The University of Sydney School of Physics

Alumni News

June 2006

Major "Intergalactic Archaeology" findings for Sydney astronomer team

Geraint Lewis feels like an intergalactic Indiana Jones, searching through the fossil remains of ancient stars for clues about their history. Unlike Indiana Jones, though, Associate Professor Lewis, from the Institute of Astronomy at the School of Physics, can't get very close to the fossils: they're 2 million light years away.

Intergalactic archaeologist Assoc. Prof. Geraint Lewis

Associate Professor Lewis is part of an international team of astronomers that has announced their findings about our galaxy's closest cousin – the Andromeda Galaxy (M31). With members from UK, US, France and Australia, the team used the Keck telescope in Hawaii – at 10 metres in diameter the largest optical telescope in the world – to take very careful measurements of over 10,000 stars.

What they have found has overturned traditional beliefs about the Andromeda Galaxy. "It turns out that earlier measurements were contaminated, which fooled us into believing Andromeda was quite different to the Milky Way" (our own galaxy) says Associate Professor Lewis. "But we have been able to see past the contaminants to realise that stars in Andromeda are in fact very similar, making it more of a twin galaxy than a cousin."

Amongst the 10,000 stars measured the team found about 1000 "fossil" stars - stars dating from Andromeda galaxy's primeval years. Just like our own galaxy at the same age, Andromeda was a huge spheroidal gas cloud, that would later collapse into the flattened disc we see today. But as the gas cloud collapsed, the early stars remained in their original orbits creating a remnant spheroidal "halo" of stars around the new flat disc.

continued page 3

OFTC prize for the Future of Fibre

With great lengths of the stuff being laid all around the world to carry our data, from phone calls to internet searches to music downloads, there's no doubt that the future of communication technology is in optical fibres.

But as conventional fibres, made from glass or silica, are expensive, fragile and inflexible, new methods are required to produce cheaper, easier to manufacture fibres for the telecommunication revolution.

As it happens, a trio of researchers from the University's Optical Fibre Technology Centre have developed such a method to produce inexpensive polymer fibres every bit as effective as the glass types. In November last year, the researchers – Alexander Argyros, Dr Martijn van Eikelenborg and Dr Maryanne Large – were awarded the Australasian Science Prize for 2005 for their ingenious technology.

Australasian Science, Australia's only monthly science magazine, created the Prize in 2000 to recognise and reward outstanding science by the country's most inspiring minds. Criteria used for selection include originality, depth of impact and evidence of effective communication.

Optical fibres need to carry light signals as efficiently as possible, and polymer fibres are

continued page 3

In this Issue

Headline

Assoc Prof Brian James

A significant event in the life of the School and a sign of the times: the Physics library has moved from the Physics Annexe to be combined with the Chemistry and geosciences libraries in the Madsen Building. The Physics library has been in the Physics Annexe since 1965; in fact the second floor of the annexe was designed explicitly for operation as a library. A review of the Physics collection resulted in retention of many fewer monographs (rarely borrowed books will be placed in storage) and most journals are available electronically now, eliminating the need to maintain a hard copy collection locally.

The relocation of the remaining collection with the Chemistry and Geosciences collection is the first step in the creation of a new Science and Technology library next to the Wentworth Building. When this 'SciTech' library is ready in 2008 it will house the physical sciences, mathematics, information technology, engineering and architecture collections in a state-of-art library, providing modern information services and extended hours of operations. It's not that we no longer need a library, but the way we use libraries has changed. The space vacated by the Physics library will now be converted to office space to relieve crowding due to our increasing numbers of research-only staff and postgraduate students. In the case of the latter, the number has reached 100 for the first time.

In November last year we held a half-day review of the relationship between the School and the Foundation, with the aim of deciding priorities for Foundation support over the next few years. The focus was on providing funds to help initiate new activities, rather than supplementing existing ones; for example, helping to establish facilities for studio teaching, which combines aspects of lectures, tutorials, laboratory classes and computer labs, was considered to be a worthwhile longer term goal.

This year the School was again successful in obtaining new research grants from the Australian Research Council, the main source of external funds for the School. The annual external research income to the School is around $10M, more than twice the funding it receives internally from the University for teaching and research. This a stark indicator of how the School has changed over the last few years: while the number of students we teach has changed little over two decades, and has recently increased slightly, the number of staff involved in teaching and research has halved, and research-only staff have increased dramatically.

During 2005, Ian Cooper retired after 13 years in the School. Ian came to the School after a short sojourn in the Faculty of Education following incorporation of the Sydney Teachers College into the University, and played a major role in our teaching programs, particularly in the operation of the Junior Physics laboratory.

Looking ahead, this year marks the 50th anniversary of the first operation of SILLIAC, one of the first computers in Australia, and one which played a significant role in introducing universities, government and business to automatic computation. Plans are well underway to mark the occasion with a celebratory dinner, surrounded by a two-day event to both honour the pioneers of the past and showcase the IT leaders of the future. We hope to see you at the ICT Pioneers and Leaders event in September.

Head, School of Physics
The University of Sydney

ICT Pioneers and Leaders

SILLIAC, the first computer in the University of Sydney and a pivotal machine in Australia's IT history, began its life 50 years ago right here in the University of Sydney's School of Physics. This year we celebrate its creation in a two-day gala event. We look back to see how far we have come since that momentous day, and look forward to see what the next 50 years will bring.

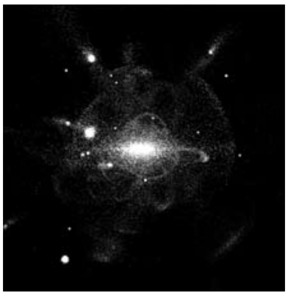
Come and join the celebrations at ICT Pioneers and Leaders

• Conference with international speakers • SILLIAC Celebration Dinner • Opening of new IT building
• SILLIAC Book Launch and DVD • Industry leader panel discussion • NSW Pearcey Awards

University of Sydney, **12–13 September 2006**
For more info, visit **www.silliac.org**
Contact Dr Michael Charleston, **silliac@usyd.edu.au**, **+61 (2) 9351 4459**

Major "Intergalactic Archaeology" findings for Sydney astronomer team

continued from page 1



Numerical simulation of the troublesome galactic halo, courtesy Dr James Bullock

The Andromeda Galaxy

These old stars are made primarily from the simple elements of the early gas cloud: Hydrogen and Helium. The heavier elements, including metals, are formed by stars that live fast, die young and explode in a supernova, showering their neighbours with metal-rich dust. Being away from the (comparatively) densely populated disk, the far-flung fossil stars have remained uncontaminated by heavy elements.

"It started off as a big kid in the playground and it's been fattening itself up by eating smaller galaxies ever since. Some of the metal rich stars from those galaxies have ended up in the halo, masquerading as stars from Andromeda's primeval past."

So why the confusion?

"Andromeda's a bully," says Assoc Prof Lewis. "It started off as a big kid in the playground and it's been fattening itself up by eating smaller galaxies ever since. Some of the metal rich stars from those galaxies have ended up in the halo, masquerading as stars from Andromeda's primeval past."

It is only now, after sifting through thousands of measurements of the stars in Andromeda that the evidence for the galaxy's metal-poor beginnings has been found.

The fossil stars not only tell us about Andromeda's unseen past, they tell us about its unseen components, dark matter. Being the survivors from a past era, their orbits still hark back to the primeval spheroidal shape of the early galaxy, travelling at quite different angles and speeds to the well-ordered disc of younger stars.

Although dark matter can't be observed directly, its gravitational effects can be seen in the motion of the stars. With such a large survey of stars and their motion, a picture of the distribution of the dark matter can be built up.

While a survey of 10,000 stars sounds like hard work, it's only the tip of the iceberg. "This is going to be a long term project" says Assoc Prof Lewis. "There are 400 billion stars in M31."

OFTC prize for the Future of Fibre

continued from page 1

typically not as transparent as glass. The three researchers have used the superior workability of plastics to create fibres with minute systems of channels that guide the light along. Known as Microstructured Polymer Optical Fibre (MPOF), this new design is just as effective as glass fibre, but more robust, flexible and cheaper to make.

That's not to say that producing MPOFs is easy. "The fabrication of glass fibres is much more developed", says Argyros. "Glass melts and can be drawn out, while polymers soften and stretch. It was a matter of getting the right parameters, the right pressures."

What makes their success even more remarkable is that just one year ago, the researchers' lab was quite primitive. Using their limited equipment and a lot of ingenuity, they were able to demonstrate the practicality of their ideas and justify funding for much better equipment to manufacture the fibres.

Dr Maryanne Large, Dr Martijn van Eikelenborg and Alexander Argyros showing off their holey fibre. Photo by Justin Digweed courtesy OFTC

For more information about the OFTC and fibre research, go to **www.oftc.usyd.edu.au**

Profile: Imants Tillers

Imants Tillers is one of Australia's leading post-modernist artists, whose forthcoming exhibition, IMANTS TILLERS: ONE WORLD/MANY VISIONS, (curated by Deborah Hart) runs from 14 July to 16 October 2006 at the National Gallery of Australia, Canberra. Imants is also a graduate of Architecture from University of Sydney, and, probably least known of all, an alumnus (1967) of the Professor Harry Messel International Science School. The ISS seeks to encourage high school students to pursue a career in science – Alumni News spoke with Imants to find out where we went wrong…

Photo courtesy Sophie Payes

Imants Tillers

Alumni News: Considering the ISS aims to encourage students to pursue careers in science and technology, perhaps in your case we weren't very successful! You were only 16 when you attended, did the ISS have much of an impact on you?

Imants Tillers: I attended the Summer Science School (as the ISS was then known) in January 1967 and found it very exciting but also very challenging. I was the only participant from Sydney Technical High School in Bexley and therefore must have been one of the top students in science and maths in my year at this selective high school. I remember that Professors Gold, Harry Messel and Julius Sumner Miller were among the lecturers and that we looked at the complex nuclear reactions that fuel stars and other cosmological issues in this course. While very stimulated by these dynamic lecturers, the course perhaps made me realise that I did not want to pursue a career in science. Nor did I want to follow in the footsteps of my father who was a talented mechanical engineer.

Nevertheless even at the age of sixteen, despite an aptitude for science and maths, I had been touched by the power of art, and also felt the stirrings of an inner necessity to expressing myself through my art. Consequently I dropped Science and took on Art for the Higher School Certificate, even though the school did not offer such a course and did not have any other students doing it at the time.

AN: Would you say science has played a role in influencing your art?

IT: Most definitely. The experience with the ISS left me with a deep respect for science, for rational thought, for scientific method, but also a great admiration for the creative leaps of the imagination required to produce new hypotheses, new models, new theories – in fact I continue to keep abreast of some of the fascinating ongoing developments in scientific thought through the books of Paul Davies, Fritjof Capra, Mickio Kaku and others.

AN: Which do you think has the greater impact on society – science or art?

IT: I think art and science have an equally profound impact on society. Art can reach people directly as a form of expressions but for the artist, art is also about discovering new information, new knowledge. Art can, like science, be a way of knowing.

AN: Do you think science and art have a connection?

IT: Art and science have always had a connection. For example Leonardo da Vinci was a brilliant artist but also a visionary scientist as is revealed in his notebooks. He explored in these the possibility of flight and other technical inventions and his anatomical and physiological studies gave the means to depict human beings in a revolutionary naturalistic way. Then there is also the case of Marcel Duchamp, one of the great and influential artists of the 20th Century whose masterpiece The Large Glass is now seen as a kind of playful responses to certain scientific discoveries at the beginning of the 20th Century – X-rays, electrons, radioactivity and electromagnetism.

AN: How do you think technological change effects art, now or in the future?

IT: Technological change can always influence the course of art but new technology is not enough on its own to make interesting art – the art itself has to transcend its technological means. Just as video art took some time to produce an artist of great vision and quality like Bill Viola to rise above a level of mediocrity, today's information and communications revolution will eventually undoubtedly produce artists working with PCs and the Internet who rise above the banal and superficial. On the other hand, there will be always others like myself who prefer to work in more traditional and low-tech ways. I like to control all aspects of my production, I like labourious manual tasks, I like the attitude of the amateur and I eschew most technological aids except perhaps for the photocopier!

AN: Finally, any advice for future International Science School students?

IT: Savour the moment and embrace the opportunity – you never know how you may put your experience to some good use later on!

Blueberry Power!

Inspired by Nature, TSP student's solar-cell research bears fruit

Greenhouse gases from burning fossil fuels are pushing the globe to the brink of catastrophic climate change. What we desperately need are new energy sources; one first-year physics student looked to Nature for inspiration, and created electricity from sunlight and blueberry juice.

TSP student Helen Smith and her blueberry-flavoured solar cell

One of the most obvious alternative sources of energy is sunlight; vast quantities of energy shine down on our upturned faces every day. Whether it's solar hot water for our bathtubs or electricity produced by photovoltaic cells, pollution-free solar energy seems an easy choice in our sun-drenched country.

"Helen is not your typical solar energy researcher — she has only just started her undergrad degree."

Life is rarely that simple. Conventional solid-state photovoltaics are expensive – to convert as much solar energy to electricity as possible, the semiconductors must be very pure, and the manufacturing processes are costly and polluting. While solar panels are becoming more common for household use, photovoltaics are not yet a viable alternative for widespread, large-scale energy generation. Researchers are working on ways to produce cheaper, cleaner solar cells that don't depend on such high purity materials.

Helen Smith is not your typical solar energy researcher. While most of her colleagues are academic and industry scientists with postgraduate degrees and years of experience, Helen has only just started her undergraduate degree at the University of Sydney. She is, however, a member of the Faculty of Science Talented Students Program (TSP), which allows the very best students to tailor their degree by choosing subjects or combinations of subjects not normally available. TSP students can also gain credit for independent research projects from the very beginning of their university career.

Helen chose a project with Dr Nicholas Ekins-Daukes – 'Ned' – in the School's Applied Physics group. Ned introduced Helen to a very different kind of solar cell, one that mimics Nature's own preferred system of solar power conversion: photosynthesis.

In plants, a chemical dye called chlorophyll absorbs sunlight and, through a cycle of losing and gaining electrons, the energy is converted to more useful forms. In the process, the chlorophyll is regenerated, ready for another cycle. Helen and Ned took inspiration from this chemical cycle in creating a DYSC – Dye Sensitised Solar Cell – in which the role of the chlorophyll is played by an organic dye coating on a layer of titanium dioxide. While plants store the sun's energy as chemical energy in starch, DYSCs convert it directly to electrical current. During her project, Helen tried out several kinds of dye before settling on a tasty and colourful choice: blueberry juice!

DYSCs have been around for a few years now, says Helen, "and are becoming a serious competitor to solid-state devices" such as traditional solar cells. "They're a commercially realistic option for using solar energy." The dyes are cheap to produce and can be chosen for specific applications, and there is less need for high-purity semiconductors, which depend on expensive, environmentally-damaging manufacturing processes.

There is much work to be done, however. State-of-the-art DYSCs can reach efficiencies of around 10%. That's not far from the theoretical limit for natural photosynthesis of about 13% (while rainforest plants capture only about 1% of the sun's rays). By comparison, conventional solar cell efficiencies are typically 15-20%, and have reached as high as 30% in the lab.

Ned and Helen's blueberry DYSCs can transform about 2% of solar energy to electricity, putting them at the lower end of the efficiency spectrum. "They will become more competitive with a bit more research,"concludes Helen. That's perhaps a little modest, though – if this is what a TSP student can achieve in her first year of university physics, you have to be optimistic about the future of alternative energy research.

The Physics Dinner 2006

Fine Dining, Physics Style

Each year, the School of Physics and the Science Foundation for Physics host a dinner for staff, students, alumni and friends. It's a tradition that goes back fifty years, when the then Nuclear Physics Foundation hosted gala dinners in the University's Great Hall. In recent times, the event has evolved into a cosier affair, a chance for the School and Foundation community to enjoy good food, share a drink and mingle.

Emeritus Professor Harry Messel makes his point

Guest speaker Henri Szeps in full flight

ISS2005 alumnus Mr Tony Nguyen with Foundation governors Dr Peter Jones and Mr Jim O'Connor

This year, 130 guests packed the Main Common Room of the University's Women's College for pre-dinner drinks and words of welcome from Head of School Associate Professor Brian James and Foundation President Mrs Louise Davis. The evening's MC, Dr Chris Stewart, then took the crowd back in time with a 1977 promotional video on physics research, unearthed from the Foundation archives. Careful viewers spotted a very youthful Professor David McKenzie and a dashing Associate Professor Bob Hewitt amongst the cast.

As the dinner progressed in the College's Dining Hall, Mr John Hooke CBE, Deputy President of the Foundation, gave an update on the Messel Endowment, which aims to raise sufficient capital to fund the Professor Harry Messel International Science School in perpetuity. He remarked on the success of the Endowment campaign, which has raised over $2.8 million to date, and then called upon the assembled guests to join with the Foundation in vigorously pursuing the remaining $1.7 million needed to reach the Endowment's goal.

Mr Hooke then invited Professor Harry Messel to the stage, and congratulated him on his recent award of Companion of the Order of Australia. Never reticent to share his thoughts, Professor Messel spoke about his experiences raising funds for research and education over a long career, before exhorting his audience to help keep the International Science School alive long into the future.

After the main course, the evening's final guest speaker was no stranger to taking the stage. Mr Henri Szeps, one of Australia's best-known actors of stage and television, revealed himself as a graduate of physics and engineering from the University of Sydney – Henri and Associate Professor Bob Hewitt were classmates in 1963. Henri spoke about the utility of a scientific background to an actor, informing the audience that acting requires keen observation skills, the ability to analyse one's performance, to theorise about a characters motives or reactions to a situation. "I really do believe that just as you can't be a good scientist without intuition", he explained, "I don't think you can be a good artist without logic."

As the College staff cleared the last of the dishes and guests made their way out into the cool autumn air, old classmates Bob Hewitt and Henri Szeps were still huddled together in animated conversation, sharing thoughts on physics, theatre and life – a suitable close to another fine Physics Dinner.

An Excellent Award

Dr John O'Byrne receives the Messel Award for Excellence from Head of School Assoc. Prof. Brian James

Professor Harry Messel's motto, adopted by the Foundation, is "the pursuit of excellence". When he retired in December 1987, the Science Foundation inaugurated the Harry Messel Award for Excellence to reward excellence in contributions by staff or research students to the School, whether through research, teaching or administration. Often the award is given to recognise effort that goes unacknowledged through the usual channels, such as research grants. The Award is made every two or three years and the winner is presented with a medal and a cheque for $2,500.

During his welcoming address at the 2006 Physics Dinner, Associate Professor Brian James took the opportunity to announce the winner of the 2006 Harry Messel Award for Excellence: Dr John O'Byrne.

"In keeping with previous awards the decision has taken into account contributions to the School's activities which are above and beyond expectations," explained Assoc. Prof. James. "While John is an astronomer, in recent years his research activities have been hindered by the responsibilities he has taken on as head of Junior Physics – we have around 1,000 students studying Physics at the Junior level. Without John's efforts, we would not have one of the best alumni programs in the University.

"John keeps our website in order; he has championed the introduction of IT to teaching via an on-line assignments system; and for years he has enhanced public perception of the School via his Continuing Education courses, public lectures and books on astronomy.

"John's contributions to School and Faculty outreach activities is outstanding. To list a few: the Faculty's Science Alliance School's Outreach program, Physics Olympiad training, Siemens Science Experience, National Youth Science Forum, Science in the City, and the Sydney Science Forum. And John is always a willing volunteer for representing the School on information days for high school students.

"It is a great pleasure to give the 2006 Harry Messel Award for Excellence to John O'Byrne."

Dr Karl at large

Gun Recoil

Movies are all about images. One indelible Hollywood action image is the Thrown-Back-By-A-Bullet one. In this sequence, you see the victim being hit by a bullet, and then lifted off their feet and thrown backwards. They usually land on a conveniently-located large shopfront window which then smashes into a million pieces, in lovely slow-motion. This special effect is spectacular, but it completely disregards the Laws of Physics.

Photo courtesy Gerald Diel

To explain what should happen, you need a simple update on "Conservation of Momentum". To make it easy, let's assume that the victim and shooter weigh roughly the same. The bullet travels between them, carrying a certain amount of momentum. According to the Laws of Physics, if the victim is going to be thrown backwards a certain amount, then the shooter had to be thrown back the same amount.

The bullet starts off in the barrel of the gun with zero velocity and zero momentum. The powder in the cartridge explodes, and turns into gas. The gas expands and pushes the bullet ahead of it. Newton's Third Law tells us that "For every action, there is an equal and opposite reaction". The bullet zips away from the shooter, and applies an equal force back on the shooter – the "recoil".

To keep things simple, let's assume that the bullet doesn't lose any speed in its flight, because it's all happening at such close range. It then hits the victim, and comes to a complete halt inside their body - which means that all the momentum of the bullet is now transferred to the victim.

Now let's assume that the victim weighs 80 kilograms. He's been hit with a bullet weighing around 30 grams, travelling at around 1,700 kilometres per hour. This combination of mass and speed gives the bullet a certain amount of momentum.

If we ignore the losses due to air friction, and assume that all the bullet's momentum gets transferred to the 80 kilogram man, it turns out that the bullet gives the victim a velocity of around 0.7 kilometres per hour! Now bear in mind that people can walk at about 6 kilometres per hour, so 0.7 of a kilometre per hour is just a mere nudge. There's no way that a shooting victim is going to be flung off his feet and thrown into the plate glass window behind him with such a small force.

Going back to our speeding bullet, in reality it turns out that the victim gets less of a push than the shooter. First, the bullet does slow down in the air. Second, when the bullet hits the victim, not all the bullet's energy appears as a "push" on the victim - some of it appears as a shockwave inside their body, and some appears in the deformation or damage of the bullet as well as the victim's body parts. So the bullet gives a smaller push to the victim, than to the shooter - which is yet another reason why they would not get violently hurled into the nearest window.

One movie that did show this action-and-reaction accurately was Men In Black, made back in 1997. Agent J (Will Smith) has been assigned as an apprentice to the older and more experienced Agent K (Tommy Lee Jones). On his second day on the job, Agent J has to stop our planet from being destroyed. The agents go to an armoury, and the more experienced Agent K picks out a huge firearm, roughly half his body length, weighing half his body mass. He gives his protégé Agent J a tiny firearm not much bigger than a small butterfly, called the "Noisy Cricket". When Agent J fires the Noisy Cricket and destroys a garbage truck, he is sent flying backwards into a conveniently located pile of garbage bags.

So why does Hollywood stick with the image of the shooting victim flying backward into the plate glass windows? Could I cynically suggest that when script, plot and continuity are not important to movie makers, how could the Laws of Physics stand a chance?

Where are you now?

Alumni report on themselves

Henri Szeps

B.Sc. (maths and physics) 1964
and B.E. (electrical, Hon. II) 1966

Henri studied acting at Sydney's Ensemble Theatre while gaining degrees in Science and Electrical Engineering at Sydney University. He chose the theatre over science and has become one of Australia's most respected actors. Henri married actress Mary Ann Severne in 1969 and from 1971 to 1975 they worked in England in numerous British television productions and on the London stage. They returned to Australia in the mid-1970's and since then Henri has enjoyed an enviable career on stage, film and television, including the unforgettable Mother and Son. More recently he appeared in the highly acclaimed 12 Angry Men and the musical Cabaret, for which he won a Helpmann Award. His one-man show Why Kids? is about to tour nationally. Henri was honoured with an OAM in 2001 for services to the arts and the community.

Henri was guest speaker at the 2006 Physics Dinner in 30 March – see page 6.

David Payne

ISS 1970

After school, David started a Social Work degree at Sydney Uni, but left after two years and worked in the NSW public service. He has been married 31 years to Fran, and has two adult daughters. A strong desire to escape the rat race of Sydney prompted a move to beautiful Wagga Wagga, where David studied librarianship, and worked for ten years as school librarian at Trinity Senior High School. He and Fran have been partners/managers in Gateway Bookshop, a children's and school specialist shop, since 1987. Recently, David's desire to study science has been rekindled, leading who-knows-where… perhaps a science bookshop on the internet in a few years' time?

David Schodt

ISS 1965

David attended high school in Canberra for 5 years while his father worked for the U.S. Embassy. He received a degree in Science and Electrical Engineering from Cornell University in 1969, before joining the US Peace Corps in Ecuador from '69 to '72. The turmoil of the Vietnam years, and the Ecuadorian experience, moved him off the straight science path and into the social sciences – David finished his PhD in economics in 1980 and has worked as a development economist since. He has been at St Olaf College in Minnesota since 1977, and is now Director of the Center for Innovation in the Liberal Arts and Professor of Economics. In 1987 he published Ecuador: An Andean Enigma (Westview Press).

We welcome contributions to this column

Diary 06: Coming Up

STW06 and KickStart on the Road

The 12th Science Teachers' Workshop for physics teachers come to Sydney on 15-16 June, and combines with KickStart On The Road in Wagga on 20-21 July, and Armidale on 7-8 September.

For more info, see www.physics.usyd.edu.au/foundation

SILLIAC Turns 50!

Celebrate the Golden Anniversary of Computing at the University of Sydney's ICT Pioneers and Leaders event, including a gala dinner to commemorate the anniversary of SILLIAC's official launch in 1956.

See www.silliac.org for more details.

Contact Details

Alumni News Editor Chris Stewart **Contributors** Phil Dooley, Alison Thorn and Chris Stewart.

School of Physics Alumni John O'Byrne Email j.obyrne@physics.usyd.eud.au Phone +61 2 9351 3184, Fax +61 2 9351 7726

International Science School Alumni Ms Alison Thorn, email a.thorn@physics.usyd.edu.au, Phone +61 2 9036 5194, Fax +61 2 9351 7726

Postal Addresss School of Physics A28, The University of Sydney, NSW 2006 Australia

Website http://www.physics.usyd.edu.au

TANDEM 11259 04/06