



THE UNIVERSITY OF  
MELBOURNE

# School of Physics

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## Alumni & Friends Newsletter

### Merry Christmas & Happy New Year 2007

As the holiday season approaches quickly, I would like to wish you all a very Merry Christmas and a safe New Year. After six years as Head as Physics, it is with some sadness that I acknowledge the time has come for me to pass the reigns over to incoming Head, Professor David Jamieson. His enthusiasm and wisdom leave me with no doubt that the School will continue to be vibrant and dynamic in research and teaching under his leadership. I take the opportunity to thank all the staff who have supported the School and myself while carrying out this challenging role. It has been a privilege to serve the School and while I leave with a few more grey hairs than when I first arrived, I have found the experience immensely rewarding. I look forward to focusing my efforts on the Large Hadron Collider which is due to come on line mid 2008. Next year will be a great one for physics!



Prof Geoffrey Taylor celebrates his outgoing headship with a glass of "Taylor's" red wine while incoming Head, Prof David Jamieson, toasts with a glass of "Jamieson's Run"

### Public Lecture - Professor Roy Kerr

The University was privileged to hear a public lecture "Unravelling Einstein's secrets" by Professor Roy Kerr (introduced by Professor Fulvio Melia) on 13 November 2007, to an absolutely packed Murdoch Theatre.

Soon after Einstein developed his general theory of relativity, a physicist called Schwarzschild showed the theory implied the existence of black holes. But black holes had such alarming properties that not all astrophysicists were convinced that they would actually form when real stars neared the end of their lives. Some thought that Schwarzschild's solution was too artificially simple to be a reality, and that the spin of a star would prevent black

holes from forming. Physicists debated the implications of Einstein's theory for over forty years. In 1963 a meeting of over 300 astronomers and their theoretical colleagues, both astrophysicists and general relativists, came together to try to understand the death throes of spinning stars.

New Zealander Professor Roy Kerr became the first physicist to unravel Einstein's theories and presented a paper providing a mathematical solution showing that the spin of the collapsing star would not stop a black hole forming. At that time the astronomers ignored this paper completely, but it is now believed that there is a supermassive black hole at the centres of most if not all galaxies. Kerr retired some time ago, but is now again doing research as modern developments test his solution to Einstein's theory more and more thoroughly.

A final secret that Roy Kerr shared with us over dinner was that, as a very keen bridge player/champion: he had the pleasure of playing with Omar Shariff in 1956!



L-R: Profs Geoffrey Taylor, Roy Kerr, Fulvio Melia (Arizona Uni)

### Woodward Medal Winner: Dr Greentree

Dr Andrew Greentree has received the University's Woodward Medal for 2007 for his contributions to quantum information science, in particular, for his prediction of "Solid-Light": spanning the nexus between quantum optics, quantum electronics and condensed matter physics.

Some highlights include the discovery of a new method for electronic transport, Coherent Tunneling Adiabatic Passage (CTAP). This transport acts like a wire for a quantum computer and the demonstration of this in phosphorus in silicon has become a major goal for the multi-million dollar Australian Research Council Centre of Excellence for Quantum Computer Technology (CQCT).



More recently, Greentree (with collaborators Hollenberg and Cole) has discovered a system where there is a deep connection between quantum optics and condensed matter physics by predicting a quantum phase transition in an optical system, in which light can be seen to behave like a 'solid'. This work builds on his considerable experience in atom-photon interactions, and especially the advancements he has made to the new field of diamond photonics and solid-state quantum optics.

### Finalists in the Eureka Prizes

In related news to that above, CQCT's Professors David Jamieson (University of Melbourne) and Andrew Dzurak (UNSW) were short-listed as finalists in the national Australian Museum Eureka Prize (Scientific Research category), Australia's premier award for outstanding science. They were nominated following their research into developing the 'quantum computing silicon chip', in which their team is internationally recognised for developing both experimental and theoretical models for the chip.

### Portland House Foundation

We thank the Portland House Foundation for their generous support in offering the School a postgraduate PhD stipend valued at \$90,000 over 3 years in the emerging area of econophysics. Econophysics is the cross-disciplinary study and modelling of complex systems in economics and financial markets, employing the tools and methodologies developed in statistical mechanics and theoretical physics.

### November Men of Physics

School of Physics staff and students have raised over \$1000 in support of "Movember", an initiative aimed at raising awareness of men's health issues such as prostate cancer and depression. Dr Andy Martin got involved when a group of friends decided to "grow forth", much to the chagrin of his partner who, while only half-way through Movember, offered to immediately double the pledges if he would consider shaving all whiskers **off**.

On the other hand, it was Dr Brant Gibson's wife who urged him to "grow the mo". Brant did not need convincing given the worthwhile purpose of the fund-raising. PhD student Robin Wedd thought he would give "the mo a go" and likes it so much he thinks it will stay a little longer into "Mocember", as does Brant. PhD student, Sebastian Saliba, did not need an excuse either, noting that "...as the product of eastern and continental Europeans, my ability to grow an excellent moustache is not only genetic certainty but a birth-right. Next year

we should put in a 'School of Physics' team". Sensational facial growth efforts all!



L - R: Dr Brant Gibson, Dr Andy Martin and PhD Sebastian Saliba

### School of Physics helps play detective

Many of you may have been reading in the news about University of Melbourne's art conservation expert, Robyn Sloggett, whose investigative work of forged paintings by aboriginal artist Rover Thomas has been featured recently ("Art Imitating Art", **The Age**, 2 December 2007). Behind the scenes, the School's PIXE (proton induced X-ray emission) analysis and nuclear microprobe technologies have been used in this case (and other art authentication cases) to determine trace elements that give insight into types of pigments used by artists.



Prof Ray Volkas and Rhys Davies, co-winner of the Laby Medal for best Honours thesis in 2006, as reviewed by the Australian Institute of Physics. Rhys is currently studying his DPhil at Oxford on brane worlds.