The Royal Society of New South Wales
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Future Events 2011

Lectures in Sydney are held on the first Wednesday of the month at the University of Sydney.

Wednesday 7 September 2011 at 6.30pm

Distributed Small-Scale Production of Chemicals - Why and How

Dr Brian Haynes

Seminar Room 102, New Law School Building, Eastern Avenue, University of Sydney.

Commemorating Governor Sir Thomas Brisbane

Thursday 1 December 2011 at 5:30pm
Annie Wyatt Room, The National Trust, Observatory Hill, Sydney
Saturday 3 December 2011 at 2pm
Parramatta Park, Parramatta
(see separate flyer)

Southern Highlands Branch

Meetings are held on the third Thursday of each month in the Drama Theatre at Frensham School, Mittagong (enter off Waverley Parade), at 6.30pm.

September Meeting

Thursday 29 September 2011 at 6:30pm

Photonics and its Impact on the Community

A/Prof Michael Withford, ARC Centre of Excellence, Macquarie University

Drama Theatre at Frensham School, Mittagong (enter of Waverley Parade)

(NB This lecture has been moved to the end of the month to suit Frensham School commitments.)

Central West Branch

For further information please contact Kerry Madden at Charles Sturt University Orange on Tel: 02 6365 7500.

The 1195th Ordinary General Meeting
Distributed Small-Scale Production of Chemicals: Why and How

Professor Brian Haynes, The University of Sydney

Wednesday 7 September 2011 at 6:30pm, Seminar Room 102, New Law Building, University of Sydney

For the vast majority of chemicals, Australia is too small and too remote to be able to support a viable production capacity. As a consequence, the country is becoming increasingly dependent on imports. This talk describes our research into how microstructured process systems provide a means for revolutionising the way we approach chemicals manufacture. By combining highly integrated process designs with profound process intensification, we can create chemical process technology that is efficient and economical at relatively small scale. This new type of plant will be scaleable without the technical risk normally associated with plant scale-up. At the smallest scale, it is mobile and able to utilise remote and dispersed feedstocks such as stranded natural gas or plant matter. This approach is exemplified in a pilot-scale microstructured 14-bar steam-methane reformer that contains 17 pre-reformer and reformer reaction stages, 15 combustion stages and more than 20 heat exchangers which are combined to produce a highly integrated process for hydrogen production with world-scale efficiency. Extension of these concepts to a wider range of chemical syntheses is discussed and underlying research in chemical reaction kinetics is briefly described.

Brian Haynes (FTSE FIChemE FIEAust) obtained his BE and PhD in Chemical Engineering at the University of New South Wales. After periods at the University of Göttingen, MIT and CSIRO he joined the University of Sydney in 1983. His research over many years has related to energy, including combustion, alternative fuels and microchannel heat transfer. He was President of the international Combustion Institute (2004-2008). In recent years, he has been studying the creation of highly efficient and miniaturised chemical plant using microstructured systems such as microchannels.

Booking is not necessary. All welcome. Entry is free to RSNSW members. There is a charge of $5 for non-members.

Patrons of The Royal Society of NSW

Her Excellency Ms Quentin Bryce AC
Governor-General of the Commonwealth of Australia

Her Excellency Professor Marie Bashir AC CVO Governor of NSW

Report on the Society's 1194th OGM 3 August 2011

Schizophrenia: from neuropathology to new treatments

Professor Cyndi Shannon Weickert, Macquarie Group Foundation Chair of Schizophrenia Research, UNSW

Is schizophrenia caused by genes or environment? This question was posed by Professor Cyndi Shannon Weickert at the 1194th ordinary general meeting of the Society.

Schizophrenia was first formally classified in 1887. Despite extensive pathological investigation there was no clear distinction identified between the brains of people who have schizophrenia and those who do not. Until the 1930s it was considered to be primarily a behavioural disorder put down to bad mothering. But in the 1930s treatments involving insulin and shock therapy were shown to be somewhat effective. There was a breakthrough in 1952 when D2R blockers were introduced and found to be effective against some of the symptoms. However, it was not until 1988 that the first definite genetic link was established. But progress was swift and in the last decade it has been shown that there may be several hundred genes involved in the disorder. Because of the large number of genes that are implicated, identifying treatments that target these genes is extraordinarily complex. Most researchers in the field now believe that the disease has both environmental and genetic origins.

The approach taken by Professor Shannon Weickert's group is to attempt to identify the pathology of various genetic pathways to the disease, in particular identifying molecules that can be new drug targets. Once these have been postulated, the aim is to use existing drugs which are either known to or believed to affect those targets and then to test their effect in clinical trials. This approach has the advantage of using drugs that have already been approved for use in humans thereby avoiding the necessity for time-consuming and expensive early-stage clinical trials that establish general parameters such as toxicity and dosage levels.

One notable aspect of schizophrenia is that it is virtually never found in children prior to adolescence. Most cases of schizophrenia are diagnosed from mid-teens to the early 20s but, interestingly, there is a second peak among women at menopause. This

Professor Cyndi Shannon Weickert

suggests that sex hormones could be an important part of the mechanism causing the disorder. Oestrogen receptors are found in the human cortex and act as "transcription factors", that is, they transport proteins across the cell membrane into the nucleus of the neuron. On investigating oestrogen receptor proteins a mutation specific to schizophrenia has been found in a transcription factor protein called ESR1. This protein cannot bind to oestrogen and hence cannot pass hormonal signals into the nucleus of the cell. Hence, the cell cannot activate important genes that produce their normal proteins and this may cause some of the symptoms of schizophrenia.

An existing drug, raloxifene, has already been approved as a selective oestrogen receptor modulator for treating various disorders in postmenopausal women. Raloxifene has been found to stimulate the oestrogen receptor and overcome the mutant effect in the ESR1 gene. However, the great variability of genes means that the drug effect on one specific mutation is likely to be masked, so there needs to careful design of clinical trials to make the effect apparent. One such trial is currently being conducted by Professor Shannon Weickert's group and involves a double-blind trial in which patients and control groups are treated in two stages, with all trial participants receiving the drug in one or other of the stages. This clinical trial is still under way and is expected to be completed towards the end of this year. If successful it may be a major step in establishing personalised drug treatments for the 1% of the human population that currently suffers the debilitating effects of schizophrenia. [The May 2009 edition of the ABC's Australian Story was on Professor Shannon Weickert's work and is available at http://www.abc.net.au/austory/specials/allinyourmind/default.htm. Anyone interested in the clinical trial may be interested to read the transcript or to view it.]

Donald Hector

New Members

Four new members were announced at the August meeting of the Society:

Jesse Wright – Full Member
Victor Flambaum – Full Member
Vivian Robinson – Full Member
Emily Nolan – Associate Member

We welcome them into the Society.

Professor Shannon Weickert receives her Speaker's Medal from Vice President Heinrich Hora

From the President

The importance of effective communication both within and external to the Society cannot be overstated. To that end we have already taken steps to move the Society forward in relation to its internet presence and in terms of the Bulletin. The two items are closely intertwined and efficiencies can be had from creating relevant communication items once and then publishing them in several different guises, such as in the Bulletin and on our website.

Brittany Cooper, our office manager, has kindly agreed to take on the work of assembling the Bulletin and indeed using the same material for our website. We are in the process of exploring how we might move to create a new website which will allow us more flexibility in terms of maintenance and which will allow for increased member services such as a members-only area. In the longer term we would hope to move to an electronic Bulletin which was part of our website.

There have been a number of improvements made recently to the software in the office and this has meant increased efficiencies in terms of our overall management of the Society's functions. I am grateful to Donald Hector for his work in this area.

John Hardie

Southern Highlands Branch

Report on August Meeting

Heading towards the world's largest telescope - the Square Kilometre Array

Professor Michael Burton

What do the kinetic energy of a falling snow-flake and radio telescopes have in common? Well, as Professor Michael Burton pointed out in his talk on the Square Kilometre Array (SKA), the energy of a falling snowflake is about 30 micro joules and this is greater than all of the radio energy ever collected by all the radio telescopes in the world! These instruments are very sensitive! Radio astronomy looks at a part of the electromagnetic spectrum at wavelengths from 1 m to 1 km. Observations in the visible spectrum are badly affected by dust but this is not the case in the radio spectrum. Thus by combining information from optical, infrared and radio telescopes we can get a much more complete picture of what's going on in the universe. But because of the long wavelengths of radio waves, these instruments have to be very big. For example, the Parkes telescope with its 64 m diameter dish has an area of about 1000 m^2. This telescope can resolve galaxies but in order to increase the resolution to look inside galaxies, much larger instruments are needed.

The largest radio telescope in the world at the moment is the Very Large Array (VLA) in New Mexico. This instrument has 27 dishes each of 25 m diameter, with a total area of 10,000 m^2. These antennas are configured in a Y-shape that can deliver an effective maximum baseline of 32 km. Data from each array is integrated using interferometry techniques effectively giving a telescope of this aperture. This substantially increases the effective resolution of the instrument. The VLA is capable of looking at radio sources such as pulsars, quasars and give insights into the formation of galaxies. If we are to be able to look further back through the history of the universe to the dust from which galaxies form, we need instrument orders of magnitude bigger than the VLA and that's where the SKA comes in.

The SKA will be the largest telescope ever built with a collection area of 1,000,000 m^2 and a baseline of at least 2,000 km. The SKA will be able to peer far back into the history of the universe to observe the first black holes and stars, to search for Earth-like planets, to test aspects of general relativity, and to explore the origins of cosmic magnetism.

The total cost of this project will be about $3 billion and the telescope is expected to be in full operation by 2025. Because of the cost of the project, up to 20 countries will be involved in the investment. About $450 million has been invested so far with prototype technologies being constructed in potential locations for the final instrument in southern Africa and Western Australia. The core instrument (where most of the dishes are located) needs to be sited in a "radio quiet" location. It needs to be flat, open, geologically stable and well away from man-made sources of radio waves. Final site selection is expected to be complete next year. The telescope will come on-line over a period of about 10 years, with the low and mid-frequency capabilities completed by 2023 and the whole instrument by 2025.

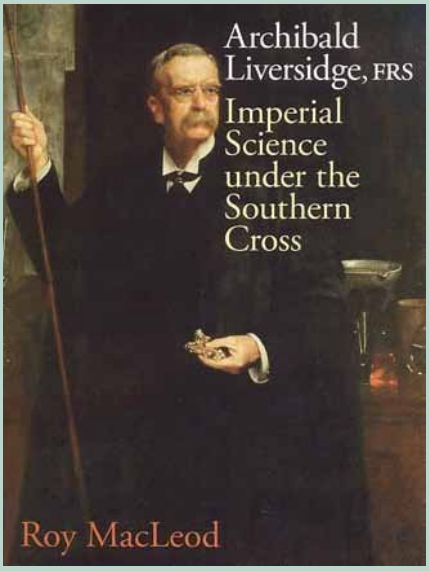
Australia is well placed to be selected as the final site, given our leadership in radio astronomy and the "radio quietness" of outback Australia. If Australia is chosen, the core instrument will be located at the Murchison Radio Observatory about 500 km north-east of Geraldton and will have dishes extending from Western Australia to New Zealand, giving a total baseline of 5,500 km.

This report originally appeared in Bulletin 345.

Donald Hector

Professor Michael Burton

Archibald Liversidge, FRS: Imperial Science Under the Southern Cross — Members' Discount



The Council is pleased to extend its offer of a 10% discount to Members on this superb book.

A joint publishing effort between the Society and Sydney University Press, this book is a detailed narrative of the progress and beginnings of scientific inquiry in Australia. It shows how central our Society was to the development of rigorous scientific research in Australia and how our development was intertwined with that of the university.

Now $54 collected or $65 posted (within Australia).

Southern Highlands Branch September Meeting

Thursday 29 September 2011 at 6:30pm

Photonics and its Impact on the Community

A/Prof Michael Withford, Australian Research Council Centre of Excellence, Macquarie University

NB This lecture has been moved to the end of the month to suit Frensham School commitments.

It is 50 years since the first demonstration of a laser, a device which quickly evolved from a scientific curiosity to a tool declared to be "a solution looking for a problem". Indeed, lasers have enabled the rapidly growing field of photonics, the optical analogy of electronics. Photonics is now used in important applications in areas such as engineering, surveying, defence, communications, computers and medicine. A recent review by the European Commission also determined that "photonics technologies underpin at least 10% of the European economy, and that reliance will increase as those technologies are further developed in the next decade". In this talk A/Prof Withford will offer a behind the scenes insight into photonic research and highlight the impact photonics is having on the community, both the success stories and the challenges for the future.

A/Prof. Withford was awarded a PhD from Macquarie University in 1995 for his investigations of the effects of gas additives on copper vapour laser performance. His research activities range from laser device development, laser applications, microphotonics, astrophotonics and quantum photonics. He is currently the Director for the MQ Photonics Research Centre, which includes over 30 research staff and over 30 postgraduate students. He also leads both the Macquarie University node of Australian Research Council (ARC) Centre of Excellence: Ultrahigh-bandwidth Devices for Optical Systems (CUDOS) and the OptoFab Node of the Australian National Fabrication Facility. A/Prof Withford is a member of the Australian Optical Society and the Optical Society of America. He holds 2 patents and has published over 80 journal papers and over 220 conference presentations.

A/Prof Michael Withford

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