



The Royal Society of New South Wales Bulletin and Proceedings 327

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July 2009

Future Events 2009

Lectures in Sydney 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 5 August 2009 7pm

What will the Great Barrier Reef look like in 2050?

Associate Professor Peter Ralph, Executive Director, Plant Function Biology and Climate Change cluster, University of Technology, Sydney

Wednesday 2 September 2009 7pm

Weird Animal Genomes and Sex

Professor Jenny Graves, Head, Comparative Genomics Research Group, Australian National University

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.

next talk

Thursday 20 August, at 6.30pm

"Trial of the Centuries" Review of Retrying Galileo

Dr Peter Slezak, University of NSW

Saturday 5 September, at 5pm

Harmonious Revolutions

Clubbe Hall at Frensham School, Mittagong - see p. 4

Bulletin Editor, Bruce Welch

Lecture 5 August 2009, Darlington Centre at 7pm What will the Great Barrier Reef look like in 2050? Associate Professor Peter Ralph, Executive Director Plant Function Biology and Climate Change Cluster University of Technology, Sydney

Coral reefs have existed for millions of years and survived in a wide range of climates; but coral bleaching seems to have pushed corals to the brink. Research into coral bleaching has been at the forefront of the climate change agenda for many years. It attracts much public interest, but we still do not know why corals die at temperatures only a few degrees higher than their optimum. Given the onset of coral bleaching and the combined stress of ocean acidification, I will describe how I see the Great Barrier Reef in 2050. Will the reef be dominated by fleshy macroalgae, soft corals or just a film of bacteria covering the dead coral skeletons?

Peter Ralph is an Associate Professor at UTS and the Executive Director of the Plant Functional Biology and Climate Change Cluster. He has over 15 years experience in the areas of photosynthetic physiology and ecology of marine plants and is widely regarded as a world expert in this field. His research team has made significant contributions to the physiology of marine plants, including corals, Antarctic sea-ice algae, seagrasses and macroalgae. His group includes senior research fellows, 3 post docs, 7 PhD students and 4 Honours students. His team has on-going research collaborations with Danish, German, UK, US and Canadian photobiologists. Peter has been addressing questions fundamental to advancing knowledge of marine photosynthetic organisms that survive at the edge of their environmental envelope. His group is currently developing mechanistic models of microalgal photo-physiology, as well as developing a fluorescence-based proxy of primary production.



Patrons

Her Excellency Ms Quentin Bryce AC

Governor-General of the Commonwealth of Australia

Her Excellency Professor Marie Bashir AC CVO Governor of NSW

Accurate Measurement: the vital backbone of Australian science & industry

Dr Laurie Besley, Chief Executive & Chief Metrologist, National Measurement Institute

Lecture delivered for the Society's 1172nd Ordinary General Meeting



RSNSW President, John Hardie, presents the speaker medal to Dr Laurie Besley

The National Measurement Institute (NMI) is responsible for the science of measurement, otherwise known as metrology. NMI was formed in July 2004 when the National Measurement Laboratory, the National Standards Commission and the Australian Analytical Government Laboratories were amalgamated. NMI is a division of the Department of Innovation, Industry, Science and Research (DIISR). A key role for the institute is to provide a measurement infrastructure which ensures measurements made in Australia are of an appropriate quality for their purpose and which enables measurements to be linked with those made elsewhere in the world.

Measurements must be accurate if they are to be used successfully to:

- Demonstrate product quality;
- Enable manufacturing process control;
- Support regulatory processes; and
- Empower good decision making.

We not only need accuracy, we also need knowledge of accuracy, i.e. measurement uncertainty of the result. Dr Besley explained how accuracy and precision are often confused. Getting the same result every day does not give you accuracy. Often what is missing is traceability to a common reference of known accuracy. Traceability provides confidence in measurements. Traceability to a

common standard provides a system that allows measurements to be meaningfully compared with other measurements. Metrology's role is to provide traceability which is: "The property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty." Measurement uncertainty is important because it allows us to:

- evaluate the reliability of the result;
- make valid comparisons between results;
- determine the level of confidence associated with any decisions that are based on the result; and
- judge if the result is fit for its intended purpose.

"Accurate measurement is at the heart of physics, and in my experience new physics begins at the next decimal place" Steve Chu, Nobel Laureate 1997 for his work on laser-cooled ions.

National measurement institutes all over the world disseminate standards into the community and conduct research to provide for the future needs of industry. When a government invests in metrology the returns are large indeed. For example US healthcare costs are around 14% of GDP (a whopping \$ 1,300 billion p.a.) and 10% of this expense is related to measurements. It is known that

25% of these measurements are wasted because they are repeat measurements to confirm results. If we could confidently eliminate wasted measurements this would provide a potential saving of \$30 billion per annum. While this figure would not be as great in Australia the savings would be substantial. Countries that do not invest in metrology often bear a high cost when things go wrong. When the EU banned fish exports from Lake Victoria, 150,000 people lost their jobs and export revenue decreased by \$ 100 million p.a. for the following two years.

Many measurements made today are made using black box technologies. It is a dangerous situation when users of these technologies take the results as correct without implementing processes to ensure the measurements are meaningful. Using some reference back to a standard and calculating a measurement uncertainty will allow the measurement to be used to make good decisions. NMI provides training courses to educate the community regarding the importance of measurement uncertainty.

The breath of work carried out by NMI covers the maintenance of physical and chemical standards for Australia, analytical testing, forensic work for the federal police on illicit drugs, testing of athlete samples, bio-analysis, and pattern approval of instruments used for trade. We also have responsibility for the *National Measurement Act 1960*. This act sets out the units of measurements used in Australia, the maximum permissible errors allowed for all measuring instruments used for trade and many more items that underpin the measurement infrastructure in Australia. In July 2010 NMI will take on the responsibility for National Trade Measurement. This will increase staff numbers from 350 to 500 and NMI will have a presence in every state and territory.

NMI is involved in collaborative international research to develop a standard for mass that relies on a fundamental constant in nature. There

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are 2 such projects on the go. One is counting atoms and is called the Avogadro project and the other is using electrical methods.

Key features of NMI are:

- NMI is a national resource for measurement needs
- NMI has many government stakeholders and clients outside DIISR
- NMI has exceptionally skilled, motivated and dedicated staff (staff turnover very low)
- NMI has a unique set of resources in buildings, equipment
- Half (M\$30 p.a.) of NMI's operating budget comes from the sale of its services
- NMI provides essential support for development of innovation in Australia.



NMI Headquarters at Lindfield

Marian Haire

Australian Institute of Physics NSW Branch



6th General Meeting 2009

Tuesday 18 August 2009 @ 6:30pm

'High-Power Ultrasonics and its Applications'

Dr Tony Farmer
CSIRO

Location of talks: Slade Lecture Theatre,
School of Physics, University of Sydney.
Refreshments are available from
6:00pm. Entrance to all events is free.

Dinner to follow at Buon Gusto
Restaurant, Abercrombie St.
Please contact Dr Fred Osman on 0418
444 477 to book.

From the President

Science House continues to be at the top of my agenda. Since the last Bulletin I have visited the building with one of the principals of a firm of heritage architects, with the Principal Policy Officer attached to the NSW Chief Scientist, and with the Company Secretary of Science House Sydney Limited. The owner, Sydney Harbour Foreshore Authority (SHFA), subsequently supplied the 800 page Conservation Management Plan for the building, which the heritage architect has examined and which forms the basis of a brief report. This indicates that the building can be modified internally to a limited extent to allow for modern work practices. It may be that funding can be sought from the Commonwealth for this work. A high level meeting with SHFA is planned for this week.



The pilot schools program being planned in conjunction with Macquarie University has now been confirmed, with the Society and the university jointly running a 1-day session at Macquarie in the second week of December this year. It will target science 'High Flyers' from Years 7 and 8 in selected schools.

The co-ordinator of the program at Macquarie is also interested in us setting up a pool of scientists who might volunteer to answer questions from school students via a mediated web interface, or visit schools through a co-ordinated program run from Macquarie. If any members are interested in participating in this program, please contact Julie Haeusler (details last page).

The very successful Harmonious Revolutions event held at the State Library of NSW in June is now to be repeated for the Society in the Southern Highlands. Celebrating Galileo, astronomy and music, it will be held on Saturday 5 September at Clubbe Hall, Frensham, Mittagong. More details are provided elsewhere in this Bulletin. I would like to thank Clive Wilmot for his efforts in bringing this event to the Society.

The Society was fortunate in being able to support the Darwin Day of the 2009 CAVEPS conference held in the last week of June at the University of NSW. The four-day conference focused on vertebrate palaeontology and evolution. I attended the launch of the conference and was able to present the awards for the best student paper and best student poster at the conference (\$250 each and complimentary associate membership of the Society for a year) at the closing session.

I also attended the launch on 10 July of a special exhibition at the Macleay Museum in honour of Professor Griffith Taylor, one of Australia's leading geographers. On 14 July I was honoured to be invited to attend the 'History in July' reception at History House, Macquarie Street, by the President of the Professional Historians Association of NSW. It was a good opportunity to talk about the ongoing work of the Society, especially that of our historian, Dr Peter Tyler, past President of the Association.

I would like to acknowledge the passing of one of the modern stalwarts of the Society, Maren Krysko von Tryst, the Hon. Secretary (Editorial) of the Society for over 30 years. Not only did she run the Journal, but she also ran the Summer Schools and the Society's office throughout this period. There is no doubt that without her efforts the Society would not be where it is today.

Several Society members were also present at the funeral of Professor Graeme Philip, former Edgeworth David Professor of Geology and Geophysics at the University of Sydney, who also passed away in June. He too will be sadly missed by the Society.

John Hardie

New Members

Three new members were announced at the June meeting of the Society.

Jan Herrmann - Full member
Susan Strangman - Full member
Martin Strangman - Student member

We welcome them into the Society.

In addition, we welcome Professor Bruce Milthorpe and his wife Pamela as full and associate members, respectively.

Southern Highlands Branch

Report of June Meeting

Deviant Sexual Behaviour by Dr Stephen Allnut

The Branch held its June meeting at 6.30pm on Thursday 18th June in the Drama Theatre, Frensham School, Mittagong.

Dr Stephen Allnut presented a fascinating lecture on the nature of paraphilias. He described paraphilias as conditions characterized by intense recurrent sexually arousing fantasies, urges and behaviours. Such behaviours may involve

non-human objects, they can cause actual suffering or humiliation to oneself or others, and may cause the involvement of non-consenting individuals. The pattern of these behaviours is generally demonstrated over periods longer than six months and commonly results in clinically significant impairment in social and/or occupational functioning.



Dr Allnut explained how the behavioural manifestations of such behaviours fall into two easily recognizable categories. The first category can be described as "hands off" and includes behaviours such as fetishism—"fetish", voyeurism—"peeper", exhibitionism—"flasher" and telephone scatologia—"heavy breather". The "hands on" examples include such behaviours as frotteurism—"groper", rape, sadism/masochism—"humiliating/mutilating" and necrophilia. Other behavioural manifestations include zoophilia (animals), urophilia ("golden shower"), coprophilia (faeces) and autoerotic asphyxia.

Interesting data was provided by Dr Allnut on the matter of sexual assault against adults, the majority of whose victims are female. The perpetrators of the assaults demonstrated multiple motivations, such as being fantasy driven (a paraphilia), sadistic, hostile, aggressive and impulsive/opportunistic. Others were motivated by a group culture and on some occasions by disinhibition/intoxication.

In addition, the characteristics of the perpetrators were examined in a longitudinal study, with some surprising findings. Perpetrators were found to constitute a heterogeneous group with no particular constellation of characteristics. From the longitudinal study of 561 males with a history of sexual assault, where the participants were guaranteed confidentiality, the following points were noted: 40% had one year of college education, 60% were employed, 50% were living with a woman, all ethnic groups were represented and 53% had at least one paraphilia prior to the age of 18 years. It was also noted that by adulthood, the average number of offences was 380.2, and that 20% had targeted both sexes. It was also recorded that 26% had engaged in both "hands on" and "hands off" paraphilias and that 23.3% of paedophiles had offended both inside and outside the family. The majority of participants had more than one paraphilia and 52% had experienced the onset of this behaviour in adolescence.

In discussing the relationship between homosexuality and paedophilia, Dr Allnut stated that there was no increased prevalence in homosexuals vs heterosexuals, and that homosexual paedophiles generally have little interest in relationships with either male or female adults. He also made it clear that there was no evidence that a boy victim later showed any predisposition to homosexuality.

Dr Allnut drew the attention of the audience to the following myths:

- A child who is sexually abused becomes an offender.
- Sex offenders can be "cured".
- People with paraphilias like their problem.
- Paedophiles hate children and are cruel to them.
- Partners know what is going on.
- Minor offending means low risk.
- Homosexuals are paedophiles.

At the conclusion of the lecture, Dr Allnut was asked numerous questions by the audience. The vote of thanks was given by Anne Wood.

Anne Wood

Next meeting: Thursday 20 August

Drama Theatre, Frensham School, Mittagong at 6.30 pm

"Trial of the Centuries" Review of Retrying Galileo

Dr Peter Slezak, senior lecturer, School of History and Philosophy, University of NSW



A moving and poetic "Early Music Multimedia" event for the International Year of Astronomy combining:

- * Sequenced Astro-Photography of Professor David Malin & the Anglo-Australia Observatory, plus JAXA, NASA, et al.
- * Early Italian Baroque music & poetry by the Galilei family & the Florentine Camerata performed on Period Instruments by some of Australia's leading exponents; +
- * Socratic dialogues scripted from the writings of Galileo Galilei, his musician father Vincenzo, classical authors, & the Inquisition trial documents, exploring Pythagorean/Platonic myth, heresy, & the birth of modern science.

Script and artistic direction: Andrew Byrne.

Development sponsored by the National Academies Forum, Canberra.

Saturday 5th September 2009.

Arrive at 4.45pm for a 5pm start at:

Clubbe Hall,

Frensham School, Waverley Parade,

Mittagong



Vale

Maren Krysko von Tryst

The Society has lost one of its leading figures of recent history with the passing on 26 June of Maren Krysko.

Maren Krysko von Tryst was born on 21 July 1921 at Hameln, Lower Saxony. After schooling she obtained the matriculation certificate from the Studienanstalt Fürstin Bismarck Schule in Berlin – Charlottenburg in 1939. The Second World War prevented her from completing university, and in 1948 she migrated to Australia.

She worked as a technical assistant with the Department of Mines, South Australia, and later with the CSIRO, Division of Radiophysics. In 1962 she obtained a Bachelor of Science Degree from the University of NSW with a major in geology. In 1965 she obtained a post-graduate Diploma in Mineral Technology from the same university.

She was a member of the Geological Society of Australia, New South Wales Division from 1952, a council member and treasurer from 1963–64. Maren was a member of the Royal Society of New South Wales from 1960. She was a council member and editor of the Journal for over 30 years.

She ran the annual Summer Schools for senior secondary students for over 2 decades and effectively ran the society during this period. She will be long remembered and sorely missed.



*Royal Society figures past and present pay their respects at Maren Krysko's funeral. Left to right: Edrich Chaffer, Alan Day, Dan O'Connor, David Branagan, John Hardie.
Photo courtesy R.L. Evans*

What's happening to the Society's collection at Prestons?

Take a look at our website: <http://nsw.royalsoc.org.au/library.html> for a full report on the progress we have been making. Former Mitchell Librarian, Elizabeth Ellis, our President John Hardie, historian Dr Peter Tyler and Vice President Robyn Stutchbury have been hard at work uncovering many of the treasures found in storage at Prestons. But we need help. We feel sure that among our members there must be those who share our passion for this wonderful material. We are planning to add another team to the project and so we are calling on a maximum of four extra pairs of hands. You will need to allocate two full days (dates to be determined) and be prepared to work alongside any two of the amiable members from the current working party (above). The project must be completed before the end of 2009.

There will be a strict set of guidelines from the project's terms of reference. And there might even be the odd cake for morning tea or sandwiches for a pleasant picnic lunch in the open air.

We realise that we will be inundated with offers of help, but too many in a team will make the process unwieldy. We will be seeking out only those of you who demonstrate the greatest enthusiasm – especially if you are conversant with entering records into an Excel spreadsheet on your own laptop.

Please contact the office to volunteer.

History of The Royal Society of New South Wales

In August 2008 Peter Tyler was advised that he had been awarded the inaugural Merewether Scholarship offered by the Library Council of New South Wales, for the purposes of preparing a "history of The Royal Society of New South Wales, its cultural significance and intellectual influence as the first scientific organisation in Australia". The principal purpose of the Merewether Scholarship is 'to encourage and support the use of the Mitchell Library's collections for the study and research associated with the nineteenth-century history of New South Wales'. In addition to a stipend, the Scholarship provides research facilities within Mitchell Library for a period of twelve months.



His final report is due later this year, however as the research proceeds, various issues or events take on a significance that was not anticipated at the beginning, because they had not been featured prominently in earlier histories. These discrete issues may form the basis for separate journal articles, as mentioned earlier. Some examples are:

In the latter half of the 19th century the Royal Society played a leading role in disseminating the discoveries of science and technology amongst the wider public. This was achieved through the annual Conversaciones, which became a significant event in the Sydney social calendar from the 1860s. Perhaps inspired by the great 1851 International Exhibition at the Crystal Palace in London, the Royal Society Conversaciones were themselves a forerunner of the 1879 International Exhibition at the ill-fated Garden Palace in Sydney which attracted over a million visitors.

Beginning in 1876, the Royal Society of New South Wales spawned a number of specialist scientific Sections. As many as twelve of these were formed, but not all existed concurrently. The most active Sections held well-attended monthly meetings at which latest developments in the particular discipline were

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One Hundred Years Ago . . .

Analysis of a Specimen of Sea-Water from Coogee

By C. J. White, Caird Scholar, University of Sydney.

Communicated by Prof. Liversidge, LL.D., F.R.S.

Read before the Royal Society of N. S. Wales, August 7, 1907

Forchhammer first definitely proved, what indeed was almost *a priori* evident, that, although the salinity of the ocean varies with locality, season, depth, etc., yet the ratio of dissolved salts to one another remains practically constant. Of course slight variations are only to be expected in coast water, especially if landlocked or if receiving extensive river drainage, but in deep sea-waters the circulation of ocean currents etc., could fairly certainly be reckoned on to thoroughly mix the dissolved salts. The detailed work of Professor Dittmar (undertaken in connection with the Challenger Expedition) was especially important in this direction, and indeed almost rendered superfluous any further complete analyses of sea-water – the percentage of total solids only being required.

However, since in the seventy-seven complete analyses of "Challenger" waters there is not included any off the coast of New South Wales, the present analysis was undertaken – at the suggestion of Professor Liversidge and in connection with his investigation on the presence of gold in sea-water – as a check on the theoretical quantities demanded by Dittmar's and Buchanan's calculations.

The accurate determination of total salts is not quite such a simple matter as at

first sight it appears. The apparently most obvious method of evaporating a known quantity of water to dryness is inapplicable, since under these conditions the magnesium chloride is partly decomposed according to the equation $MgCl_2 + H_2O = Mg + 2 HCl$.

... Other methods of determining the total solids which readily suggest themselves are (1) Determination of specific gravity. (2) Determination of some important constituent which can be readily estimated with a high degree of accuracy – like chlorine – and multiplying this by a certain constant factor.

[The author then discusses Buchanan's use of method 1 and Dittmar's use of method 2 and gives a detailed description of Buchanan's hydrometer.]

By means of such an instrument Buchanan claims that the specific gravity of sea-water can be found to ± 0.00001 . As the salinity varies directly as the density, and the density can be found with such accuracy, it follows that such a form of hydrometer is peculiarly suitable for rapid and accurate sea-water work, especially on board ship, where the extra refined methods of a well equipped laboratory are inapplicable.

... Combining the constituents found in the generally accepted way, and omitting CO_2 we obtain the following results:-

NaCl	27.370	gms. per kilo
MgCl ₂	3.884	
MgSO ₄	1.667	
CaSO ₄	1.264	

K ₂ SO ₄	.887
MgBr ₂	.072
MgO (by difference)	<u>.048</u>
Total	<u>35.192</u>

In connection with the above piece of work I wish to express my grateful appreciation of the help and suggestions of professor Liversidge, F.R.S.

Dr Michael Lake
July 2009

History of The Royal Society of New South Wales (continued)

discussed. By the beginning of the 20th century most of these Sections had been disbanded as their members formed their own professional associations, e.g. the Institution of Engineers, and the NSW Branch of the British Medical Association. Thus the Royal Society is the parent of these bodies.

Several authors have perceived Australian science as a pale colonial offshoot of English science, and perhaps as part of the broader imperial enterprise. This rather patronising viewpoint is not substantiated by the Royal Society records. Although some members showed a nostalgic longing for "home", this overlooks the fact that a surprising number were not of English birth or descent. Leaving aside the large proportion of Irish and Scots, there was a considerable number of Germans as well as other nationalities. Certainly many members were fervent monarchists, but there is a strong Australian nationalistic thread in many of the reports, and a clear wish to prove that we were scientific equals with Europe and USA.

Contact your office bearers

John Hardie President	02 9363 9360	Prof Heinrich Hora Vice President	02 9547 1424
Clive Wilmot Vice President	02 4886 4199	Robyn Stutchbury Vice President	02 9427 6747
Bruce Welch Hon. Secretary (General)	02 9569 9928	Prof Jak Kelly Hon. Secretary (Editorial)	02 9419 6877
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