The Royal Society of New South Wales

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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.

Friday 30 October 2009 5.30pm

Clarke Memorial Lecture

Climate Change through the lens of the geological record: the example of sea level

Professor Kurt Lambeck, President, Australian Academy of Science

Venue: Eastern Avenue Lecture Theatre University of Sydney

Booking is essential.
Email: royalsoc@usyd.edu.au or telephone 02 9036 5282

Wednesday 4 November 2009 7pm

The real significance of Hobbits: Hominid Biogeography in South East Asia

Professor Mike Morwood, University of Wollongong

Wednesday 2 December 2009 6.30pm

Studentship Awards and talks

Christmas Party to follow

Venue: St Paul's College, University of Sydney

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 19 November, at 6.30pm

"Sir Joseph Hooker, the Third Man in the Story of Evolution, Plant Collector and Explorer"

Peter Donaldson

Bulletin Editor, Bruce Welch

Lecture 4 November 2009, Darlington Centre at 7pm

The real significance of Hobbits: Hominid Biogeography in South East Asia

Professor Mike Morwood, Professor of Archaeology, School of Earth and Environmental Studies, University of Wollongong

In 2004 Professor Mike Morwood led the team that found the skeleton of a previously undiscovered human species on the island of Flores. The 'Hobbit' skeleton was of a much smaller stature than present day humans, being that of an adult who was only one metre in height. Evidence suggests that these 'Hobbits'; may have lived from 95,000 to 13,000 years ago and were probably descendants of the *Homo erectus* population that had evolved in isolation on Flores. It is believed that the 'Hobbits' may have still been in existence when the 16th century Dutch traders arrived at the island. This discovery raised questions about the nature of human of evolution.

The discovery of an endemic species of human on Flores was unexpected, but no more so than finding evidence of Hominids on the islands from 880,000 years ago. This lecture will explain why the 2004 discovery was not wholly unexpected with reference to the faunal biogeography of South East Asia. It will conclude with some of the implications for early hominin and modern human dispersal mechanisms, and for the future archaeological research in the region.

Professor Michael J. Morwood completed his B.A. and M.A. in Auckland before attaining his Ph.D at the Australian National University in Canberra.

He has carried out extensive research in New Zealand and throughout Queensland, New South Wales and the Northern Territory, both as an academic researcher and as a public archaeologist.

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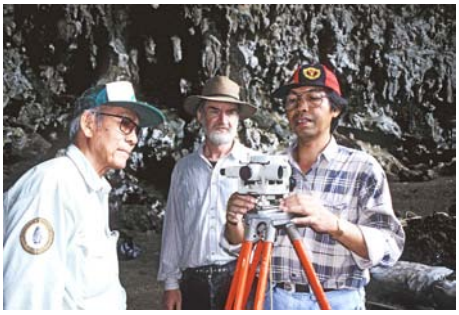

Prof. Mike Morwood (centre) at the Hominid site

Friday 30 October 2009 5.30pm

CLARKE MEMORIAL LECTURE

Climate Change through the lens of the geological record: the example of sea level

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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 7 October 2009, Darlington Centre at 7pm

The SKAMP Project - a telescope reborn to look back in time

Prof Anne Green, Head of School of Physics, University of Sydney

Lecture delivered for the Society's 1175th Ordinary General Meeting held on 4 October 2009

Radio astronomers say that God must have loved Australia, because he put all the best bits of the radio sky in the south. This probably explains why Australia is one of the powerhouses of astronomical research, and why radio astronomy is the jewel in the crown of antipodean astronomy. Professor Anne Green entertained a large audience at the 1175th OGM with her descriptions of the past, present and future capabilities of one of Australia's premier radio telescopes, and the promise of things to come.

Originally born in 1965 as a simple single-frequency transit telescope, the Molonglo Cross was a major instrument in its day with notable pioneering contributions including the discovery of the Vela pulsar (which proved that pulsars are indeed super nova remnants) and the first good survey of the southern radio sky. The telescope was extensively upgraded in 1981 to become MOST, the Molonglo Observatory Synthesis Telescope. This improved the sensitivity 190-fold and permitted high-resolution maps of up to 5 square degrees per night (the entire sky covers 41,253 so it takes years to survey the whole sky). The Sydney University Molonglo Sky Survey (SUMSS) now lists more than 250,000 radio sources. The instrument also made major contributions to the study of x-ray binaries, galactic structure and the 1994 impact of comet SL-9 into Jupiter.

The telescope is now being massively upgraded again to become SKAMP, the Square Kilometre Array Molonglo Prototype. This will increase the sensitivity 33-fold and install new receivers that can simultaneously monitor 6000 channels, a huge improvement on the previous "colour-blind" instrument that could only look at one channel at a time. Equally important, the new instrument will be able to measure polarization over a very wide frequency range. This means that it will be able to use the Faraday effect to measure our galaxy's 3-D magnetic field and to probe the magnetism of the most distant objects. This is a real breakthrough as large-scale magnetic fields are believed to be extremely important in cosmic and galactic evolution, but current telescopes can provide only the most fragmentary data. SKAMP will survey half the sky with unprecedented sensitivity. Major advances are anticipated in our knowledge of hydrogen distribution on both the galactic and cosmological scales, galactic evolution, studies of black holes, and the origin and evolution of magnetism. And we can also confidently expect that there will be important discoveries in unforseen areas.

RSNSW Vice President, Professor Heinrich Hora, with Professor Anne Green

SKAMP will lead to a veritable data flood, generating 2 terabyte of raw data per day, which hopefully can be shrunk to "only" 60 gigabytes once redundancy is removed. Scanning that refined data will be the equivalent of reading, digesting and summarizing 40 large novels per minute. Thank heavens for modern computers!

Impressive as SKAMP sounds, and important as its observations will be, it is basically just a test bed for parts of the next generation of radio telescopes, the internationally funded Square Kilometre Array. This multi-billion dollar continent sized distributed array will probe the nature of dark matter and dark energy, test Einstein's theory of General Relativity and probe the very earliest periods of the universe. Site selection has been whittled down to Australia or Africa, with a decision planned for 2012. Most observers feel that Australia has the best site from a technical point of view, but Africa has political advantages, offset by sovereign risk and a very challenging work culture. Hopefully the technical factors will win out and Australian radio astronomy can look forward to a brilliant future.

Jim Franklin,

Councillor, Activities Coordinator

Prof Green's slides (3.7 Mb PDF) can be found at http://nsw.royalsoc.org.au/talks_2009/talk_Oct2009.html

Fibre optic cables being laid as part of the upgrade to the Square Kilometre Array Molonglo Prototype

From the President

The forthcoming Clarke Memorial Lecture promises to be an exciting opportunity to learn what geology is telling us about climate change and to see how it can contribute to the current debate. We are fortunate in having Professor Kurt Lambeck, President of the Australian Academy of Science, as the Clarke Memorial Lecturer for 2009. I do hope you will be able to attend this important lecture.

The opening of the new Science Exchange in Adelaide earlier this month was a major event for science advocacy in this country. It will be a vital cog in science communication, housing the Australian Science Media Centre, as well as the Royal Institution of Australia (RiAus), which, as you know, has already involved the Society in several of its activities.

I represented the Society at the State Dinner held in Adelaide's Convention Centre to mark the occasion. The high regard in which the Society is held was evidenced by the fact that I was seated at one of the tables adjacent to the top table with HRH the Duke of Kent presiding, and the Governor of South Australia, the South Australian Premier, Mike Rann, Baroness Professor Susan Greenfield, Director of the RiGB, and another member of the British government present. At our table was the President of the Australian Academy of Science, Professor Kurt Lambeck, the Head of Questacon in Canberra, Professor Graham Durant, the Director of the RiAus, Professor Gavin Brown and the Chief Scientist of South Australia, Dr Ian Chessell, sitting next to me.

The Science Exchange itself is a good model for what we can do with Science House. In fact, because Science House is much larger, we have scope to do even greater things there, including a greater educational role, and more for the commercialisation of science. We hope to build up an ongoing relationship with the Adelaide Science Exchange in all its aspects.

I will be representing the Society at the next meeting of the Royal Societies of Australia in Hobart in early November. This will be an opportunity to build on the previous work done to secure

a firm foundation from which to work collaboratively across all Royal Societies in Australia.

John Hardie

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He is particularly interested in ethnohistory, material culture studies and the social-ceremonial role of art in Aboriginal Culture.

In 2007, alongside Penny Van Oosterzee, Professor Morwood won the John Mulvaney Book Award for the publication of *The Discovery of the Hobbit: The Scientific Breakthrough that Changed the Face of Human History* documenting his work on the Indonesian island of Flores. In addition to his work in Indonesia, he is an expert in Australian Aboriginal rock art and the author of *Visions from the Past: The Archaeology of Australian Aboriginal Art*.

He is currently the Professor in Archaeology, School of Earth and Environmental Studies at the University of Wollongong.

Australian scientist wins Nobel prize

Tasmanian-born Professor Elizabeth Blackburn has become the first Australian woman to win a Nobel Prize.

Professor Blackburn has already made history for changing the way scientists think about ageing and disease with her groundbreaking work on cells.

Now she and her US-based colleagues Carol Greider and Jack Szostak have been jointly awarded the 100th Nobel Prize for Physiology or Medicine in recognition of their work.

But Professor Blackburn's win is also historic because she is the first female of Australia's handful of Nobel laureates.

The trio has been credited with creating a new field of science, with their investigation of chromosomes and the discovery of an enzyme which they named Telomerase.

Telomerase is almost like an anti-ageing solution - it is critical to the regeneration of cells, which are the building blocks of life. If cells cannot replenish, humans are more prone to disease.

"It's important for really all our cells and our bodies to get to a healthy old age," said Professor Blackburn.

But the enzyme also helps bad cancer cells grow, which means the Nobel laureates' work could also lead to new ways of treating cancer.

"It's helped people really understand the processes of disease in a whole new light, and so it's very much a continuing and progressing field," she said.

She's been a professor of biology at the University of California in San Francisco since 1990, and is still asking questions. Her work is now focusing on the effect psychological stress has on cell regeneration. "The question is, can one intervene in ways that would allow people to cope better?" she said.

"We're really interested in that aspect, because chronic stress affects so many people."

Professor Blackburn was our speaker at the September 2008 meeting of the Society.

Southern Highlands Branch

Report of September Meeting

The Sun Goes on Strike by Dr Ken McCracken

Dr Ken McCracken was welcomed by an audience of 77 when he arrived to address the October meeting of the Southern Highlands branch at 6.30pm on October 15th in the Drama Theatre, Frensham School, Mittagong.

Ken McCracken made it clear that most of the research he was about to present had been done in the past three years, and that new discoveries were being made month by month, making this a very exciting time for solar physics. The lecture that followed detailed the cyclical activity of the sun, as demonstrated by its sunspots and other behaviours, and their relationship with global climate records.

Four hundred years ago, Galileo noted a very "spotty" sun, and concluded from his observations that the sun rotates about its axis every 27 days. Sunspots are regions of extremely high magnetic field that may occupy an area of diameter ten times greater than that of earth. The magnetic fields are very unstable, resulting in enormous explosions called solar flares. The magnetic fields result from the fact that the equatorial regions of the sun rotate faster than the polar regions.

Sunspots exhibit an approximately 11 year cycle, each characterized by a well defined maximum and minimum level of activity. When a sunspot minimum was reached in September 2006, it was anticipated that a new cycle would begin in early 2007. NASA and others predicted it would be "the biggest ever". However after the disappearance of the sunspots in late 2006, new spots failed to appear. As at the date of the lecture, there had been 735 days without sunspots during this latest minimum compared to 485 in any recent sunspot minimum.

The sun has exhibited this type of behaviour before. From 1600 to the early 1700s, in the time known as the Maunder Minimum, sunspot activity ceased to be a cyclic phenomenon. Again in the early 1800s, the reduction in sunspot activity led to this period being known as the Dalton Minimum. Both of these periods coincided with Little Ice Ages. It is now known that the sun has been inactive 22 times during the last 10,000 years.

Sunspots are just one result of the magnetic fields of the sun. Less well known, but very important for the climate of the earth, are their companions known as the faculae, the solar network and the "super granulation", all readily observable features on the sun. With sunspots alone, the sun would get cooler when there were many sunspots. However satellite measurements indicate that the sun in fact gets hotter. Dr McCracken explained that the faculae and the solar network provide an explanation for this apparent anomaly. They are able to make up for all the heat lost because of the sunspots, and then some.

In summary, Ken McCracken said that since 2006, solar magnetic fields have been decreasing, cosmic radiation intensity is increasing, and the heat output of the sun is decreasing. He stated that we have never seen anything like this before!

As for the implications of these findings on our future climate, Ken McCracken believes that if we are going into several cycles of low solar activity, then the reduced heat output from the sun may lead to several decades of climate cooling. However, over the longer term, the solar heat output will return to its previous levels, and then the 2200 year solar activity cycle will reinforce the man-made effects on the climate to further accelerate the warming of the earth.

At the conclusion of the lecture, Dr Ken McCracken answered as many questions from the audience as time allowed. The vote of thanks was given by Anne Wood..

Anne Wood

Next meeting: Thursday 19 November

Drama Theatre, Frensham School, Mittagong at 6.30 pm

"Sir Joseph Hooker, the Third Man in the Story of Evolution, Plant Collector and Explorer"

by Peter Donaldson

Peter will focus on Joseph Hooker, in his view the unsung hero of evolution and possibly the greatest botanist of the 19th century.

Peter's talk will be from Hooker's perspective, especially work that he did in the Southern Hemisphere and the Himalayas that assisted Darwin's thinking as well as his role in the publication of Darwin's and Wallace's papers at the Linean Society in 1858 and Darwin's publication of *On the Origin of Species*.

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