The Royal Society of New South Wales

Bulletin and Proceedings 307

ABN 76 470 896 41 ISSN 1039-1843 August 2007

Future Events 2007

Lectures are held in Lecture Room 1, Darlington Centre, University of Sydney at 7 pm on the first Wednesday of the month with drinks available from 6 pm

Wednesday 5th September

Recent progress in quantum electronics
Control of small electronic circuits by quantum rather than classical physics.
Professor Alex Hamilton
School of Physics, University of New South Wales.

Wednesday 3rd October

Revolutions in Life Science
How engineering, cell biology and IT intersect.
Professor Keith Williams

Co-founder of Proteome Systems, former Professor of Biology, Macquarie University.

Wednesday 7th November

The future of Australian astronomy
New earths, dark energy and giant telescopes
Professor Matthew Colless
Director, Anglo-Australian Observatory

Wednesday 5th December

The Clarke Memorial Lecture
Dr David Branagan and Professor Roy MacLeod

The Society's Christmas celebrations will follow the lecture.

Details in the next Bulletin

Tuesday 25 September

Edgeworth David Symposium
Clean Coal Technology
Earth Resources Foundation
University of Sydney

August 18 – 26

National Science Week

Don't miss out – see information on this page.

Professor Alex Hamilton Lecture 5th September 2007

Recent Progress in Quantum Electronics: What happens when electronic circuits are small enough that the laws governing their behaviour change from classical to quantum physics?

The transistor, a product of fundamental research, is now an integral part of modern life, and has created the "information age". A transistor is simply a 'tap for electrons', where current flow through the device's 'channel' is switched on or off by applying a voltage to a 'gate'. In a computer, bits of information are represented by the transistor's on/off state. In order to make ever faster and more powerful computers, more and more transistors have to be packed onto each silicon chip, which has been achieved by continued advances in miniaturization. However the electrons that move inside these transistors are quantum objects, and as we shrink these transistors, eventually the laws that describe their operation will change from the familiar classical physics to the counter-intuitive, and just plain strange, quantum physics. There is thus great interest in understanding the properties of quantum electronic devices, both to predict how current devices will work, and to exploit the power of quantum mechanics to create new types of devices.

Quantum semiconductor devices already form the basis of important devices such as lasers and high frequency transistors (subjects of the 2000 Nobel Prize for Physics), and underpin much fundamental physics research. Quantum effects become particularly apparent when one or more of the device's physical dimensions is comparable to the electron's wavelength. Using a combination of modern crystal growth and lithography techniques it is possible to define the physical size of quantum devices in all three dimensions. This exquisite control allows a range of new quantum phenomena to be examined. *Continued page 2*

A new look for the Bulletin

We have decided to take the plunge into colour for those who have access to the Internet. Unfortunately it is beyond our budget to print off in colour, so it will remain in black and white for those receiving the Bulletin by post. Please use the return slip on p4 to indicate how you would like to receive future copies of the Bulletin

AIP Bulletin

Cathy Foley, President of the Australian Institute of Physics distributes a monthly bulletin that covers physics-related events and articles. If you wish to subscribe, visit http://www.aip.org.au and check the pages for your state. Cathy is working on a special issue to cover physics events for National Science Week. For more information, please contact Brian James, (02) 9351 2471, B.James@physics.usyd.edu.au

National Science Week

August 18 – 26

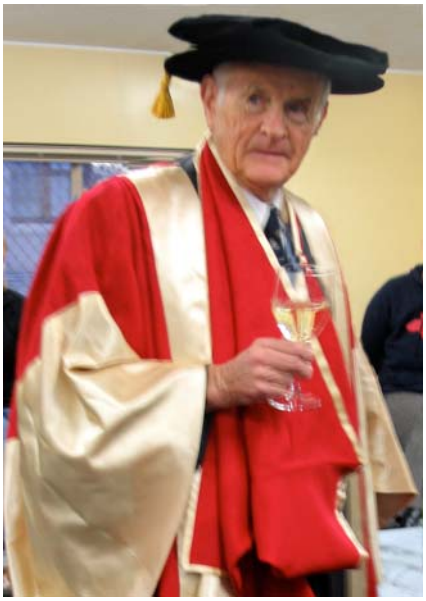
The following websites list Science Week events that might be of interest to you. For all National Science Week information:www.scienceweek.info.au and for the Ultimo Science Festival, which runs from Wednesday 22 August until Sunday 26, visit www.ultimosciencefestival.com

Yet another honour for David Branagan

The year 2007 is one that Royal Society member David Branagan will not forget easily. Our former President and Councillor was recently one of four short-listed for the Inaugural Prime Minister's Prize for Australian History and this came straight on top of his award of honorary degree of Doctor of Science on 8 June 2007.

David's contribution to Australian geology over the past 50 years is acclaimed by all but not everyone is aware of his international reputation in the history of geology. He has published a number of books, but it was 'TW Edgeworth David: A Life' that attracted the attention of the judges. The book is considered to be the definitive biography of Professor Edgeworth David, the world famous professor of geology at Sydney University in the early decades of the 20th century, a legendary figure in Australian scientific development and one of the greatest personalities ever associated with the University of Sydney. Perhaps David Branagan might be another.

By the way, if you have missed out on your copy of David's book, please contact either the Royal Society Office (Phone: 61 2 9036 5282; email: royalsoc@usyd.edu.au) or David himself (Phone: 61 2 9958 7127; email: dbranaga@mail.usyd.edu.au).



David Branagan celebrates his honorary degree of Doctor of Science

Professor Alex Hamilton

continued from page 1

In this talk I will give a gentle introduction to quantum semiconductors and transistors, and illustrate the strange role of quantum mechanics by focussing on a few specific devices from leading research groups worldwide, including a 'which-path' detector that can be used to directly test the wave-particle duality of nature, and new 'spin-electronics' devices.

Professor Alex Hamilton's research interests are in the design and fabrication of nanoscale semiconductor devices to study their quantum electronic properties. He has published over 100 research papers, as well as jointly establishing UNSW's degree program in Nanotechnology.

Hamilton obtained his degree in Physics from Imperial College, London in 1988, and his PhD in 1993 from the University of Cambridge. His PhD studies were performed at the Cavendish Laboratory, under the supervision of Professor Sir Michael Pepper *FRS* and Professor Mike Kelly *FRS*. He continued his research at Cambridge under the auspices of an EPSRC Fellowship, and moved to the University of New South Wales in 1999. In 2000 he was a founding member of the Centre for Quantum Computer Technology where he established the Quantum Measurement group. He now leads a research group in the School of Physics studying fundamental quantum properties of semiconductor nanostructures.

School of Physics, UNSW
www.phys.unsw.edu.au/QED

Claude Roux's lecture, August 1 2007

From the Crime Scene to the Courtroom: Removing the Hollywood Hype, what is Forensics all about?

Professor Claude Roux spoke on problems of using forensic evidence in criminal investigations and court cases. Both police and juries can suffer from the "CSI Effect" with unrealistic TV driven expectations of how much forensic science can be brought to bear on an average case, how long the testing takes, and the resources required. For operational purposes the police usually need quick, intelligence-grade information. However, current practise is geared towards producing proof beyond reasonable doubt, which may take months. All too often the results of current forensic tests are not available until near the end of the investigation. Claude outlined some new developments in taking the forensic lab to the crime scene to permit rapid, on-the-spot processing of evidence. He also described recent advances in numerous areas including: mulit-spectral imaging (a powerful tool for investigating suspect documents), obtaining fingerprints from difficult surfaces (including polymer bank notes), bruise age analysis (via multi-spectral imaging), explosives testing (hand held lab-on-a-chips are being developed), DNA identification of ethnic group (still in its early days), and obtaining DNA identification from trace (almost microscopic sized) samples.

Claude illustrated his talk with interesting presentations on several cases including: the problems with analysing partial fingerprints in the Christine Jessop case, a murder in Frenchs Forrest where the conviction hinged upon highly detailed analysis by Claude and his colleagues of carpet fibres found on a shoe print, and the murder of an Israeli Tourism minister where a chain of DNA and fingerprint evidence secured the

assassins' conviction. The lecture stimulated a wide variety of questions from the audience.

Councillor Jim Franklin

Professor Claude Roux is Professor of Forensic Science at UTS and founding Director of the UTS Centre for Forensic Science

Community Heritage Project

Progress report

Currently the bulk of the work on this project is being done by our consultant historian, Dr Peter Tyler who is meticulously working through the 48 boxes held by the Mitchell Library with some assistance from me, mainly entering Peter's notes on the relevant details required for the final report due mid-October.

Working at the library, we quickly learnt that the use of Swiss Army knives or scissors to open the heavily taped boxes was very definitely not on and ink pens and photocopying were totally out of the question. These no doubt sound to be trivial hurdles but the time involved in having boxes officially opened and waiting for busy staff to make photocopies of important records have slowed down the process.

Nevertheless, the work is exciting and the material coming to light is of high historical significance. Some of the detailed records include material that will be very useful for a history of the Royal Society.

Peter feels the following quote from an unidentified speaker at the 75th anniversary dinner in 1931, which also celebrated the move to Science House might be of interest to our Members:

> *In Science House will be housed the great library of the Royal Society of New South Wales, which possesses the best collection of works on physics and chemistry in the Southern Hemisphere.*

Peter comments, 'How times change! Both in terms of the status of the library, and the scientific disciplines strongly represented in the Royal Society.'

Robyn Stutchbury

Edgeworth David Symposium 2007

Clean Coal Technologies

Here are details of the Symposium for those of you who might wish to attend.

It is to be held from 8.30am to 5.30pm, Tuesday 25 September 2007 at Eastern Avenue Conference Centre, The University of Sydney

For more detailed information about the Symposium and dinner visit http://www.geosci.usyd.edu.au/news_events/index.shtml or *contact Lana Damjanovic, phone: (02) 9351 2916; email: lanad@geosci.usyd.edu.au*

Southern Highlands Branch

There is no lecture for this month, but Clive Wilmot has let us know that the newly formed committee, which meets on the third Thursday of each month, has lined up speakers for September, October and November. The new Honorary Secretary of the Southern Highlands Branch, Jennifer Braithwaite will be sending in a report of their meetings and advanced notices of future talks. For information contact Clive Wilmot, phone: 02 4886 4199.

Snippets from the President's July Report to Council

Clarke Memorial Lecture

The Chair of the NSW Division of the Geological Society of Australia, Emeritus Professor Ron Vernon, has given his in-principle support to jointly hosting the next Clarke Memorial Lecture which is normally held every second year, but has not been held since 2001.

It is planned to hold the Lecture on Wednesday 5 December and combine it with a book launch and Christmas gathering. The theme of the Lecture will be historical, and Dr David Branagan and Emeritus Professor Roy MacLeod have agreed to be joint lecturers. They will be speaking on Professors TW Edgeworth David and Archibald Liversidge, two extremely important figures for our Society and Australian science.

Publication of a biography of Archibald Liversidge

Society member, Emeritis Professor Roy MacLeod of the Sydney University, has asked if the Society would be interested in publishing his completed biography of Professor Archibald Liversidge. Because of its relevance to the Society, this matter is being pursued.

The Society's profile would benefit enormously by re-entering the field of scientific publishing, as other Royal Societies have done, and we would also benefit from the proceeds of sale of the book.

Publications Sub-committee

This committee has been established to review the Society's publications such as the *Journal and Proceedings, the Bulletin* and website. Recommendations for reform will go to Council for discussion and ratification, and if appropriate they will be reported in future issues of the Bulletin.

John Hardie, 24 July 2007

MEET OUR MEMBERS

We need your help!

How many members of the Royal Society do you know? We plan to run a column, 'Meet our Members', in each Bulletin so that members can get to know each other. You are invited to provide up to 150 words about your interests, achievements and pursuits with a photograph.

Who will be the first?

Please contact Robyn Stutchbury, by email: rstutch@bigpond.net.au or phone: 02 9427 6747

The Pinch Effect Presentation and its aftermath

Member James Welsh has put together an interesting article based on correspondence that had the effect of amending Associate Professor Brian James' subsequent article for Australian Physics on the discovery of the pinch effect. Brian James gave his stimulating presentation to the Society in August 2006 on the discovery of the Pinch Effect in Australia in 1905.

'*In essence, Pollock & Barraclough proposed that a current of approximately 100,000 amps had heated and softened the copper tube of the lightening conductor and electromagnetic forces had crushed the softened tube.*

In subsequent discussions over the usual post-presentation dinner with Jak Kelly and other members of the society, I expressed a concern that Pollock and Barraclough's assertions regarding the heating of the tube and its subsequent (albeit almost instantly subsequent) collapse may have ignored the rise in pressure of the trapped gasses within the tube.

Given that the original paper had been presented to this Society in 1905, it seems fitting that the Society should again contribute – albeit in minor a way – to this later review of the 1905 contribution.'

The correspondence spawned by these discussions has been put together by Jim into a fascinating article that is unfortunately too long to include in our Bulletin. However, it is just what we need for a proposed new section of our website called 'Virtual conversazione' or similar whereby we have a page that can be used to publish verbatim a whole discussion session with its own index; more about this in our next Bulletin. Meanwhile, thank you Jim Welsh and for those who are eager to read his material right now, I can arrange to forward Jim's original email attachment. Please let me know, editor.

Le Souëf Memorial Award

The Entomological Society of Victoria calls for nominations. The award is to be made for contributions to entomology by amateurs in Australia.

Nominations should be submitted to the Secretary of the Society by 30 September 2007. For details contact

For further information contact: **Margaret Brocx rswa@iinet.net.au or Daniel Dobrosak (Vic) suturalis@yahoo.com**

***MEMBERS** are invited to contribute articles and notices to the Bulletin. Do you have comments to make? Are there events coming up that we should all know about?*

Please send in your contributions by the end of the first week of the month to the Society's office (contact details below)

Receiving future copies of the Bulletin

We need to know your preference for receiving your copy of the Bulletin. Please send the following information to the Office (contact details below) either as an email message, by fax or by post:

Your name and contact phone number or email address; your preference of receiving the Bulletin by email or post. If by email you will receive your copy in colour as a pdf attachment. If by post, your copy will be in black and white printed on both sides of two A4 sheets.

Our thanks to member Val Gregory who is organising the distribution of this issue and who is running the Society office in the absence of Irene Kelly.

We would also welcome comments on the new format for the Bulletin and Proceedings and the information it contains. With thanks, Robyn Stutchbury.

Contact your office bearers

John Hardie President	02 9363 9360	Prof Jak Kelly Vice President	02 9419 6877
Clive Wilmot Vice President	02 4886 4199	Prof Peter Williams Hon Sec (Editorial)	02 9685 9914
Marian Haire Hon Treasurer	02 9747 2462	Christine van der Leeuw Hon Librarian	02 9680 3598
Alan Buttenshaw	02 9569 0236	Trevor Danos	02 9210 6580
Jim Franklin	02 9550 7288	Prof Heinrich Hora	02 9547 1424
Dr Michael Lake	02 9481 0949	Jill Rowling	02 9481 0949
A/Prof Bill Sewell	02 9295 8434	Robyn Stutchbury	02 9427 6747

Bulletin and Proceedings is issued monthly by the Royal Society of New South Wales
Postal address: Building H47, UNIVERSITY OF SYDNEY, NSW 2006, AUSTRALIA
Irene Kelly, Office Manager Phone: 61 2 9036 5282; Fax: 61 2 9036 5309;
Email: royalsoc@usyd.edu.au Web page: http://nsw.royalsoc.org.au