



## Secondary School Newsletter - Volume 2 April 2007

Welcome to the 2nd edition of the QCV Newsletter!

In this edition we will be profiling the students that worked with QCV between December 2006 & February 2007 on various projects, as part of our Summer Internship.

In this edition, the staff profile spotlight will fall on David Simpson. David is QCV's Materials Engineer. David spends his time engineering diamonds to suit our specific research requirements.

We will also take a look at another Physics Fundamental - Schroedinger's Cat.

### QCV Students:

#### Mr Daniel Drumm:

Daniel has always been interested in how things work and why they do what they do. This led him to pursue a double degree of a Bachelor of Arts and Science with majors in Psychology, Philosophy, Chemistry and Physics. These four areas of study make enquiries into different scientific areas. Daniel's favourite subjects involved practical experiments and Quantum Mechanics, because he loves seeing physics in action in the laboratory, and thinking about the weird implications of Quantum Mechanics.



Over the summer, Daniel was employed by the CSIRO on a joint project with The University of Melbourne, developing a technique for

making waveguides on a microscope slide surface. Waveguides are used for guiding light.

Currently, Daniel is studying towards a Bachelor of Science with Honours in Physics. His research towards this degree involves theoretical computations (done by a supercomputer) to evaluate the ability of different types of synthetic diamond to provide single packets of light (photons) of a particular wavelength, on demand. These synthetic diamonds will then be used in quantum encryption systems to produce single photons.

For Daniel, physics offers the best opportunity to understand the world around us, due to both its diversity as a field and its intricate use of mathematics to describe what is being studied. The analytical techniques Daniel is developing will allow him to solve many problems, and his skills will be highly valued in the wider workforce, not just in research. Daniel's analytical skills may find him work in fields such as investment banking, management consulting and the civil service. As well as his research interests Daniel also enjoys using his analytical skills while participating in many outdoor activities such as sailing, Surf Life Saving and constructing towers with the Boy Scouts.

#### .Ms Sophie Dawson:



Sophie has always enjoyed studying Physics and Maths, programming her computer, and doing all things computer related.

These interests motivated Sophie to apply for a double Bachelors degree in Engineering and Science at The University of Melbourne, where she is now in her second year of studying software engineering and physics.

Towards the end of the first year of her degree Sophie joined the QCV for a summer studentship over the university summer break. Sophie's project involved writing programs to control the moving stage of a confocal microscope (a type of high powered microscope which detects fluorescence), and building a particle analysis program for interpreting the results of scans obtained from the confocal microscope.

Sophie enjoyed working at the QCV and interacting with members of the group and is keen to apply for further studentships, having found the experience very rewarding. Eventually, Sophie hopes to complete an honours year in the School of Physics.

Outside of her studies Sophie enjoys archery, tennis and programming on her home computer.

### Mr Marcus Doherty:



Marcus has always been interested in problem solving and understanding how the physical world, machines and devices worked. These interests lead Marcus to study mathematics

and science subjects in secondary school. This has led him to complete a combined degree of Bachelor of Mechanical Engineering and Science at The University of Melbourne. Marcus's favourite undergraduate subjects were those related to quantum mechanics, as these subjects introduced Marcus to the powerful application based concepts of quantum computing and communications. Marcus is now completing his honours

Marcus is looking forward to an exciting year as part of QCV and aims to continue further research beyond his honours year in the areas of quantum communications and computing.

In his spare time away from a busy honours schedule, Marcus serves as an Army Reserve Officer and trains in martial arts. Marcus has enjoyed many opportunities in his Army Reserve service, including two deployments overseas in the past four years.

### QCV Staff in the Spotlight:

#### Mr David Simpson:



David graduated from Victoria University in 2001 with a Bachelor degree in Optoelectronics and an honours degree in Physics. He is currently nearing the completion of his PhD in Physics, during which time he has gained significant experience in the fabrication of optical fibres. During his PhD David spent his time characterising the light transmission properties of particular elements embedded in optical fibre, with a particular interest in the amplification of light.

David also has industry based experience as an optoelectronic engineer, where he focused on the design and development of solid state lasers for medical applications.

David has been working at the QCV for over a year now in the role of materials engineer. His expertise is invaluable to the QCV program where his knowledge is used to engineer the development of the single photon source module by integrating synthetic diamond with optical fibres.

In his spare time David enjoys taking his dog Muzza (aka Murray) for long walks in the park and on the beach and hanging with his girlfriend. David also enjoys listening to hard core French house as a way to relax after a long day in the lab.

## Physics History: Schroedinger's Cat:

Erwin Rudolf Josef Alexander Schrödinger (August 12, 1887 – January 4, 1961) was an Austrian physicist who achieved fame for his contributions to quantum mechanics, especially the Schrödinger wave equation, for which he received the Nobel Prize in 1933. One of Schrödinger's more infamous proposals was the thought experiment termed Schrödinger's cat. This experiment illustrates the strangeness of quantum mechanics and serves to explain one of the most important principles of quantum mechanics known as superposition. The thought experiment involves taking a cat and placing it in an enclosed room which has no windows and a single door. In this room, there is a piece of radioactive material and a Geiger counter attached to it. A bottle of poison is then connected to the Geiger counter. When the Geiger counter records an increase in radiation due to the emissions from the radioactive material, the bottle of poison would release, killing the cat. After the door has been closed, there is no indication as to the status of the cat. Since the emissions from the radioactive material are completely random, you therefore cannot know with any certainty the fate of the cat. The uncertainty of the status of the cat leads to it being both dead and alive at the same time, hence in a state of superposition, as depicted in the figure below.



However, if we are now to open the door, to determine the actual status of the cat, we have changed the conditions of the experiment and the superposition ceases, leaving the cat in one of either two states, dead or alive.

These types of thought experiments have since been used with great success to explain other seemingly abstract ideas of quantum mechanics.

## Want to know More?

Check out the QCV web site

[www.qcvictoria.com](http://www.qcvictoria.com)

If your school would like a visit from QCV for a practical demonstration of quantum physics, call our Operations Centre on (03) 8344-8744 or send us an email at [wattss@unimelb.edu.au](mailto:wattss@unimelb.edu.au)

If you would like to arrange a visit to the School of Physics for a tour or to arrange a MUPPET (Melbourne University Physics Promotion, Education and Teaching Services show), please contact the School Office on (03) 8344-7670.

[www.ph.unimelb.edu.au](http://www.ph.unimelb.edu.au)

