Merger brings new school to life

Welcome! Whether you’re a graduate in biochemistry, biology, botany, genetics, microbiology, marine science, nutrition or zoology, you are now part of the life and environmental sciences alumni community.

The Schools of Biological Sciences and Molecular Biosciences have joined, with academics from the Faculties of Veterinary Science and Agriculture and Environment, to form the School of Life and Environmental Sciences.

This new School aims to generate knowledge about the diversity, function and health of living systems from the molecular to the ecosystem scale, and to investigate the driving forces behind change such as evolution, behaviour and molecular interactions as well as the direct impact of human activities. We hope you’ll join or follow along with us in these endeavors.

A new School brings a new Head and so we welcome Professor Iain Young to the role. Iain joins us from the University of New England where he was Head of the School of Environmental and Rural Science (read more from Iain in the Headspace section on pg2).

The School of Life and Environmental Sciences is part of the Life, Earth and Environmental Sciences project which will result in major curriculum reform and (hopefully) some new buildings to house us all.

As life sciences alumni we hope that you will join us later in the year for a social gathering, that you continue to read this publication, and that you consider becoming involved in our alumni committees and mentoring programs. Stay in touch on social media too!

- facebook.com/sydneysoles
- twitter.com/SydneySOLES

“By bringing these disciplines together we will lead the way in addressing some of the biggest (and smallest) issues facing our planet.”

Professor Trevor Hambley
Dean of the Faculty of Science
Headspace

Head of School, Professor Iain Young, joins us from the University of New England, where he was Head of Environmental and Rural Science. Beyond his leadership role, he is interested in the 3D architecture of soil, which he studies using biophysical modeling and experimentation.

“As I write this ‘Headspace’ I am in Beijing on my first School of Life and Environmental Sciences (SOLES) visit to various institutions joined by colleagues from the University of Melbourne and Western Australia. All are keen to find out about the new School, as Australian and Chinese universities love restructuring. When I tell them what is happening at Sydney, the overwhelming response is “that’s what we should do”. All are impressed by the vision and depth of SOLES, and the impressive 400-plus staff makes us one of, if not the, largest School in Australia looking at life and environmental sciences. These staff will be the core of any SOLES success.”

“The development of SOLES is a bold move for the university. Bringing together the staff and activities of four successful Faculties and Schools is no simple exercise. And yet, I am convinced that it’s the right thing to do. The answers to the questions and challenges that confront us are most likely found across discipline boundaries. SOLES will be the focus for multidisciplinary teaching and research. We will be teaching the best students the application of fundamental science across veterinary science, agriculture and biological sciences.”

“In developing SOLES, we will not forget the importance of our origins, and SOLES will have an ongoing commitment to the alumni of the former Schools of Molecular Bioscience and Biological Sciences and the Faculties of Veterinary Science and Agriculture and Environment.”

Whilst we are at the very early stages of the SOLES development it is clear that our remit will be to work together to feed the world and protect the planet. Thankfully, SOLES will not be alone in this endeavor as the school is embedded in a faculty where it significantly benefits from input from the best chemists, physicists, mathematicians and geoscientists in the country. Our resources to equip the future life and environmental science students, scientists and industries are unmatched.”

“As detailed elsewhere in the newsletter (pg 7), a new building is taking shape, and will provide impressive teaching and research space. This is the first of three new builds on the Camperdown campus, under the Life, Earth and Environmental Sciences vision of the university.”

“As SOLES develops I will provide some updates on the significant events in future newsletters.”

Professor Iain Young
Head of School
Research spotlight: Margaret Allman-Farinelli

The good news is that the prevalence of obesity in children is no longer increasing; the bad news is that obesity in young women has risen from 6% to 20%, and in young men from 5% to 14%, since 1995. To investigate the eating habits of these young people, Professor Margaret Allman-Farinelli is turning to the device in all their hands – their smartphones.

“We developed an app – called the electronic dietary intake assessment app – about two years ago for a project looking at the food environment on campus,” said Margaret. In partnership with the School of Information Technology, this app is currently being tweaked so that Margaret and her PhD student, Lyndal Wellard, can investigate the poor nutrition of these emerging adults.

Why are young adult’s diets so bad?

“I’ve been looking at the diets of young adults for the past seven years simply because they are the worst diets among adults and by that I mean they have the lowest intake of vegetables and fruits, and the highest intakes of sugar sweetened drinks and nutrient-poor, energy-dense foods.”

Margaret suspects that eating on the run forms a bigger part of an 18-24 year-olds diet, compared to adolescents. “At this stage people are starting to become autonomous in what they eat but we know that they lead quite busy and chaotic lifestyles. The message they’re giving us is that they don’t really know how to cook, shop or budget.”

The dietary intake app will collect information on where the participants are buying their food, when they buy it and who they’re eating it with. “We are interested in the social context that determines what they eat as well as what they’re actually eating,” explained Margaret. “We hope to get a good picture of their nutritional intakes and use that to develop messaging and programs to shape health promotion that suits them.”

To carry out this work, the Sydney Uni team have partnered with Cancer Council NSW on an ARC Linkage grant. “The Cancer Council can see that it’s possible obesity will overtake smoking as the major cause of cancers in this younger generation.” An ideal partner, Cancer Council NSW has relationships with young volunteers across the state; relationships and connections which are necessary to successfully recruit the 1000 young adults needed for the study.

“As they head towards middle age we don’t want to offer young people an obese unwell future.”

“I am hopeful, and I think gains are being made with children. By sustained efforts we can turn things around for the prevention of obesity in young adults too.”

Margaret Allman-Farinelli
Professor of Dietetics
Bend and twist: exploring elastin’s dynamics

By Vivienne Reiner

Elastin is a crucial building block in our bodies – its flexibility allows skin to stretch and twist, blood vessels to expand and relax with every heartbeat, and lungs to swell and contract with each breath. But exactly how this protein-based tissue achieves this flexibility remained an unsolved question – until now.

A team of researchers, including Dr Giselle Yeo and Professor Tony Weiss from the School of Life and Environmental Sciences, has carried out an analysis, published in the journal Science Advances, that reveals the details of a hierarchical structure of scissor-shaped molecules that gives elastin its remarkable properties.

Elastin is a polymer made of molecules of a protein called tropoelastin, which are strung together in a chain-like structure.

In silico and wet-lab experiments combine

The dynamics of elastin’s motion were revealed through the combination of computer modeling and laboratory work. In this work, the team compared ‘wild-type’ tropoelastin with a mutant expressed with an additional exon. By comparing the mutant and the wild-type it was found that key local regions controlled the structure and overall shape of the protein.

The dynamics turned out to be complex and surprising, Professor Weiss said. “It’s almost like a dance the molecule does, with a scissors twist – like a ballerina doing a dance.” The scissor-like appendages of one tropoelastin molecule naturally lock onto the narrow end of another molecule, like one ballerina riding piggyback on top of the next. This process continues, building up long, chain-like structures.

However, where the wild-type gave a twist and a scissors; the mutant did a stiff bend and a sway. Revealing that for all tropoelastin’s apparent flexibility, small local changes in the monomer can impact elastin’s overall motion and function.

“It’s almost like a like a ballerina doing a dance, with a scissors twist.”

Tony Weiss
Professor of Biochemistry and Molecular Biotechnology

An endangered colony of Long-nosed bandicoots in Sydney’s inner west is being assessed in an online community survey. Dulwich Hill, Lewisham and Petersham locals are being asked to report sightings or signs of these rabbit-sized marsupials.

The six-month project, headed by the School’s Dr Catherine Price, involves Transport for NSW, local councils and the Office of Environment and Heritage. Dr Price said, “We’ll be looking at the survey results to target areas for further surveys and try to understand how a critical weight range mammal might be surviving in such a highly urbanised area.”

The team is also monitoring eight sites along the light rail line with motion-sensitive cameras to try and find out if Long-nosed Bandicoots are using these areas. If you live in the area, please fill out the five minute survey.

− facebook.com/innerwestbandicoots
Changing climate, predictable evolution

Is evolution random? Or is it limited to particular solutions and therefore predictable? A new study into the evolution of Australian cockroaches suggests the same evolutionary response to climate change time and time again.

Digging deep to escape the heat
“Australia’s soil-burrowing cockroaches have a fascinating evolutionary history,” said PhD student, Jun Tong. “They evolved from wood-feeding ancestors that migrated from Asia.”

At the time the cockroaches colonised the continent, some 23 million years ago, the land was wet and lush. It then began to dry out. “The wood-feeding ancestors across the eastern seaboard adapted to the drying conditions by evolving into soil-burrowers.”

Convergent evolution
This study, published in the Proceedings of the Royal Society B, is the culmination of over a decade’s worth of work by Associate Professor Nathan (Nate) Lo, Jun, and their colleagues. Wild burrowing cockroaches are notoriously difficult to find as some species can bury themselves up to a metre underground. Most of the specimens were collected by Honorary Associate Professor Harley Rose (Faculty of Agriculture and Environment), who trekked across Australia, from tropical far north Queensland to the inner shrublands of western Victoria, to collect the 142 specimens needed for the study. The resulting ‘family tree’ suggested that soil-burrowing had evolved from wood-feeding a number of times. Jun explained, “On nine separate occasions, wood-feeders evolved soil-burrowing adaptations to become these unique animals, purpose-built for the new Australian climate.”

Nate said, “This is an example of how commonly convergent evolution occurs, and suggests that evolution is actually quite predictable. That is, life comes up with similar solutions to problems over and over again.”

Wood to soil to wood?
In building their phylogenetic tree, Nate and Jun investigated two scenarios – one in which soil-burrowing could evolve from wood-feeding and another where wood-feeding could revert back to soil-burrowing. In the first case, soil-burrowing evolved in nine separate lineages. With the alternative parameters, soil-burrowing evolved three times and reverted to wood-eating in four instances. But which is more likely? Can a soil-burrower revert?

“The former is more consistent with the evolutionary timescale for the group,” Nate explained. “In the former case, soil burrowing evolved multiple times during a period (2.1-17 Ma) when aridification events are known to have occurred in Australia; while in the latter, soil-burrowing would have evolved in one major clade before these aridification events are thought to have taken place (16-26.4 Ma).” So in the second scenario there is no obvious driver for the change.

Predictable or random evolution
Is evolution random or is it a predictable process that leads to expected conclusions? “The debate asks, if we rewound the tape of life back 500 million years then started over with similar environmental conditions, would we get the same outcome?” said Nate. His research would suggest, ‘yes’; and that those outcomes are intimately linked with changes to climate and environment.

“A number of examples of parallel evolution have been reported previously, but ours is one of the first to directly link ancient climate change in driving this process.”
What were some highlights of your time as a student?

University was a huge shock. There was so much personal freedom and exposure to many people from cultures and backgrounds that were new to me. Studying science was demanding and while I was not a top student, I later realised that persistence pays off.

Was the ‘real world’ of work what you expected?

I was unemployed for eight months before getting a temporary job in a food factory testing the salt level of peanuts. However, I had sent out over 1000 job applications and eventually I was able to get my first job as a food microbiologist.

The world of difference between the theoretical learnings from my degree and the practical experience of working solo in a lab. But interacting with people on the food factory floor helped me learn the importance of clear and effective communication of scientific information to people who needed to know, but struggle with the concepts and terminology.

Why did you do an MBA?

I was retrenched from my first microbiologist job and this experience bothered me for many years – why would a business retrench a small team of hard working scientists? As I worked my way up through laboratory management I reached a point where I wanted to do further study. I decided that an MBA would help me better understand the business logic that led to my earlier retrenchment. It also helped me to decide that the best way to protect me and my family was to run my own business where I would have more control over my own destiny.

There was a world of difference between the theoretical learnings and the practical experience of working solo in a lab. But interacting with people on the food factory floor helped me learn the importance of clear and effective communication of scientific information to people who needed to know, but struggle with the concepts and terminology.

What service does Australian Food Microbiology offer its clients?

I do “anything related to food safety”. I provide many food safety services, including food analysis, food safety training, food safety plans (HACCP) and audits, nutritional labelling, allergy management, food microbiology laboratory work including lab set up and accreditations, food manufacture quality control and quality assurance work, new product development and I am always ready and willing to help small business get started in the food industry.

How important is food safety?

When you learn that in Australia the food industry poisons 11,500 people every day and kills three people every fortnight, then you start to realise how important food safety is. Listeria monocytogenes would be the most commonly found pathogen, perhaps due to State Government mandated monitoring programs. But Campylobacter and Norovirus are causing the most food related outbreaks. Even though the microbiology can be complex and daunting, the controls for all of the food pathogens are simple and easy to implement.
Biochemist (and horologist), Emeritus Professor Philip Kuchel, was made a member of the Order of Australia on January 26th, “For significant service to science in the field of biochemistry, as an academic, author and researcher, and to professional organisations.”

Professor Kuchel was appointed to one of the two ‘establishment’ professorships in biochemistry in 1980 and alternated headship of this department until 1994. “It is curiosity driven science that I have pursued in my academic career,” he said. Professor Kuchel’s curiosity led him to make discoveries about the metabolic processes in cells using nuclear magnetic resonance spectroscopy.

In addition to academia, Professor Kuchel has been active in professional organisations – including as president of the Australian Society for Biophysics and the Australian Society for Biochemistry and Molecular Biology. And at the Australian Academy of Science, he served as secretary for Science Policy, and was a member of the Council. “These committees are linked closely to government so it was interesting to be in a position of such influence.”

Which brings us to the science of measuring time (horology); Professor Kuchel has been president of the Sydney Clockmakers Society and makes regular contributions to horological journals. “Clocks and watches have been a lifelong interest,” he said. “In fact I disassembled my first alarm clock when I was five years old and put it back together.”

The Order of Australia is the pre-eminent way Australians recognise the achievements and service of their fellow citizens – congratulations Professor Kuchel.

“I am not really sure where the passion to know how things work came from, but no doubt it is there and it has never left me.”

Philip Kuchel AM FAA
Emeritus Professor of Biochemistry

New building to house Life and Environmental Sciences

A new building, as part of the Life, Earth and Environmental Sciences project, is undergoing final council approval. The new building will be constructed on the site between the Carslaw Building and City Road. The builder has been appointed and building works are due to commence mid-2016.

This building is one of three planned to create a life science precinct. These three buildings will bring together the dispersed life and environmental sciences disciplines into a purpose-built facility.
Events

Sydney Science Forum: 2084 - how future medicine will create a happier world

Presented by Professor David James

Albert is born on 5 June 2084. At birth a prick of blood is drawn for DNA sequencing of his genome and epigenome. The Wellness App diagnoses Albert’s long term disease risks. Fecal matching is done and he is given an optimal colonisation from a suitable donor.

For the first two years of Albert’s life he is provided with careful environmental cues matching his DNA profile, ensuring optimal neuronal synapses in the brain for a happy and healthy life. The MedChip is implanted at six months to monitor sleep, food, activity and language. Data is uploaded to the Wellness App providing Albert with constant feedback about his optimal life options.

Unlike the Orwellian view of life, now we have learned how to help people live happier healthier lives. This requires individuals to take control of their own data and their own health for better outcomes. Discover how metabolic systems biology could revolutionise our health by offering precision medicine.

What’s on

− Wednesday 17 August 2016
− 5:45pm - 7pm
− Eastern Avenue Auditorium
− Free, but registration essential