



The Royal Society of New South Wales Bulletin and Proceedings 349

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September 2011

Future Events 2011

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

Wednesday 5 October 2011 at 6.30pm

Sex in the Sea: How Understanding the Weird and Bizarre Sex Lives of Fishes is the First Step to their Conservation

Professor Bill Gladstone, UTS

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

Wednesday 2 November 2011 at 6.30pm

Grid-Connected Energy Storage: the Key to Sustainable Energy?

Professor Tony Vassallo, the University of Sydney

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

Southern Highlands Branch October Meeting

Thursday 20 October 2011 at 6:30pm

Forensic Psychiatry

Dr Stephen Allnutt, the University of New South Wales

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

Central West Branch

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

The 1196th Ordinary General Meeting Sex in the Sea: How Understanding the Weird and Bizarre Sex Lives of Fishes is the First Step to their Conservation

Professor Bill Gladstone, UTS

Wednesday, 5 October 2011 at 6:30pm Seminar Room 102, New Law Building, University of Sydney

In 1938 the pioneer deep sea explorer William Beebe described the sex life of anglerfishes as "sheer fiction, beyond all belief unless we have seen the proof of it". Beebe would be equally amazed today by the even more diverse reproductive strategies of fishes that have been discovered, and how this understanding is applied for conservation. This seminar will cover some of the more weird and bizarre examples of the sex lives of fishes from the deep sea to the Red Sea, the evolutionary pressures, and how this science of sex in the sea is being used for conservation purposes.



Clownfish (Photo by Petr Kratochvil)

Professor Bill Gladstone is fascinated by the behavioural ecology of fishes, and his research has taken him to the Great Barrier Reef (spending 2500 hours underwater for his PhD), the Red Sea, and temperate New South Wales. Bill is interested in the reasons fishes form large spawning aggregations, especially the benefits provided by the sites where these aggregations occur and the applications of this knowledge in conservation planning. Bill loves to communicate this interest to his students and the community, and has received several prestigious teaching awards. He is currently the Head of the School of the Environment at the University of Technology, Sydney.



Professor Bill Gladstone

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 1195th OGM 7 September 2011

Distributed Small-Scale Production of Chemicals: Why and How

Professor Brian Haynes, the University of Sydney

In the last two decades tens of thousands of jobs have been lost from the Australian chemical manufacturing sector. As Professor Brian Haynes of the School of Chemical and Biomolecular Engineering at the University of Sydney explained at the recent meeting of the Society, there are a number of reasons for this. In Australia, feedstocks often are in remote locations, the nation is geographically remote from large global markets, Australian industry has traditionally had a low R&D expenditure, and the domestic market often does not justify investment in world-scale manufacturing capacity. Nonetheless, sales of chemicals and pharmaceuticals in Australia amount to tens of billions of dollars per annum and contribute significantly to Australia's balance of trade deficit. Professor Haynes' group at the University of Sydney has been working on technologies that might change this situation dramatically.

One of the important reasons that chemical plants are so big is that the relative capital cost per unit of production drops substantially as plant capacity increases. Historically, large plant capacity has been achieved by designing and building very large production equipment. This solves the capacity/cost problem but introduces other major costs and inefficiencies. In particular it is much more difficult to control chemical reactions

in large reactors (so impurities and by-products are produced and have to be dealt with) and, often, energy efficiency is compromised. An alternative being explored by Professor Haynes' group is to use advanced reactor design technologies to make relatively small and highly efficient manufacturing processes that are scalable simply by adding more of them rather than by building very large production equipment. This approach enables production capacity to be located near feed-stocks or customers, capital costs are much lower, the process has much reduced environmental impact, is safer to operate and is more energy efficient.

This "process intensification" approach to chemical reactor design uses technology that is analogous to that used in printed circuits. By etching or engraving small channels in plates of stainless steel (or other alloys) and stacking and then fusing the plates, pipework, heat exchangers and reaction vessels can be formed. Because of their very small size, control of reaction kinetics, heat transfer and mass transfer can be very precisely controlled.

One way of achieving this is to design a series of small reactors known as "multiple adiabatic beds" laid out with heat exchangers between each bed. This enables maximisation of the

New Members

One new member was announced at the September meeting of the Society:

John Rasko – Full Member

We welcome him into the Society.

heat generated during a reaction and gives very high energy efficiency. One important industrial process where this approach is being used is "methane-steam reforming" in which methane and steam are reacted first to form carbon monoxide and hydrogen, and then the carbon monoxide being further reacted with steam to form carbon dioxide and hydrogen. For every mole of methane used, four moles of hydrogen are produced. Large processes currently use steam to reform natural gas (which contains a high proportion of methane), producing large quantities of hydrogen for industrial use. In large-scale industrial processes, there is a great deal of heat wasted but using the process intensification approach, much greater energy efficiency is achieved. The group at Sydney University has demonstrated this process on a pilot unit which is both scalable and, unlike large industrial processes, can be started in a matter of a couple of hours.

There are number of other important processes that are used on very large scales to make industrial chemicals where this technology can be employed. These can be ideal for relatively small industrial economies like Australia and other markets remote from large-scale plants.

Donald Hector



Professor Haynes receives his Speaker's Medal from the President

From the President

The Society will be looking closely at its program for next year with the view to creating a greater variety of style of event and a higher level of impact. While our monthly lectures are our staple and create interest in their own right, it is now time to diversify. We have taken great heart in the level of response we achieved from the debate held in April between Barry Jones and David Malouf and think a repetition of that style of event would generate great interest in the broader community and hence be of benefit to the Society. Your ideas for speakers for these events would be welcome.



In addition, we are looking for members who would be able to help us with the preparation for and the organisation of such events. There is always room for another pair of hands to help with the phone, publicity and promotion, logistics and so on. Please contact the office to find out more.

I would also like to encourage those of you who are still receiving this Bulletin in print to consider the electronic option. More and more Societies such as ours will be utilising the incredible possibilities electronic technology can bring for members, such as special member-only areas on our website for discussion and sharing of information and ideas, and electronic newsletters that provide links to websites and other places where additional information can be found about a particular article. All of these possibilities are available to the Society right now so it is my prediction that it won't be too long before we move in this direction. Why not take the plunge now and get in ahead of the pack?

Bequests are important to a Society such as ours as they help keep the organisation flourishing and able to do the sorts of things members want. In our case there is so much more that we could be doing to foster an interest in science in young people, to build bridges between the different scientific disciplines, and to allow us to see the connections between science, art, literature and philosophy. I would encourage you to consider the possibility of giving something back to the Society so that others may enjoy what you have into the future.

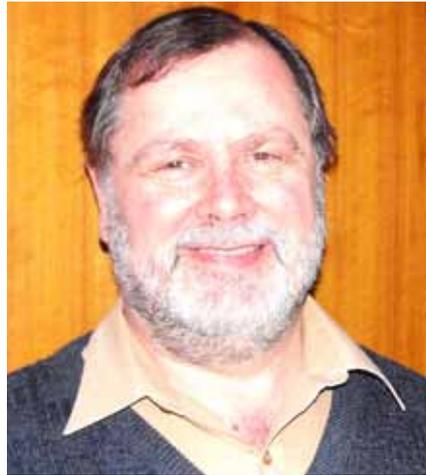
John Hardie

Southern Highlands Branch

Report on July Meeting

Who Cares About the Weather in Space?

Dr Marc Duldig, President of the Australian Institute of Physics



Space weather is the name given to variations in the physical and the radiation environment in the near Earth space and the consequences of those variations. The consequences of these variations can be dramatic and have significant economic impact.

Significant observations of the effects of space weather include, but are not limited to, electricity grid disruption, telecommunication disruption, and increased pipeline joint corrosion. In regard to satellites, memory failure, surface charging, solar cell degradation and increased atmospheric drag are obvious effects. Navigation disruption has also been observed, as has increased aircraft passenger radiation exposure, astronaut radiation hazards and the benign and beautiful aurorae.

It is clear that many of these effects have significant economic impact, making reliable forecasting of space weather storms highly desirable. Dr Duldig said that although the quality of space weather predictions has improved dramatically over the past decade, much still needs to be done. Australia has a significant role to play in both space weather research and prediction. Instruments at the Australian Antarctic bases, at Macquarie Island, in Tasmania,

mainland Australia and its offshore smaller islands are essential to space weather research and prediction.

Dr Duldig said that to understand space weather, it is first necessary to understand the processes generating the high-speed solar plasma and its embedded magnetic field. He described the solar wind as plasma at very high temperature with an average radial speed of 400 km/s, although this speed shows huge variations in the range 250-800 km/s. During severe solar eruptive events, the speed can exceed 2000 km/s. This solar plasma affects the earth's magnetic field, and also affects near-earth radiation levels.

A particularly dramatic demonstration of the effects of a coronal mass ejection on earth's atmosphere occurred on 13 March 1989, as a result of a coronal mass ejection which had occurred three and a half days earlier. Variations in the earth's magnetic field on that occasion caused a massive power generation disruption in Canada, the blackout lasting nine hours. It was accompanied by extremely intense aurorae at the poles.

Marc Duldig concluded his lecture with wide-ranging comments on the particular significance of space weather for Australia. Because of our geographic isolation, we are heavily reliant on satellite technology, a dependence which can only increase into the future. Evidence is mounting that the space era may have been an unusually quiet time for space weather activity, and that a greater level of disruption may be possible in the future.

It is in our national interest to develop a space weather strategy that optimizes national research, ensures rapid distribution of observational data for space weather forecasting and develops appropriate forecast warning procedures for industry and government use.

Marc's lecture was very much appreciated by the 45 person audience, who requested him to return to the Southern Highlands for another lecture on this fascinating topic.

Anne Wood

Be part of the Society's future

All members are invited to participate in shaping the Society into the future. We have set up five sub-committees to look after and progress the five key priorities determined at Council's Strategic Planning day on 7 May and all members are invited to contribute to them in whatever ways you can.

The Sub-committees and their leaders/members are:

Sub-committee	Focus	Leader/member
Membership	Increase member numbers by offering more attractive options; target younger members	John Hardie Don Hector Brynn Hibbert
Funding	Create a healthy funding base to allow the Society to fulfil its goals	Tony Nolan Bill Sewell
Profile/ relationships	Establish strategic partnerships to further extend the Society's reach	John Hardie Don Hector
Publications/ communication	Increase the Journal's status and coverage; offer a more dynamic and member-focused website; use up-to-date electronic technology including social networking; leverage the Society's tangible assets for merchandising	Don Hector Brynn Hibbert Tony Nolan
Schools	Establish relationships with schools to create a focus for young people	Fred Osman Bill Kneprath

Please contact the leader of the sub-committee you are interested in to find out more (contact details below).

Events, Homicide Sub-committee.

Dr Allnutt is the recipient of awards from the American Journal of Forensic Services and has a NSW Premiers Gold Award for work with the NSW Court Liaison Service.

In addition to being a conjoint Senior Lecturer at the University of New South Wales, Dr Allnutt is a well received speaker, and has presented and published papers both locally and internationally on forensic topics. He has a scientific interest in the bizarre, the deviant and the dangerous.

The title of Dr Allnutt's October lecture is unspecified as yet. When further details become available they can be found online at this address: <<www.royalsocietyhighlands.org.au/html/lectures.html>>.

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.

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

Southern Highlands Branch October Meeting

Thursday 20 October 2011 at 6:30pm

Forensic Psychiatry

Dr Stephen Allnutt, MB, ChB, FRANZCP, FRCPC, the University of New South Wales

Dr Allnutt trained in Psychiatry at McMaster University in Canada and in Forensic Psychiatry in Ottawa, Canada. He has held a number of positions including Deputy Director of Mason Clinic (Auckland, NZ) and Clinical Director of Long Bay Hospital, Sydney. He is currently Clinical Director of the NSW Community Forensic Mental Health Services. Dr Allnutt has a ministerial appointment with the Sentinel

Contact your office bearers

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