Mitch Pileggi hosted this hour-long show, which claimed that NASA had faked the entire Apollo Moon project by filming it in a movie studio. This myth has a small but dedicated

following – according to both a 1995 Time Poll and a 1999 Gallup Poll, about 6% of Americans do not believe that twelve astronauts walked on the Moon. The hoax believers or conspiracy theorists cite all kinds of evidence. Did they or didn't they? Come along and hear the debate (For & Against) presented by Dr Karl Kruszelnicki and Adam Spencer.

While the lecture is free, seat bookings are essential as places are limited. To make a booking, fill out the online booking form or email ssf@science.usyd.edu.au with your name, the names of the lectures you wish to attend, and number of seats required (limited to 5 per booking except for School groups). Bookings can also be made by calling (02) 9351 3021 between 10.00am and 3.00pm.

Above: The former Australian Prime Minister, the late William (Billy) McMahon and fellow Science Foundation for Physics guests holding models of Apollo at a past ISS