After months of hard work, consultation and soul-searching, The Meaning of Life exhibition in the Macleay Museum is finally open. It was a challenging exercise to decide what to include in the exhibition and exactly what constitutes the ‘School of Biological Sciences.’ But this process of historical reflection has yielded an exhibition that highlights the serious as well as the silly and social sides of the School.

Along with some truly fabulous insights into the changing fashions of biologists – beards, moustaches, beehives and bobs (and that’s just the men) – there are remarkable reflections on the contributions that the School of Biological Sciences staff have made in international research. From tracking echidnas through the snow in order to study hibernation to understanding the adaptations that frogs and desert mice use to cope with extreme conditions in the Simpson Desert; from the microscopic mapping of the transfer of energy in plants to using demographic approaches to studying fire-ravaged coastland – the School of Biological Sciences has contributed many new ideas and approaches.

The Meaning of Life was launched on September 27th by the Chancellor, Her Excellency Professor Marie Bashir. The Head of School, Professor Robyn Overall, thanked all the contributors to the exhibition, in particular the museum curator Jude Philp and the Schools photographer, Malcolm Ricketts. Science journalist and ABC Radio personality, Professor Robyn Williams, also spoke at the launch. He reminisced about the School’s co-founder, Professor Charles Birch, and encouraged all biologists to tackle the ‘big questions’. The event was attended by biologists, alumni, university heads of school and deans, as well as our friends from the Australian Museum, the Royal Botanical Gardens and in government.

The Meaning of Life is not only an exploration into the past but a taste of things to come. To find out what issues are driving research into the future, come and listen to our special series of lectures to be held at the museum – details are on the back page.

The museum will be open exclusively for alumni on Friday the 19th of October, the night of the annual alumni social Celebrate Biology: Your natural selection. See the back page for more information. Kid-friendly activities are also part of the exhibition so bring your children and grandchildren and inspire the next generation.

The fun side of work and study is being explored at the exhibition through a pin-board which is slowly being covered by photos of biology alumni, staff and students. Make sure to bring your own memory to add when you visit.

Celebrations for the School’s 50th Birthday are now well underway. I look forward to seeing you at our birthday party Celebrate Biology: Your natural selection on Friday 19 October (page 8). This will be a family friendly event on the Botany lawn with a ‘retro’ bush band and jumping castle (register at www.partybioalumni.eventbrite.com.au). There will be a special viewing of the Macleay Museum exhibition The Meaning of Life to celebrate fifty years of the School of Biological Sciences. The exhibition includes glimpses of research achievements of our staff over the 50 years, artefacts of our teaching, research and fieldwork to evoke memories and an interactive pin board of images of past students, staff and parties. The exhibition was officially opened last month by the Chancellor, Her Excellency Professor Marie Bashir, who remembered fondly taking Botany and Zoology in the first year of her medical degree (page 1). The well known ABC science journalist, Professor Robyn Williams, shared his experiences of interacting with members of the School including Professors Charles Birch, Steve Simpson and Rick Shine along with a few light hearted comments about Monty Python’s Meaning of Life. The exhibition will remain open until March 2013.

I was pleased to see so many alumni and friends at our 2012 Murray Lecture by Professor Iain Couzin from Princeton Crowd Control: The principles of collective behaviour in August. We were treated to fascinating tales of the role of ‘uninformed individuals’ in pushing a group to make a decision based upon the weak preference of a majority of individuals rather than a strong preference of a minority of individuals.

We are delighted that Professor Rick Shine has been awarded an ARC Laureate fellowship for his project Using biological invasions to understand evolutionary processes (page 6). And three of our staff Dr Gregory Brown, Associate Professor Madeleine Beekman and Associate Professor Min Chen were awarded prestigious ARC Future fellowships. Also congratulations to our latest television personality, Professor Steve Simpson, for his role in the epic documentary Great Southern Land (page 6). There are still two episodes remaining on Sunday 7 and 14 October and other episodes can be found on iview – I strongly urge you to make the time to view spectacular shows.

A warm welcome to Professor Edward (Eddie) Holmes, who joins the University this month as an NHMRC Australia Fellow from Pennsylvania State University (page 3). Eddie works on the evolution of viruses and his appointment is between the School of Biological Sciences and the Sydney Institute Emerging Infectious Diseases and Biosecurity. We look forward to interacting with Eddie and his group.

I hope you enjoy this edition of Biology News, which includes a profile on yet another of our very accomplished alumni, Dr Jim Peacock.

With warm regards

Robyn Overall

E: biologyalumni@sydney.edu.au
RESEARCH SPOTLIGHT: EDDIE HOLMES

Cue the scary music, flash to an image of disease and chaos and the scene is now set to introduce the newest addition to the School of Biological Sciences academic staff, Professor Edward (Eddie) Holmes.

Eddie is not the cause of these dramatic scenes, rather he works to understand the evolution, epidemiology and emergence of viruses. In particular, how viruses are able to jump species boundaries and emerge in new hosts. “Whether or not a virus is able to jump species boundaries reflects a complex interplay between ecology and genetics” said Eddie. (see page 5 for an example of a virus jumping species)

From Pennsylvania State University, Eddie is joining the School with a $4 million National Health and Medical Research Council Australia Fellowship. “I want to apply my knowledge of emerging viruses to the practical situation in Australia,” said Eddie. “A number of important infectious diseases have emerged recently in the Asia-Pacific region, so emerging viruses are likely to be an important issue for Australia.”

To help determine how a new virus may spread through Australia I plan to create a unique new database that will integrate information on the landscape, demographic, behavioural and socioeconomic features in Australia that are likely to have a major impact on disease transmission.” This Australian Disease Database will include information on population densities, major road networks, direction and magnitude of flight traffic and landscape features such as the Great Dividing Range. “I hope that this database will make it possible to predict how quickly and in what directions any new or existing pathogen will spread once it reaches Australia.”

The majority of Eddie’s research is on RNA viruses – the most common cause of emerging disease. “The main differences between RNA viruses and other organisms are that RNA viruses evolve incredibly rapidly and are extremely small.” In addition, the enzyme responsible for RNA replication, RNA polymerase, is very error prone. This leads to more mutations and therefore faster evolution.

“I study virus evolution in a number of ways but always using comparative approaches. That is, I compare the gene and genome sequences of different viruses. My main tool is the phylogenetic tree, which contains an enormous amount of evolutionary information.” A phylogenetic tree is rather like a family tree; if two species have very different genome sequences, they will be placed on very distant branches, which shows a very distant relationship. “The beauty of phylogenetic trees is that they can tell you so much more. With a few analytical tricks you can use them to deduce where a virus has come from, the direction it has spread through a population, how quickly it has evolved, and even how rapidly its population size has grown.”

Eddie will use these trees and the database to predict virus spread, which will help in disease control. Cue the hero music!
ALL WE WANT FOR OUR 50TH BIRTHDAY IS A NEW BUILDING!

BY ROSALIND HINDE (HEAD OF SCHOOL 2000-2004)

Speaking in Senate in October 1962, Sir Stephen Roberts, then Vice Chancellor, supported the proposal to amalgamate the departments of Botany and Zoology to form a School of Biological Sciences, but said:

“The full benefits of reorganisation and unification can only be achieved when there is a separate physical, School of Biological Sciences, but it is possible to obtain some immediate advantages.” At this meeting it was also argued that such unification is hard in older universities, as those involved have “their current personalities and history to overcome”.

Senate agreed to form the School in November, 1962, with the understanding that housing the whole School together was a high priority. At this stage there were staff and labs in five buildings - Zoology (now Heydon-Laurence), Botany and its Annexe, Macleay and Carslaw. As staff and student numbers increased space was allowed in Old Geology (now Edgeworth David), the Ross Street Building and the Science Road Cottage. We also used (and still use) teaching labs in Badham, making nine sites in all. This fragmentation certainly made overcoming “personalities and history” much slower than it should have been.

Because of the ‘plan’ for a new building, little maintenance, and no major work was done for several decades. The buildings became shabbier and more crowded as numbers grew. In the early 1970s a site was provided for the new SoBS building - next to the Department of Biochemistry (now School of Molecular Bioscience). Plans and working drawings were produced and money promised by the Federal Government. Building was to start in December 1975, but in November it became a casualty of the dismissal of the Whitlam government, as the new PM, Malcolm Fraser, put a hold on all new publicly funded buildings. It was not, however, until 1990 that the VC (Professor McNicol) said publically that a new building for the School was not under consideration! This at least allowed us to argue successfully for some repairs and for upgrading of labs and offices to current standards.

More and more people were shoe-horned into the same space, until accommodation was increased by replacing the large lecture theatres in two buildings with two floors of labs and offices, adding a wing behind Heydon Laurence and turning two floors of Zoology into three (thanks to the Heydon bequest).

By 2007 the University was planning a life sciences precinct; including buildings for SoBS, Molecular Biosciences, Agriculture, Vet and Medicine. Head of School, Mike Thompson, was assured we would move into our new building in the precinct in time for the School’s 50th birthday.

In 2008 and 2009 applications were made for funding for a Biological Sciences/Agriculture Building. The results – close but no cigar! The University then sought to fund this building itself, but financial stress has stopped that – “for at least a decade”.

In spite of the difficulties and inefficiencies caused by lacking a single home, the School has been remarkably successful in producing world-class research and teaching. In his review of the School in 2010, Lord May of Oxford said “Such successes tend to bring problems with them. And certainly there does seem to me to be a very serious problem not just with the space available but even more with the way it is dispersed from one corner of the large campus to the other... I fear that this excellent performance will be constrained under the increasing pressures faced from the way the units are scattered over roughly one square mile...”

Robyn Overall, current Head of School, recently wrote: “The University now claims to have a co-ordinated logical approach to setting priorities for infrastructure. There was a call for needs from Schools in 2012 and of course we put a new building at the top of our list...” Maybe in time for our 100th?

Thanks to Mike Thompson and Robyn Overall for the use of their School newsletter articles.
Slime mould (Physarum polycephalum) has no brain and yet it ‘remembers’ where it has been. The mechanism for this marvel has been elucidated by PhD candidate Chris Reid in a new study published in the Proceedings of the National Academy of Sciences.

As the name suggests, slime mould leaves behind it a thick mat of translucent slime. By avoiding its own slime, the mould avoids repeatedly searching areas already determined to be devoid of food. But it is not the icky-ness of the slime that causes the avoidance behaviour. Chris found that when the slime was spread everywhere, the slime mould no longer tried to avoid it.

The slime mould uses the slime as an ‘externalised spatial memory’, which enables it to navigate complex environments. In Chris’ experiments, the slime mould was challenged with the ‘U-shaped trap problem’ – a classic test given to robots to see it they have autonomous navigational ability. Slime moulds placed on un-slimed surfaces were able to lay down their own slimy memory and escape the trap quickly. Only a third of the slime moulds placed on a pre-slimed surface made it out of the trap to complete the navigation task. And those that did, spent nearly ten times longer re-exploring areas they could no longer remember.

Tragedy struck the Zoological Gardens Wuppertal, Germany in 2010 when Jerka, a 20-year old female polar bear, died from encephalitis. The male polar bear sharing her enclosure, Lars, survived only after intensive medical intervention.

Dr Simon Ho, from the School of Biological Sciences, was part of the international team investigating the cause of death. Their findings, recently published in Current Biology, pointed to a recombinant zebra herpes virus. In the wild, polar bears and zebras live thousands of kilometres away from each other, but in the Zoological Gardens they were a mere 68 metres apart. Still quite a distance for a small virus – but this suggests that direct contact was not needed to cause infection.

Dr Ho’s study of the viral genes suggested Jerka was killed by a recombinant of two strains of equid herpes virus – EHV1 and EHV9. Generally viruses are adapted to a specific host but through random mutations and recombination events, it is possible for them to cross species.

The work of Dr Ho and colleagues is essential if zoos are to maintain their mission of species conservation.

Black rats (Rattus rattus) inhabit a rich olfactory world. They sniff out dates, dinners and danger. But when searching for a meal against a crowded background of odours, do they ignore odours that might not result in a snack? Associate Professor Peter Banks and Dr Catherine Price have been investigating this question.

Their research shows that wild rats learn to ignore unrewarding smells and that this normal foraging behaviour can be exploited to ‘hide’ vulnerable prey. In their experiments, recently published in the Proceedings of the National Academy of Sciences, they pre-exposed rats to the smells of domestic quail (Coturnix coturnix japonica), in the absence of the animal itself. The rats sought out the source of the odours but soon lost interest as their foraging did not result in a meal. Once the rat’s attention had waned, the quails and their eggs were introduced into the environment.

This odour deception resulted in quail egg survival that was 62% greater compared with introducing the eggs at the same time as the odours. Associate Professor Banks suggests that “this technique is likely to be particularly useful when native predators pose a threat to prey but are themselves of conservation concern.”
Taking to the sky in gliders, helicopters, hot air balloons and anything else that will carry him, Professor Steve Simpson takes us on a unique journey across Australia looking at how we humans interact with this great continent.

Professor Steve Simpson, from the School of Biological Sciences, presented Great Southern Land – a four part documentary series on ABC TV which started on 23 September.

The series revealed how Australians use the land to produce food and generate electricity, and face the challenges of bushfires, droughts and floods. It uncovered how we move people, goods and data around the continent, and showed how the Australian population is concentrated on the coastal fringes of the continent in sprawling metropolises.

"Filming Great Southern Land was an amazing experience – this land of ours is truly remarkable," said Professor Simpson.

"In the series, we view Australia from above in all sorts of interesting ways, including while skydiving, while hang gliding, from a NSW police helicopter, from the top of a crane moving shipping containers and even from the perspective of an electrical worker crawling along power lines with 500 000 volts running through them!"

With these unique perspectives on our land, the series sought to explore how remoteness, distance and our relationship with the natural world shape the rhythm of daily life in Australia.

“The four episodes of Great Southern Land presented some really startling facts and let you in on all sorts of processes that you might not normally think about, but that affect your daily life. Like we unravelled the network of food production by tracing the ingredients of the humble Australian burger from Roma in Queensland to Adelaide, and from Victoria’s Mornington Peninsula to Queensland’s Glass House Mountains. It’s a remarkable journey!”

Professor Simpson was chosen to present the series as his biological research also takes a big picture approach, having discovered the significance of protein in our diets from work that began with examining why locusts swarm. Professor Simpson’s warmth and charm on screen, paired with his scientific expertise, lent the series a real sense of discovery and exploration.

The series was produced by Cordell Jigsaw, with executive producer, Steve Bibb, and series producer, Ivan O’Mahoney, Great Southern Land provided a visually spectacular and unique view of our continent.

The series will be available through ABC shops from 21 November 2012.

BIOLOGY’S ARC GRANT WINNERS

The School of Biological Sciences has been awarded four Australian Research Council (ARC) grants. These highly sought after and prestigious grants will enable our scientists to fund their research for the next five years.

For more read the full news story sydney.edu.au/news/sobs/1698.html

ARC Laureate Fellowship
Professor Rick Shine - using biological invasions to understand evolutionary processes ($2,175,454)

ARC Future Fellowships
Associate Professor Madeleine Beekman – social insects as model systems in complexity science ($820,180)
Dr Gregory Brown – integrating ecoimmunology and population ecology to understand how tropical reptiles deal with novel changes ($702,528)

Associate Professor Min Chen – biosynthetic and evolutionary pathways of red-shifted chlorophylls ($822,056)
ALUMNI PROFILE: JIM PEACOCK

Happenstance, and an interest in genetics, lead Dr William James (Jim) Peacock (BSc (Hons) 1958, PhD 1962) down the garden path of biological science research.

After a rewarding honours year at the University of Sydney, Dr Peacock set out on an exciting research career. His many achievements have been acknowledged by many honours including; being made Companion of the Order of Australia, fellowship to the Australian Academy of Science, the PM Prize for Science and most recently the Rabobank Leadership Award. We caught up with Dr Peacock for this latest alumni profile.

What drew you to Biology?

I grew up in the Blue Mountains where I was a keen naturalist and observer. But when I finished high school I wanted to be an economics teacher. Apparently they needed science teachers so the teachers college persuaded me to do science instead. It wasn’t a well thought out future.

I started at university in 1954, a year after Watson and Crick published the structure of DNA. It was a wonderfully exciting time in our understanding of genetics and a great era for advances in biology. But I knew science was the right path when I did a research project in my honours year. I then bought my way out of the teachers college contract.

What are your memories of your University days?

I was president of the Biological Society when I was an undergraduate. We worked on projects that took us up to various national parks where we did biological surveys. We recorded what species were present and we took it very seriously. It involved people from both botany and zoology.

I stayed in contact with the academics I respected – in particular Roger Carolin and Spinny Smith-White. I was in Roger Carolin’s third year botany class, the first he taught in Australia, and his British braces always made us laugh!!

You have been with CSIRO Plant Industry for many years but you haven’t always worked on plants, what was the focus of your research throughout your career?

Genetics. I’ve always wondered about genes. What are they? How do they function? I did honours in botany and genetics and then studied for a year at a genetics school in Adelaide before completing a PhD in genetics with Spencer Smith White. I then moved to Oregon for my post-doc because I was attracted by their published research work in drosophila. Afterwards I switched back to working on plants.

What have been the scientific highlights of your career?

The ‘jumping gene’ work I did on maize – showing the chromosome sequence changes that occur when a gene jumps in and out – would be a highlight. As would the work I did with Liz Dennis on the flowering switch gene for which we won the PM Prize for Science in 2000. The flowering switch gene determines when plants go from a vegetative to a flowering state and is agriculturally very important.

I am now working on the mechanism for hybrid vigour. Growers preferentially use hybrid plants because they have more vigour. But how does the plant do this? How does a hybrid plant produce a higher yield than its parent varieties? We found that while the chromosomal genetics are identical, there are epigenetic changes which enable the hybrids to produce so much more.

You have had many prominent roles in science, what do you feel were your greatest contributions?

I was president of the Australian Academy of Science and then chief scientist of Australia and in both those places I was able to start some important programs in school science education. I am now the patron of a national program called Scientists in Schools. We have about 1600 partnerships and we have been funded in the last budget to expand the program.

Do you still have time for research?

Yes! Even when I was chief of CSIRO Plant Industry I never gave up my research. I had 900 staff in my division but I had wonderful administrative support. I’m still in research, and I have six post-docs to do the bench-work and make fantastic contributions in ideas.
ANNUAL ALUMNI SOCIAL - FRIDAY 19 OCTOBER 4-8PM

Celebrate Biology: Your natural selection
The School of Biological Sciences turns 50 and you are invited to the party! Celebrate with former classmates and staff over some nibbles and a glass of bubbly. The Macleay Museum will be opened exclusively for Alumni so that you can take your friends and family on a trip down memory lane at The Meaning of Life: 50 years of biological sciences exhibition. Family-friendly activities include a jumping castle, live music, balloons and birthday cake. See the School of Biological Sciences’ alumni webpage for more details: sydney.edu.au/biology/alumni

VENUE  Botany Lawn and Macleay Museum, University of Sydney
RSVP  Bookings essential at partybioalumni.eventbrite.com.au

50TH BIRTHDAY LECTURE SERIES
Learn more about the exciting research being done at the School of Biological Sciences. This lecture series has been put together as part of the Celebrating 50 years events. Take the opportunity to view the Meaning of Life exhibition after the lecture

Light and photosynthesis  presented by Dr Min Chen Wednesday 24 October 2012
Futurescapes - urban ecology in a changing world  presented by Dr Dieter Hochuli Wednesday 21 November 2012
A tale of paintbrushes, party drugs, cannibalism and obesity  presented by Professor Steve Simpson Wednesday 23 January 2013
The herbivore’s dilemma - to eat or be eaten  presented by Dr Clare McArthur Wednesday 20 February 2012
Defence and the Dark Arts - plants fight back in glowing colours  presented by Professor Peter Waterhouse Wednesday 6 March 2013

VENUE  Macleay Museum, University of Sydney
TIME  6pm-7pm
RSVP  Bookings essential at biorsvp@sydney.edu.au