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The Royal Society of New South Wales

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Wednesday 1 October

Australia's most spectacular environmental rehabilitation project: Phillip Island, Pacific Ocean

Dr Peter Coyne

1226th Ordinary General Meeting

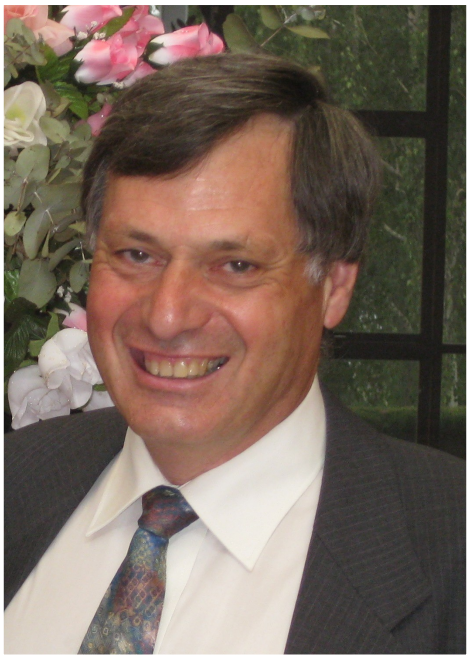
Union, University &Schools Club

25 Bent St, Sydney 6:00 for 6:30 pm

Phillip Island is near Norfolk Island, halfway between Sydney and Fiji. Before feral animals were released on Phillip Island, the island retained its natural sub-tropical vegetation and native fauna. The first disastrous action was release of pigs on the island in 1793. The early settlers also introduced goats and rabbits to Phillip Island by 1830.

By around 1860 the island had almost no vegetation apart from a few remnant trees. The pigs and goats appear to have died out when inadequate food remained to support them but the rabbits survived, preventing the growth of vegetation and allowing unrestricted erosion to continue. Rabbit eradication efforts between 1979 and 1986 succeeded, allowing the environment to rebound spectacularly. Although only about 200 hectares the island is extremely rugged with cliffs 200 metres high, necessitating unusual methods to reach inaccessible areas - swimming, rock climbing, even archery. The talk will describe the island's history and natural history, explaining how geological and geomorphological events helped shape the ecosystem.

With a diversity of breeding seabirds and some of the world's rarest plants,



Phillip Island is a real natural treasure. Some independent scientists described this as possibly Australia's most spectacular environmental rehabilitation project.

A pair of before and after photos is attached. This area was probably covered in sub-tropical rainforest in 1788. The 1981 photo shows some vegetation resulting from intensive rabbit control; a year earlier it would have been virtually devoid of vegetation.

(Continued on page 2)

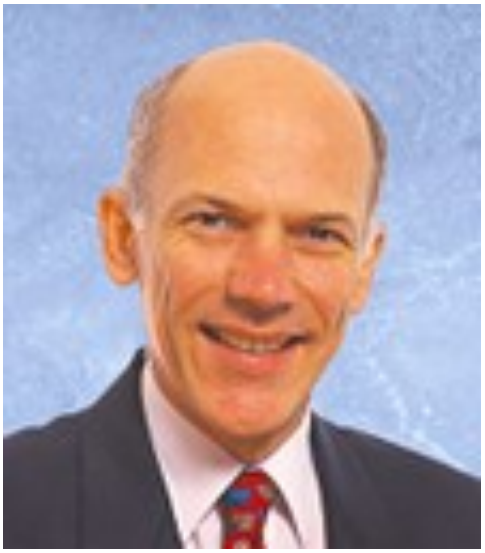
Future Events

Wednesday 1 October 2014
1226th Ordinary General Meeting
Australia's most spectacular environmental rehabilitation project: Phillip Island, Pacific Ocean
Delivered by:
Dr Peter Coyne
Union, University & Schools Club
25 Bent St, Sydney
6:00 for 6:30 pm

Wednesday 5 November 2014
1227th Ordinary General Meeting
From Angry Birds to mobile laboratory Turning smart phones into science labs for $2 — the DIY Droplet Lens
Delivered by:
The winners of the 2014 ANSTO Eureka Prize, Dr. Tri Phan of the Garvan Institute and Dr. Steve Lee of the Australian National University
Union, University & Schools Club
25 Bent St, Sydney
6:00 for 6:30 pm

SOUTHERN HIGHLANDS BRANCH
Thursday 16 October 2014
Higgs-Boson Particle and CERN
Delivered by:
Professor Kevin Varvell
The Performing Arts Centre, Chevalier College, Bowral
6:30 pm

From the President



It is pleasing to be able to report that migration of the Society's back-office services to The Association Specialists (TAS) is well underway and expected to be completed before 30 September. The final stage of this is implementing a new web-based member management and event registration system. One of the major deficiencies that we've had over the last few years is that members cannot easily update their own information and payment for events, such as monthly meetings, dinner reservations and merchandise purchases has been difficult and complicated. Within the next couple of weeks, the web-based system will be enabled and we will notify the membership of details how it works – we expect this to be a major step forward for our members.

It is most regrettable that Emma Dallas, our hard-working Executive Officer is leaving the Society with effect from 30 September. We all wish her very well for the future.

A final reminder that the nominations Society's 2014 awards close on 30 September. Please give this some consideration and nominate people you think would be worthy recipients.

The next several months are busy – the Clarke, Liversidge and Dirac lectures will be delivered and the Royal Society of NSW Scholarships for 2014 will be judged. Some of the details have not yet been determined – these will be posted to the website as soon as they are finalised. The Jak Kelly award presentation is expected to take place at our December meeting prior to the Christmas party.

Planning has commenced on the events programme for 2015 – if there are specific subject areas you would like to see included, please contact John Hardie, chairman of the Events Committee. We are working on some brand-new concepts that we hope will be particularly attractive across our entire membership of Fellows and Members.

If there are any issues you would like to raise with me, I am easily contacted by e-mail at *president@royalsoc.org.au* and would like to hear from you.

Donald Hector

(Continued from page 1)

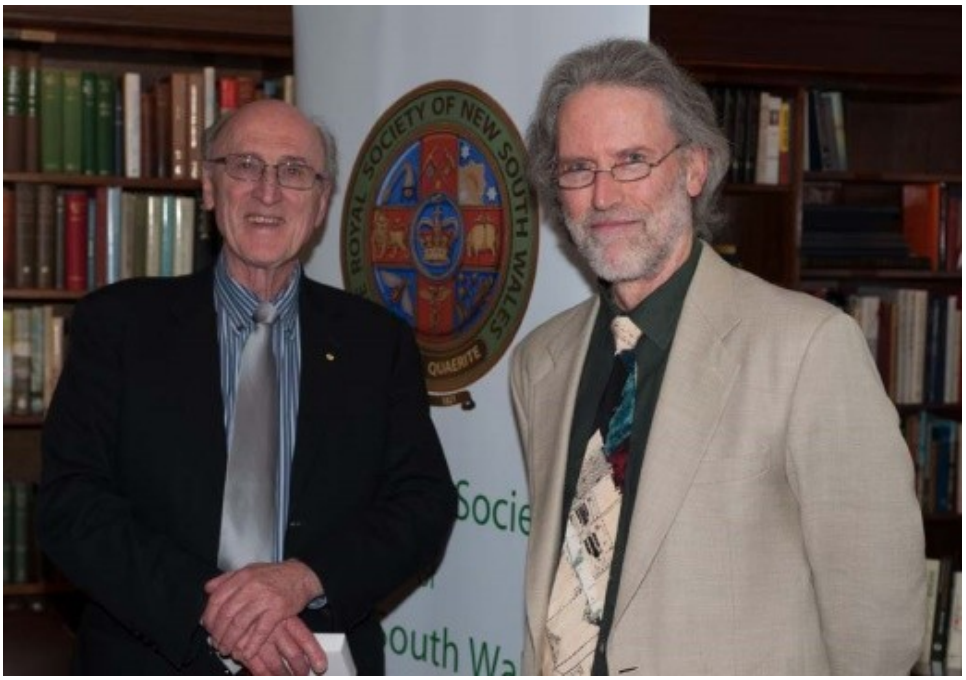
Peter Coyne commenced his career in nature conservation in 1973 when the field was just developing. With central involvement in more front-page news items than could be considered comfortable for a prudent public servant, he had a challenging and rewarding career. A highlight was the period when Peter and his family lived on Norfolk Island while Peter inaugurated the office of the Australian National Parks and Wildlife Service. His major tasks there were working towards establishing the Norfolk Island National Park and undertaking the first steps towards ridding the shockingly bare Phillip Island of rabbits.

That work included setting up experimental exclosures to demonstrate the effect of eliminating rabbits, and then extraordinary techniques when commencing the extermination efforts. Requiring immense effort, the eradication brought significant rewards including the discovery of a plant species previously thought to be extinct and another plant new to science, and establishing habitat for new nesting colonies of an array of seabirds.

The Fourth Dimension and Beyond - the paradox of working in unimaginable worlds

Emeritus Scienta Professor Ian Sloan AO FRSN

Report of September Meeting 2014



Emeritus Scienta Professor Ian Sloan and Professor Chris Bertram

Professor Ian Sloan is not content to work in an environment of four dimensions – he is quite at home in space with many more dimensions than most of us are accustomed to. Many mathematical problems can be considered as problems and multidimensional space – the question is how do we imagine these environments? The dimensions of a space can be considered to be the number of directions that you can go from any single point within it. For example, in our four-dimensional world, from any point we can go in three special directions, plus time. If we are in a six-dimensional environment, we can go in six directions from any given point and mathematically we don't need more than six variables to describe this environment. But why would we be interested in multidimensional spaces?

Many problems are best analysed in multi-dimensions. For example, the shop may have 250 stock items. This can be thought of as a single point in 250-dimensional space. Each stock item has a price, so there are another 250 dimensions to consider. One area where this approach has a major application is evaluating certain types of financial transactions such as derivatives.

An investor may want to analyse a potential investment in Woolworth shares, for example. The payoff might be thought of as the closing share-price over a period of 250 trading days in, say, $10 increments. Using multidimensional mathematics, the investor can calculate the expected payoff at a certain trading day on the basis of what the closing share price might be. Such calculations soon become extremely complex, in fact, too complex to be evaluated (this is known as "the curse of dimensionality" a term coined by Richard Bellman, a noted researcher in this field). And what if the payoff can take any value, rather than being in $10 increments – does this make it even harder? Well, fortunately it does not.

Using a statistical approach known as the Monte Carlo method, these highly complex functions can be evaluated quite accurately. The Monte Carlo method may be thought of as a technique whereby one randomly throws points at a target and evaluates whether the points fall on the target or outside it. If the target can be mathematically described, the functions can be evaluated with considerable accuracy after no more than a few thousand random "throws". This enables highly-complex derivative functions to be evaluated quite accurately. The problem then lies in the assumptions underlying the mathematical model used to define the "target". Flaws in the underlying assumptions have resulted in many a lost fortune!

Despite the accuracy of the Monte Carlo method, with highly complex functions the number of random throws can become very large and the question arises, can we do better than generating the throws randomly? For some problems, using a pattern, for example, a lattice has been shown to converge much more quickly.

Multidimensional mathematics is one of our most powerful tools in solving problems from financial derivatives, to metadata analysis, to cosmology. Professor Sloan provided a particularly clear insight into a highly complex and very powerful mathematical technique.

Southern Highlands Branch

Green Materials and Recycling End-of-Life Polymers in Steelmaking.

Scientia Professor Veena Sahajwalla

Director, Centre for Sustainable Materials Research and Technology, UNSW Sydney

Report of August 2014 Meeting

Professor Sahajwalla's research has completely changed our understanding of the properties of carbon-bearing materials such as coals, cokes, graphites, plastics and rubber tyres. Worldwide, the carbon-based industries of ironmaking, steelmaking and ceramics are huge, and she has had a significant impact on the theory and practice that form the basis of the operations.

In particular, she has demonstrated how waste plastics and waste rubber can be valuable components as a partial replacement of coal and coke in EAF steelmaking. In bridging the gap between pure and applied research, she has focused on the behavior of carbon in high-temperature conditions, and has provided fundamental understanding of materials processing in these industries. This work is providing the opportunity for industry to work towards environmentally friendly and cost-efficient production methods. Already more than 1.5 million tyres have been prevented from ending up in landfill.

Importantly, the commercialization arm of UNSW has signed an agreement with Australia's largest manufacturer of steel long products, OneSteel, to allow the sublicensing of this unique technology.

Professor Sahajwalla spent a large portion of her lecture discussing her team's research into a solution for ASR – automotive shredder waste. This is the most problematic of the non-metal components of vehicles that cannot be recycled easily, and which include items such as plastics, windscreens and other glass. The problems associated with the recycling of windscreens arise because of the lamination used to create safety glass.

According to the US Environmental Agency, about 80% of a waste vehicle by weight can currently be recycled. Last year of the more than 85 million new cars and light commercial vehicles that came on the world's roads, the single largest number, almost 20 million, were purchased in China. Overall there were 27 million more vehicles worldwide than a decade ago. In addition, vehicles everywhere are now being replaced in ever shorter cycles. The ASR, which is being produced in increasing quantities all over the world, is essentially a mixture of ground plastics, rubber, textiles, fibrous materials and wood, contaminated with metal slivers and oil. For every vehicle, some 120 kg of ASR ends up in landfill.

Professor Sarajwalla emphasized that traditional recycling focuses on using materials in their original form, glass into glass, steel into steel, but that this model does not work for more complex materials. There is no easy way to recycle complex materials simply into their original form. Her team has now taken a completely new approach of looking at materials in terms of their elements. In other words, through innovation, they are considering complex waste as a valuable resource of elements.

Professor Sarajwalla is hoping that a solution for the ASR problem could lead to vehicles being 100% recyclable. Her research is building on the success she has achieved in using high temperature reactions to convert waste tyres and plastic into valuable materials for steel production. In the case of ASR, she is already achieving promising results using it in the production of metal alloys.

She commented that over the last 50 years, humans have consumed more resources than in all previous history. The US EPA reported in 2009 that while the world's population is projected to grow 50% between 2000 and 2050, global energy and material use will probably grow by 300 %. She told the 50 person audience that she is confident that there will be solutions, but added that those solutions will be heavily reliant on innovation and investment.

Anne Wood

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