



The Royal Society of New South Wales Bulletin and Proceedings 340

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October 2010

Future Events 2010

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 3 November 2010 at 7 pm

Dr David Mills, Chief Scientific Officer and founder of Ausra, Inc.

Powering the US Grid from Solar and Wind

(see details at right)

Friday 26 November 2010, at 5.30pm

Liversidge Lecture

Professor John White, ANU

Belief in Science



Merewether Theatre,
University of Sydney

Details on page 5

Wednesday 1 December 2010 at 6.30 pm (note early starting time)

Studentship recipient talks and Christmas Party

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 18 November 2010, at 6.30pm

Lecture 3 November 2010, Darlington Centre at 7pm

Dr David Mills

Co-founder of Ausra, Inc.

Powering the US Grid from Solar and Wind

Solar and Wind are our two largest energy resources and are well distributed globally. In these respects, they are ideal to repower humanity with little climate or political impact. Some say that such a strategy is not practical because the solar resource disappears at night and each wind generator can be highly variable in output. However, the impact of already commercially available solar thermal storage technology, together with the overlap effects of wind energy from many sites may prove otherwise.

The first example used is the USA 2006 electrical load calculated on an hourly basis from government data and the second is a total energy supply scenario. A high voltage DC grid backbone (commercially available today) is assumed to allow full access of delivered power to all parts of the country. National wind and solar output are calculated hourly using government resource data. The initial results of the analysis are presented together with a discussion of the roles of solar and wind in such a new system, in comparison to conventional baseload/peaking thinking.

The talk will begin with an update of Dr Mills company's activities in the United States since his leaving Sydney in early 2007, followed by an update of today's solar technology. The main part of the talk describes private work in progress by the author and his colleagues in the United States to take a first look at the feasibility of powering the United States energy system entirely from wind and sun by mid-century.

Dr Mills is the former Head of the Solar Energy Group at the University of Sydney and past President of the International Solar Energy Society. He is the co-founder and former Chairman of the SHP and Ausra companies.



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

Lecture delivered for the Society's 1185th Ordinary General Meeting held on 6 October 2010

Is the climate right for nuclear power

Dr Ziggy Switkowski, Chair ANSTO

Many of the stalwarts of the Society were pleasantly surprised to see a larger than usual audience for this much anticipated talk. Young people, whom we had not seen before, were gathered, not, as it transpired, to hear Dr Switkowski, but to regale the meeting with chants against the nuclear industry. The tragedy was not that these folk were passionate about something they felt keenly involved in, but that they did not stay to listen and debate. Perhaps they felt, as youth often does, that those a few generations in advance of them would not wish to engage in the kind of debate with which they would feel comfortable. Was it ever thus?

Dr Switkowski was the least discomfited of anyone in the room. As a high profile protagonist of nuclear power he has probably entertained worse. With mastery of his subject, fact followed statistic, followed question, followed conclusion. Why is Australia the only country in the G20 not to have nuclear power or plans for nuclear power? How can we plan for 2 % per annum energy growth leading to a doubling of energy needs by 2050, while meeting obligations to reduce atmospheric carbon? Why has the energy White Paper explicitly left out the nuclear option? Why are we earning \$5 billion a year from uranium, when Saudi Arabia makes \$6 billion a day from oil?

Nuclear power has about the same carbon footprint as solar and wind (10% of that of brown coal), and is a well-



established technology. Off-the-shelf reactors can be bought for \$5 billion and built in less than a decade. Twelve clusters of reactors could satisfy all of Australia's present and projected energy needs. With present reserves of less than a century, breeder technology and the use of lower grade uranium isotopes and thorium will need to be developed to ensure a suitably sustainable future. Cost might drive future expansion. Although nuclear cannot compete with coal now, a carbon price in the range of \$15 to \$40 per tonne per year would level the playing field.

Dr Switkowski was careful to acknowledge some of the arguments against the development of nuclear power. 1) long-term toxic waste; 2) nowhere to build the reactors; 3) capital cost; 4) potential for disaster; 5) weapons proliferation and terrorism; and 6)

water requirements and environmental damage. His responses covered the expected bases: explaining the life cycle of a fuel rod and how and where the final waste can be buried; if Australia can't find a site then nowhere can; and state and world regulation of nuclear material.

Questions took up Dr Switkowski's assertions that renewable forms were not capable of playing a major role in meeting a country's energy needs. One of the remaining young people offered Spain as a country with 53% of its energy being satisfied by wind. Inspection of Wikipedia reveals that 53% was reached on November 8th 2009, (it must have been mighty windy) but over the year 2009 only 14.3% was from wind, so Dr Switkowski's observation that he would be surprised if more than half of the country's energy were satisfied by wind seems vindicated. Further reading rubs it in, as nuclear capacity in Spain is more than that of wind. The psychology of the nation's response to the nuclear question was also explored. If the case is so overwhelming why are we not building nuclear reactors fit to bust? Dr Switkowski's reply was that at the moment the benefits were not enough to balance the political downside, which is a truism if there ever was one.

Dr Switkowski remains optimistic, expecting the tide of opinion to turn in a couple of years, when other solutions to climate change and energy security will be seen not to be sufficient.

The vote of thanks by Professor Hora was made over more complaints from the back of the room. At least these people had stayed to listen.

Brynn Hibbert



From the President



I am pleased to report that on 29 September the Editorial Board of the Journal met to consider current issues necessary to improve this, the Society's most important publication. A range of measures came out of the meeting which includes the diversification of the Board to cover a broader range of disciplines and protocols to streamline the production process to ensure that the Journal meets the requirements for the citations indices.

Professor Jak Kelly, who has been the Journal's Editor for several years, has had to step down for health reasons. I would like to thank him sincerely for his work on the Journal and wish him a speedy recovery.

Our October General Meeting sparked a diversity of opinion among the large audience. As you will see from the separate report in this issue, the start of the meeting was interrupted by those attempting to stop the speaker from expressing his views. The society welcomes all forms of debate and values every opinion, but everyone is entitled to be heard. I would like to thank Dr Switkowski for his forbearance under these circumstances and for continuing with his presentation.

Science House is on the agenda again with the involvement of Bruce Welch and Donald Hector. Bruce and I met with the NSW Opposition Planning spokesperson, Brad Hazzard, and his colleague Rob

Stokes on 20 October to alert them to the current situation. Meetings with the Planning Minister, Tony Kelly, and the Minister for Science and Medical Research, Jodi McKay, are in the pipeline. Meanwhile, the building remains empty.

On a recent visit to Science House we uncovered a plaster bust of Archibald Liversidge – in three pieces – in the attic. We are looking at ways in which we might be able to have it restored.

I attended the first birthday celebrations of the Royal Institution of Australia held in Sydney, also on 20 October. This provided an opportunity to catch up with old friends but also to meet new ones. There was considerable interest in our progress with Science House, and in the forthcoming Liversidge Lecture, which I would encourage all members to attend, as it will look at some of the key philosophies underpinning our understanding of what science is all about and how it fits in with other human endeavour.

John Hardie

Farewell to Sonia Chan

It is with great regret that our office assistant/office manager, Sonia Chan, has resigned. She has been offered internship with a commercial company whilst completing her Masters in Publishing. Luckily she was able to recommend one of her fellow students, Brittany Cooper, who has already commenced duties with us. We thank Sonia for her excellent work for the Society and wish her well in her new endeavours.

New Members

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

Jann Porges - Full Member
Marc Panhuis - Full Member
Joseph Wright - Full Member
Stuart Porges - Associate Member

We welcome them into the Society.

Southern Highlands Branch Lecture Report

held on Thursday 21 October 2010, at 6.30pm

Dr David Branagan

School of Geosciences, The University of Sydney

Geology & Geophysics of Antarctica: The Early Australian Story

David Branagan has had an extraordinary career as a consultant geologist in coal and metal mining, and particularly in engineering projects. He has been President of the International Commission for the History of the Geological Sciences, President of the Royal Society of New South Wales and is an Honorary Life Member of the Geological Society of Australia. He was awarded an honorary D.Sc. by the University of Sydney in 2008.

Branagan has written numerous textbooks and technical papers, but in recent years has concentrated on the history of geology. One of his biographical works is *TW Edgeworth David: A Life* published by the National Library of Australia. This book was one of four works short-listed for the first Prime Minister's History Award in 2007, and was largely the subject of Branagan's lecture to the Southern Highlands Branch October meeting. Others who played a role in stimulating interest in Antarctica, and who were discussed in the presentation included Franklin, Neumayer, von Mueller, Bull, Borchgrevink, Bernacchi, Gregory and David.

There were two major themes in this lecture. The first described the search for the elusive South Magnetic Pole while the second dealt with the growth of knowledge of the geology of Antarctica. A minor but linked theme was the relationship existing between Australia, Scandinavia and Japan during the period from about 1840 to 1914.

Considerable Australian interest in Antarctica exploration and science dates from the 1880s, with the formation of an Exploration Committee set up in Melbourne. One extraordinary outcome of the study of the rocks of Antarctic was that it allowed the conclusion that the land was indeed

continental, and therefore at an earlier stage had been part of Gondwana. This was a pivotal realisation that influenced numerous fields of study in the years that followed.

The key figure in this presentation was Sir Tannatt William Edgeworth David (1858-1934), geologist, born in Wales. In 1891 he became Professor of Geology at Sydney University, and within ten years of taking the position had achieved world wide acclaim. In 1907 Ernest Shackleton invited David to journey south with his expedition and return in the *Nimrod* at the end of the summer. The university granted leave and in December 1907, David, with two former students, Sir Douglas Mawson and Leo Cotton joined Shackleton in New Zealand.

Even before his Antarctic landfall, David had decided to stay with the expedition. It meant taking unauthorized leave but he could not resist the unique opportunity to research the geology of such a remote and inhospitable part of the planet. He celebrated his fiftieth birthday within sight of the active volcano Mount Erebus (3795 m) and in March he stood on its summit, leader of the first successful climbing party.

Shackleton was so impressed that next spring he put him in charge of an attempt to reach the South Magnetic Pole. The journey of four months during which David, with Mawson and a young Scots doctor Forbes Mackay, dragged laden sledges from sea-level up more than 2200 m to their goal on the ice plateau and back, covering in all some 1250 km, has passed into the annals of polar exploration as an epic of courage and endurance.

In the general rejoicing at David's return to Sydney late in March 1909, it was hardly surprising that his unscheduled absence from Sydney University was easily forgiven.

The audience was clearly intrigued with this presentation of Antarctic exploration and asked as many questions as time allowed.

The vote of thanks was given by Anne Wood.

Anne Wood

Our new Office Manager Brittany Cooper

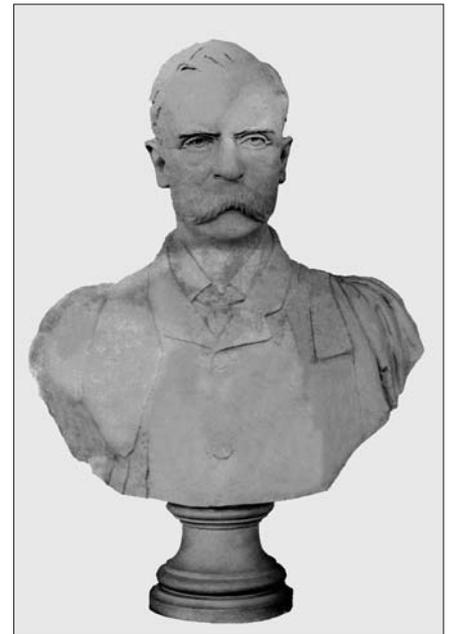


Brittany Cooper hails from East Kurrajong in the Hawkesbury region. In her youth she was lucky enough to be selected to attend both the Professor Harry Messel International Science School (ISS) and the National Youth Science Forum (NYSF). Her first experience of scientific research was through the CSIRO Student Research Scheme at Macquarie University, where she undertook some gold sputtering. With encouragement from her high school science teacher, Mr Robert Hollow, she also benefited from the Cosmology distinction course in her final year of high school at Tara in Parramatta.

Her undergraduate studies were initially interdisciplinary, allowing her to explore her interests ranging from physics, history and philosophy of science and mathematics to linguistics and foreign literatures. In 2008 she graduated with a Bachelor of Arts (Languages). After living in Naples, Italy and Vienna, Austria, she returned to Australia this year and is currently completing a Master of Publishing at the University of Sydney.

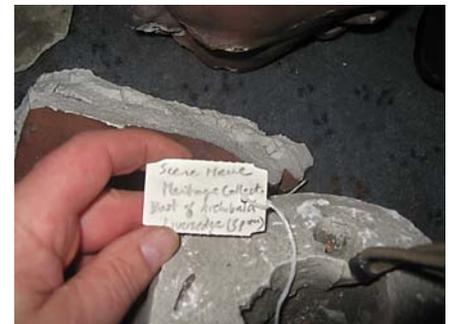
In her free time she is a keen bushwalker, percussionist and amateur translator. She is very pleased to be in the employ of the Royal Society of New South Wales, not only because she believes in the promotion of scientific research, but because it will allow her to maintain her interests in astronomy, forensic science and biological diversity.

Liversidge Bust Found?



Photograph of the bust of Archibald Liversidge

During a recent inspection of Science House we were exploring the attic areas on the top floor and I spotted some unusual objects behind a pile of what looked like junk. Closer inspection revealed a tag on one piece which reads "Science House Heritage Collect. Bust of Archibald Liversidge (3 pieces)".



I didn't have time to drag it all out and see if all the pieces are there, but rest assured this will be done at the earliest possible time. We are negotiating with the Sydney Harbour Foreshore Authority about getting the various pieces out (it looks like more than 3 pieces to me) and getting it restored.

Bruce Welch

The 2010 Liversidge Lecture Belief in Science Professor John White, Australian National University

Friday 26 November 2010, at 5.30pm
Merewether Theatre, University of Sydney

The achievements of science in the last 400 years have been of great benefit to humanity and are appreciated widely. Less well understood is how personal attributes of awareness, excitement, frustration and recognition of beauty are central to successful science. These very human qualities and the role they play in making discoveries interest me. Science requires absolute honesty and care about conclusions to be believable. Science is not autonomous and the sometimes necessarily tentative opinions are often incomprehensible and even unacceptable to the public - we must do better in explaining! The current climate change debate is an example - the believability of developing scientific opinions has been questioned and mocked by positive assertions from cynics. I am not sure what to call this humane part of science but I insist on its importance from personal experience and to disabuse the public of the common scientist stereotype.

These thoughts were provoked by a letter to the Royal Society of Chemistry house journal in 2007 on "the scientific method" - evoking another part of "the method":

"As a very old scientist (University College London, 1934-1939) I am concerned about the decay of the scientific method. I read so often "scientists believe that ..." Yet it was the abandonment of belief in favour of the results of experiments that has been the key to science's success"....

"We must grant that in highly connected non-linear systems, the design of controlled experiments on Poperian principles is very difficult. "We must find ways to do it. Otherwise science will simply become another "religion" dependent on faith."

In the Liversidge Lecture I will examine how scientists' optimism, "suspended disbelief" and a reliance on empiricism are as much part of the "scientific method" as clear logic. I will describe also some of my recent work on the structure and function of industrially valuable explosive emulsions - understood by the novel neutron scattering methods of "contrast variation" pioneered in my research.

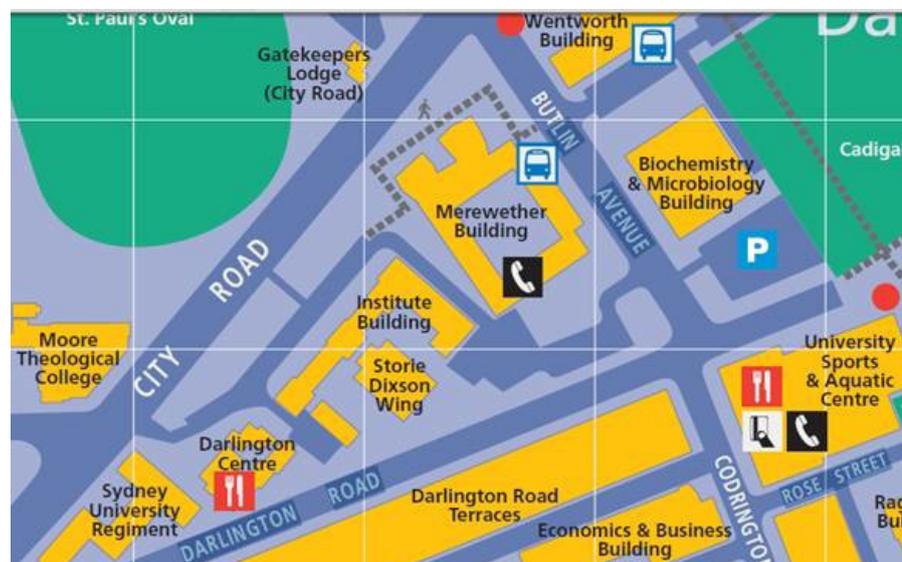
John White CMG FAA FRS is currently Professor of Physical and Theoretical Chemistry at the Research School of Chemistry at the Australian National University.

Graduating from Sydney University he went to Oxford University on an 1851 scholarship in 1959. He became a Research Fellow of Lincoln College before finishing his DPhil and an official Fellow of St John's College Oxford in 1963. He is one of the discoverers of isotopic contrast variation in neutron scattering - which is currently



used worldwide for understanding the structure of "soft matter". Returning to Australia in 1985 he established a new scientific program and immediately became involved in processes to establish in Australia synchrotron radiation and neutron scattering facilities comparable to or better than those available internationally. At various times he has been Chairman of the National Committee of Crystallography of the Australian Academy of Science, Science Policy Secretary of the Australian Academy of Science, (where key papers on human cloning, higher education and stem cell research were written), President of the Royal Australian Chemical Institute, President of the Australian Institute of Nuclear Science and Engineering and Chairman of such committees as International Advisory Committee of the J-PARC project in Japan and the Bragg Institute International Advisory Committee (ANSTO). He is currently Chairman of the Asia-Oceania Neutron scattering Association (AONSA). On the policy side he currently chairs an Academy of Science committee on the effects of low level ionising radiation and is Chairman of the Oxford- Australia Scholarship Committee.

Professor White has received a number of awards which include: the Marlow Medal and the Tilden Lectureship - of the Royal Society of Chemistry, Argonne Fellow of the University of Chicago, T.G.H Jones Memorial Lecture, University of Queensland, H.G Smith Medal, Royal Australian Chemical Society, Craig Medal of the Australian Academy of Science, Leighton Medal of the Royal Australian Chemical Institute, Distinguished Friend of Oxford University.



Archibald Liversidge, FRS: Imperial Science under the Southern Cross

by Roy McLeod

Extract from chapter 8 *Dean and Doctor*

In May 1876, in what would be the last Anniversary Address from the pulpit of his presidency, W.B. Clarke urged fellow members of the Royal Society to keep their eyes fixed firmly on the ground before them. Their 'true position', as he put it, was to remain that of 'pioneers, sowers, foundation layers', their purpose simply a 'flourishing association of men ... [who] have at least a better aim, and a more useful and nobler object for the employment of their leisure.'¹

Clarke's view of steady progress was conditioned by nearly forty years of hardship and struggle, redeemed by an improving knowledge of the land and its resources. Clarke inspired the science of Australian field geology, then taking shape amidst the dust, rain and cold of the gold fields and mineral ranges. The new world of laboratory science he saw coming, but was not equipped to manage. Yet, within twenty years, colonial science was to move from the domain of gentlemen collectors to the world of professionals. That much he knew; how it would come about, was another question. Clarke's generation had begun a slow revolution in the public recognition of science; he was to be its Marat, not its Robespierre. Liversidge's arrival gave him fresh hope, and a promise of things to come.

1. The 'Elizabeth Street Conspiracy'

During the years 1878–79, while Liversidge was in Europe, the work of the Royal Society simmered gently. The Council's most urgent task was to get a building. Liversidge's appeal had been successful, if not overly so: some seventy-three of its 350 members gave a total of £500, which brought them within range of the Government's matching offer of £500. To this was added a gift of £500 from Thomas Walker, the wealthy grazier of Yaralla. Patronage had its privileges: Walker was duly elected an Honorary Member, joining a list of fourteen distinguished men of science, including Darwin, Huxley, Owen and Hector. Thereafter, Council revealed the genius of property-owning Sydneysiders.

For some time, the Society rented premises at 5 Elizabeth Street from the Academy of Art, which had in turn leased

them at £250 per annum from their owner. But when, in 1878, the owner sought to raise his rent to £300, the Academy, reluctant to stay and unable to buy, looked to its lodger for a solution.² Following negotiations between Henry Russell and E.L. Montefiore – art dealer, Trustee of the Academy, member of the Society, and Liversidge's friend³ – the arrangement was turned on its head. Where the Academy had previously been the host, now it became the guest, promising to lease its own premises for £200 if the Society would buy them. With this guarantee, and a Savings Bank mortgage of £2000 at six per cent, a purchase was possible.⁴ The Society instructed its solicitors (also, happily, members of the Society) to buy the building.⁵ As the Society was not incorporated, Smith, Russell and Leibius acted as Trustees for its purchase, at a cost of £3525. The Society had found a 'home' at last.



Although he had made the play possible, the final curtain did not fall until Liversidge was away from Sydney; and so he was when Clarke died in June 1878. On 28 May 1879, with Leibius still overseas, and Liversidge but two days returned, Smith gave the Society's Anniversary Address, consisting almost wholly of obituary tributes to his friends – M.B. Pell, Dr John Dunmore Lang, and most extensively, to the dear Rev. Clarke. Liversidge shared in the mourning. A week later, on 4 June, he reported on his travels. He and Russell were the only speakers.⁶ The Society

needed their leadership.

Within the coming months, Liversidge and Russell confounded the Cassandras, convinced that the winds of change would not last. For a start, the creation of specialist sections quickened the tempo of meetings. Not all benefited equally, but membership topped 430, and the Government renewed the Society's annual grant without comment. From 1876, the Society held its deficit in check, and by 1879, it was showing a small profit. Even the library that Liversidge assembled was given an insured value of £1000.⁷

In October, the Society celebrated by holding one of the 'most successful and brilliant gatherings' of the season, its first *conversazione* in the Great Hall of the University. According to the *Australian Town and Country Journal*, Hector's photographs, shown by the aid of a hydrogen lamp, Cracknell's telegraph and thermometers, and Russell's clocks captivated an audience of over 800.⁸ Smith displayed his favourite half-prism spectroscope, and he and Liversidge showed their new 'Cailletet apparatus' for the liquefaction of gases. Thanks to Liversidge's recent foray in Europe, there was a new microscope, which he displayed alongside 150 books, and new photographs of Venice.⁹ Charles Moore decorated the Great Hall with palm leaves, ferns and evergreens from the Botanic Garden, and tables were laid with crimson cloth. The cost was fearful.¹⁰ But such was the price of publicity.

The Society's governance was fully in the hands of its secretaries. In 1880, they persuaded the Council that officers should be elected by ballot only. The Governor of NSW, hitherto the Honorary President, was replaced by a 'working president'.¹¹ The first, elected for 1880–81, was John Smith. But Smith gave Liversidge *carte blanche*. In March 1880, Liversidge brought James Cox and C.S. Wilkinson onto the Council. This not only improved lines of communication with the Australian Museum and the Department of Mines, but gave Liversidge more votes when he needed them.¹² The effects of his improved 'housekeeping' were immediate. Correspondence was listed before meetings; section chairmen were



A Royal Society conversazione in the Great Hall, 1879.

appointed without delay; and the hall at Elizabeth Street was hired out, frequently to the University's Senate, further helping to pay the mortgage.

Smith's first annual report spoke to a new-found optimism. A sense of history pulsed through the Society, when the Council commissioned portraits of distinguished colonial scientists since Brisbane, and ordered from London a set of decorative plaster busts celebrating British genius from Bacon to Murchison, with Queen Victoria added for good measure.¹³ In early 1880, the Society's membership exceeded 450. Applications from women had hitherto been politely declined,¹⁴ but with women entering the University from 1881, they could no longer be confined to the *conversazioni*, nor would Liversidge allow it.¹⁵ Liversidge even moved an amendment (in what might have seemed the most arrant *hubris*) actually to *limit* the Society's membership to a ceiling of 500!¹⁶ News of the Society's activity spread afar. In a sense of turnabout as fair play, Robert Etheridge Sr, then at the British Museum, even approached the Council for a grant to publish his catalogue of Australian palaeontology – possibly the first time a British scholar looked to Australia for a grant.

The tide of prosperity', Smith said, we owe to the 'enlightened zeal and indefatigable labours' of Liversidge and Leibius.¹⁷ Fresh from England, Liversidge was determined to elevate the Society's profile. After Clarke's death, the Council raised funds to endow an annual Clarke Medal, to be

awarded 'to men of science who have made valuable contributions to our knowledge of the Geology, Mineralogy or Natural History of Australia'. With its rules written by Liversidge, the prize was to be open to all; its value was to be enhanced by appealing to the universe of science: bestowing credit both upon those who gave, and those who received.

The first three medals went to Englishmen – Richard Owen, who despite his anti-Darwinian views, had greatly encouraged natural history in Australia and New Zealand; George Bentham, author of the *Flora Australiensis*; and T.H. Huxley, universally famous, who had made a special point of sending copies of the *Philosophical Transactions* from London to the 'embryo society in Sydney ... which', Liversidge said, 'I hope will eventually grow sufficiently to be recognised as a not unworthy daughter.'¹⁸ With the medal to Huxley went Liversidge's thanks to his teacher. With honorary memberships, the Society displayed similar *politesse*. In 1879, when the Council added to its rolls both Darwin and Huxley, they also included Owen. Owen's pleasure at receiving the award was, as he put it, all 'the more encouraging, as coming from the colony from which I have received some of the most interesting subjects of [my] labours.'¹⁹

For some time, the Society had procrastinated about a charter. In November, Liversidge drafted a Bill of incorporation, which was eventually passed by parliament in 1881. Next, he persuaded Parkes (then leading a Parkes-

Robertson coalition) to cease the annual bickering about money, by setting the government grant permanently at a rate increased from £250 to £350. The government delayed, sought advice,²⁰ but finally relented, and eventually increased its bounty to £400 in 1882.²¹ Before 1881 was out, the Society had paid off another £500 of its mortgage.

Confident, the Society now reached out in other directions. Visibility required communication. Mindful of the benefits, Liversidge applied to Sydney the practice Joseph Henry had encouraged in Washington, DC. Moreover, he appointed a committee to abstract and reprint articles about Australia for publication by foreign societies, along the lines of the American *Popular Science Monthly*. Soon, the Society had acquired an 'instant library' of foreign journals, and within the next two years, a network exchanging 1013 issues of the Society's journal with 284 institutions in 116 cities worldwide.²² This was assisted by a government grant in aid of postage, a compliment Liversidge returned by offering to distribute 100 copies of the Council of Education's *Annual Report* with his mailings to 'Scientific Societies in Europe, America and the Colonies.'²³

To keep the Society, its journal and its library flourishing was one thing; but to keep the membership vigorous, even with the specialist sections, was a challenge. In 1881, members heard twenty-eight papers given by thirteen speakers; but of these, Liversidge himself gave nine, and Russell, another five. Their professional work had its own momentum but, beyond giving papers, editing the journal and chairing meetings he had few means of encouraging research. Accordingly, Liversidge persuaded the Council to establish a set of prizes (three at £25 annually) for the best essays submitted on set topics (and, with luck, publishable in the Society's journal).²⁴ Such incentives were unlikely to set the Tank Stream on fire, but they were made welcome.

Continued in next issue

This excellent book is available from the Society to members at \$54 collected or \$65 posted (within Australia)

2010 Einstein Lecture

Each year the AIP NSW Branch nominates a distinguished speaker whose work has covered a wide range of topics with an emphasis on Einstein's ideas and their consequences for physics and technology today. This year the Einstein Lecture was held at the Powerhouse Museum on Monday 23 August 2010 and featured Dr Phil Dooley from the University of Sydney on the topic of "Einstein's Unruly Child". Phil completed a PhD in laser Physics at the ANU but decided that he would in the future 'by-pass' nasty long equations and move into the area of science communicator. Phil has been heavily involved with high schools, over a number of years, in conducting workshops for physics teachers and high school students. He has also travelled around NSW in 'Outreach' programs stimulating and entertaining audiences in physics shows.

The Einstein series consisted of a midday show geared to an upper high school audience and a night lecture for the general public. Both of these shows were very well attended (approaching 350) and professionally videoed.

Phil started the lecture by describing some of Einstein's little known background, that is, besides Relativity and $E=mc^2$, for which he is best known to the general public. Phil explained that Einstein's insights into the photo-electric effect began a revolution in Physics that eventually led to Quantum Physics. This then set the scene for the audience to learn about some

of Einstein's work through a series of fascinating but normally difficult to 'carry out' demonstrations and real experiments (from the HSC syllabus), as well as introducing the science that has, despite its strangeness, made some of the most accurate predictions of any theory.

The audience was thrilled in seeing high energy sound waves vibrate a crystal glass leading to its destruction – a feat Phil's Opera singing was not able to do; levitation using superconductors; gas tube corona discharge as well as laser diffraction and wave harmonics.

Phil successfully explained, using chocolates, how quantum theory can help one visualize the quantum world. The consequences of Quantum Physics seem weird, but many of them flow from Einstein's proposition that light acts as particles as well as waves - we now know that matter also demonstrates this "wave-particle duality". With this key, then we can begin to make sense of some Quantum behaviour.

The day, overall, was very successful and Phil did a remarkable job in presenting a difficult and not well-understood area of physics. Phil's flair and communication skills in his presentations kept the audience engrossed from start to finish with question time reflecting their keen involvement and fascination in the lecture.

The talk was very well received and geared to scientists and members of the public alike with many discussions continuing later after the lecture. The NSW Branch of the Australian Institute of Physics thoroughly thanks our co-



Photo from left to right: Dr Frederick Osman, Dr Phil Dooley and Dr Graeme Melville (AIP Branch Chair).

sponsor The Royal Society of NSW as well as the Powerhouse Museum, for their support and use of facilities on hosting the event and Dr Phil Dooley for delivering an outstanding and stimulating 2010 Einstein Lecture!

Frederick Osman

Contact your office bearers

John Hardie President	02 9363 9360	Prof Heinrich Hora Vice President	02 4627 7769
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