COMMUNITY SCIENCE

Citizen science, crowdfunding, community engagement – Do these buzz words herald a new era in communal discovery? Involving the public in research has become the fashion, but is it worth it? What do the public offer the scientists and what can the scientists offer the people in return?

Community science can mean many things – from access to private land to data collection to project funding or even education with the aim of behavioural change. Biology News asked four of its alumni for their perspectives.

For urban ecologist Dr Adrian Davis (PhD 2014) community engagement with the Cockatoo Wingtags project began with public curiosity. “Interest was initially generated as people sighted cockatoos with yellow wing tags. This typically led to them phoning WIRES - thinking that someone had lost a bird,” Adrian said. At this stage the only way for people to report sightings (and therefore for Adrian to collect data on the birds whereabouts) was via an email address. “We then decided to trial a facebook page for the project.” The page also included nicknames for each of the tagged cockatoos. “It was a combination of the nickname and the accessibility of facebook that led to the social engagement success.”

Indeed social media seems to be one of keys to successful public science. “Social media has been important,” said wildlife conservationist Dr Ricky Spencer (BSc 1996; PhD 2001). “We communicate directly via facebook and twitter.” Ricky’s citizen science project, TurtleSAT, also uses public sightings to gather data. “Using community observations means that we can collect data across the country. We know where the turtles nest and where they are ending up as road kill.” He has also had success by targeting special interest groups like Turtles Australia.

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HEADSPACE

It is a year since I wrote my first Headspace – where did the time go? Reading over back issues of Biology News reminds me of how much has happened, and how so many people in and from the School do so many wonderful things. I thank you all – both those named and those involved but unnamed – for leaving me inspired by what you have achieved.

Reading each issue highlights to me that our world is changing – as is how we work within it. As you will see here, our ecological and conservation science on cockatoos, turtles and bandicoots has benefited from the new ways that science and scientists interact with the community (page 1). Today, the community plays an increasing, important and direct role helping to gather data and supporting research through crowd-funding. Without it, the solution to many biological questions would simply be out of our reach.

The spotlight on ecologist Mathew Crowther focuses on his research on two prominent Australian species – koalas and dingoes (page 3). What matters for koalas and what will matter in the future as our landscape and climate changes? What is a dingo, what’s a dog, and what role do they play in our landscape? Both of these are important questions. In the first, Mathew and his group are teasing apart the factors that shape koala populations in space and time; in contrast in the second, he works to understand whether and how dingoes themselves shape the ecological landscape.

Congratulations to Dr Camilla Whittington – winner of a 2015 NSW Tall Poppy Award! Camilla is recognised by her commitment not only to doing fantastic science but importantly, to communicating it effectively (page 6). You can read in detail about her fascinating discoveries of the genetic and functional parallels between male seahorses, their pregnancy and that of lizards and mammals including us humans (page 5). Congratulations also to one of our Honours students, Ruby Stephens, for receiving the first J. Allen Keast Award for excellence in undergraduate studies (page 6).

There are also lots of other snippets in the News: Do our ticks carry bacteria responsible for Lyme disease or not? Want to promote your science research? Speak with the Science Detective! And catch up on one of our alumni – Jas Chambers – who retains an interest in biology while using her skills in problem-solving and management to make our university a better place (page 7).

This will be my last Headspace, as next year we change to become a new, larger School. The good thing about change is that it gives us with the chance to look at things with fresh eyes, shake-up our thinking, and to help shape our future. I look forward to seeing Biology News morph into something reflecting that new future.

Clare McArthur
RESEARCH SPOTLIGHT: MATTHEW CROWTHER

Farming, mining, animal habitat – it is hard to limit land-use across Australia to a single purpose. Dr Mathew Crowther (PhD 2001) studies the ecology and conservation of charismatic mega-fauna, such as koalas and dingoes, trying to determine their role in the ecosystem and their needs for survival.

The koala population of the Gunnedah plains was doing well. “In 2008 it was easy to see a koala – there were seven living in the golf course in the middle of town,” Mat exclaimed. “We were easily catching them all across the farming properties, but I don’t think we’ll have such luck this time.” Mat is about to head back up to the Liverpool Plains to do another survey of koala numbers. But with an increase in the severity of summer heat waves there has been a dramatic drop in the koala population. Heat is not the koala’s only challenge, with incidences of disease also increasing.

Mat is part of a cross-disciplinary team including ecologists, veterinary scientists and industry partners, who were awarded an ARC Linkage grant to study the koalas of Gunnedah. “We are looking at why this drop in numbers occurred, and how can we manage koalas into the future.”

To do this Mat and his collaborators need to get a handle on how the koalas use their trees and how the trees are shaped by the land. “What do the koalas need from the trees? – shelter, moisture, nutrients? – and how do these things relate to soil type?” Leaf chemistry, which is related to soil type, is an interesting and important question to address when studying herbivores like koalas. “Koalas have such a specialized diet of eucalyptus leaves and they need to deal with the toxins in them.” Mat asks, do the koalas have to eat combinations of trees because they have different toxins in them? Maybe they can only handle so many?

Indeed Mat’s study involving GPS-collared koalas showed that they were using a mixture of trees; some for food and others for shelter (see Issue 24 of Biology News for more). Understanding tree use will be crucial in planning for their conservation. If land use is to change, trees need to be planted now and given time to grow. There is no point in moving a population of koalas onto seedlings, especially if the seedlings are planted on the wrong soil.

Moving from herbivores to carnivores – Mat’s work on dingo ecology is also yielding important results for conservation. “We’ve shown that dingoes have positive effects across multiple landscapes,” he said. “They suppress fox numbers – hence you get more small-to-medium sized mammals and more native vegetation in areas where there are dingoes.” Meanwhile on the other side of the dingo fence, without a top-predator, kangaroo numbers are extremely high. “The dingoes have a top-down influence.”

Despite these positive ecological services, dingoes are polarizing. Indeed, even defining a dingo had been difficult. “If you want them dead, then they’re a wild dog. If you want them alive, they’re a dingo.” So Mat went searching for a ‘baseline dingo’. “We compared pre-European specimens and specimens from early explorers that had hybridized to dogs to try and work out what a dingo is.” In doing this they discovered that dingoes were in fact distinctive from dogs and wolves.

“We know that hybridization between dogs and dingoes is probably common in parts of Australia – but does that matter?” Mat went on to say that the hybrids were more like dingoes than dogs and that, as they had not been selectively bred, the dingo traits appeared dominant. “Most dogs are not generally good at surviving away from humans.” From an ecological point of view too, the hybrids provide the same top-down regulation as dingoes.

“We are trying to untangle these issues of names and roles so we can put some science into land management and provide guidance with more realistic biological targets.”
AUSTRALIAN PARALYSIS TICK: SEARCHING FOR A LYME-DISEASE AGENT

Controversy surrounds Lyme disease in Australia. The bacteria responsible for the disease, *Borrelia burgdorferi*, is found in ticks in the Northern hemisphere but not in the Australian Paralysis Tick (*Ixodes holocyclus*). So without the causative agent, how can people claim they have Lyme disease? And yet a clinical presentation of fever and flu-like symptoms – along with a tick bite – has sufferers convinced they have Lyme disease; and in the absence of overseas travel, they are also convinced that they acquired it in Australia.

New work, published in Parasites and Vectors, has used a clever genetic method to survey for bacteria present in the Australian Paralysis Tick. Previous bacterial analysis of the ticks had been limited by an endosymbiont called *Candidatus Midichloria mitochondrii*, whose genetic signal swamped any other medically important bacteria.

Associate Professor Nate Lo was part of the team who designed a method for un-masking the presence of the other bacteria. Yet again, no *Borrelia burgdorferi* was found in the Australian tick, although this method revealed its presence in the German tick (*Ixodes ricinus*).

However other potential pathogens were identified. One of these was *Bartonella henselae*, a bacteria associated with relapsing fever. “Our paper doesn’t find the definitive pathogen,” Nate said. “We can’t yet link the bacteria we found in the ticks to causing disease in humans. But this work does provide a number of candidate pathogens for further study.”

The show features both short interviews and longer discussions on broader issues. This allows researchers to give a voice to their work and to ignite an interest in listeners. And coming on-air does come with the god-like power of choosing some music to be played!

The show’s objective is also to promote science research to the wider USYD community.

About the Host:

I recently moved to Sydney to complete an Honours project in the School of Biological Sciences. I would like to have an impact on the way science, and women in science, are portrayed in the media. I have interned in broadcasting media in London, previously studied in Melbourne and this is my first radio show.
Their pregnancies are carried by the males but, when it comes to breeding, seahorses have more in common with humans than previously thought, new research from the School of Biological Sciences reveals.

Seahorses are famed for being part of the only family in the animal kingdom (Syngnathidae) in which the male is responsible for pregnancy. What hasn’t been known until now is the degree to which male seahorses nourish and protect their embryos in their brood pouch during the 24-day gestation period.

Findings co-authored by Dr Camilla Whittington, published last month in Molecular Biology and Evolution, show male seahorses play as much a part in nurturing embryos during pregnancy as female mammals. Previously their role, other than as pouch provider, was largely unknown.

“Surprisingly, seahorse dads do a lot of the same things human mums do,” said Dr Whittington.

“Seahorse babies get a lot of nutrients via the egg yolk provided by their mothers but the pouch of the fathers has also evolved to meet the complex challenges of providing additional nutrients and immunological protection, and ensuring gas exchange and waste removal.”

Dr Whittington and colleagues found male seahorses are able to deliver nutrients to their developing embryos, particularly energy-rich lipids, and calcium to allow them to build their tiny skeletons. It is likely these nutrients are secreted in the brood pouch and then absorbed by embryos.

They also found male seahorses’ gene expression during pregnancy was similar to that of humans. Their research involved taking samples from brood pouches and assessing how gene expression changed during the course of the pregnancy. It is the first RNA sequencing study – monitoring how much genes switch on and off – across the full course of pregnancy in any animal.

“Regardless of your species, pregnancy presents a number of complex challenges, like ensuring you can provide oxygen and nutrients to your embryos. We have evolved independently to meet these challenges, but our research suggests that even distantly related animals use similar genes to manage pregnancy and produce healthy offspring.”

The similarities between seahorse, mammal and lizard pregnancies revealed in the paper warrant further investigation, Dr Whittington said. This will indicate whether the evolution of animal pregnancy across all species is more similar than previously thought.
Dr Camilla Whittington has won a 2015 NSW Tall Poppy Award from the Australian Institute of Policy and Science.

The awards are given to scientists who combine world-class research with a passionate commitment to communicating science. Camilla said, “I believe it’s the responsibility of scientists to engage with the community.”

Camilla studies how innovations like venom and live birth have evolved. “By applying new molecular technologies and functional experiments to a targeted range of pregnant mammals, reptiles, and fish, my research aims to identify the genetic underpinnings of viviparity, and to elucidate fundamental mechanisms leading to the evolution of innovation,” she explained. (See page 5 for more on her work).

J. ALLEN KEAST AWARD

A new prize, in the School of Biological Sciences, has been gifted from the estate of alumnus, Emeritus Professor James Allen Keast (BSc 1951; MSc 1953).

Allen Keast (1922-2009) was a world renowned ornithologist and generous benefactor; in 2004 he donated $10,000 to the School to establish a visiting lectureship in conservation biology. This new prize, the J. Allen Keast Award, is awarded annually to a current Honours student based on excellence in their prior undergraduate studies.

In its inaugural year, the J. Allen Keast Award has been won by Ruby Stephens. “This came as quite a surprise, but it’s really amazing to have the work I’ve put into my studies recognised,” Ruby exclaimed. “I also feel quite honoured to have won an award in the name of such a passionate nature loving biologist.”

Ruby is currently in the field investigating Australian native stingless bees for her Honours project. “I want to find out whether stingless bees are more aggressive to neighbours or strangers, and how this affects their interactions and dispersal.”

When asked about her undergraduate studies, Ruby – like Allen Keast before her – fondly reflected on trips to the School’s field station at Pearl Beach. “Things like trips up to Warrah helped keep me motivated through my degree, and taught me how to keep a keener eye out for interesting biology in the bush.” What a wonderful continuity to the shared experience of students in our School.
ALUMNI PROFILE: JAS CHAMBERS

Whilst on the Biolsoc executive, Jasmine (Jas) Chambers (BSc 1997) discovered a talent for bringing people together. With this talent, and her love of science, Jas has been problem solving at the University for nearly two decades.

As General Manager for the Division of Natural Sciences at the University of Sydney, Jas and her team support three Faculties and the Schools, Departments and Disciplines across the Division. Responsible for everything from the photocopy paper to getting a new multi-million dollar science building built, Jas works energetically to support the University’s mission around education and research – missions that led her to a career at Sydney Uni.

What drew you to major in both biology and psychology?

I had a love of biology as a kid – particularly marine biology. At school I had the most amazing science teacher – Mr Dan Massey. He introduced the concepts of connectivity and complex systems to me. These concepts were driven home when I started science at university – that systems can be robust on their own, that they can affect one another, and that they are quite delicately held together.

Psychology I knew nothing about, but I thought it might help me psycho-analyse my family and friends! Discovering statistics in psychology was a shock, but in my work I am constantly analysing numbers, looking for trends, and coming up with solutions based on that analysis. The combination of the two disciplines, alongside the skills I gained through the study of science, are the foundation of how I work.

What was the highlight of being part of the student-run Biological Society?

For me it was helping take the membership from 20 in 1995 to over 400 by the end of 1996. Biolsoc became a huge part of my senior years at unil. My close friend Alex Bannigan was the president and I was the social secretary. Our mandate was to bring together the scholarly community – students and staff – socially. Those social gatherings were fun, but it is only now that I realise we were networking.

We would find out about opportunities to be involved in research, to volunteer at the Zoo or for a fieldtrip. We would hear that someone was organising scuba diving training, or that there was a talk from an out of town scientist. We were exposed to context, and how things operated outside of the School and the University.

How did you get into student recruitment and marketing?

I considered going into honours following my bachelor degree, but my involvement in Biolsoc had allowed me to discover some things that I was naturally good at – talking to people and bringing people together. So I studied communications at UTS and began working for a small public relations company. I learnt a lot about what it takes to get noticed in a busy city like Sydney.

But my hankering for engagement with science didn’t go away. Part way through my studies at UTS, Sydney Uni advertised an administrative assistant role for student recruitment and experience. Shortly thereafter I was organising public lectures, interviewing scientists about their work and talking to high school students about what it was like to be a student of science at university. I had found my dream job.

What drew you back to Sydney Uni as a professional?

Science and education are what drew me back, and what keeps me here. I work with ecologists, soil scientists, chemists, astronomers and psychologists who are all seeking to push the boundaries of their field and who are also here to educate the next generation to do the same. Such aspirational objectives are pretty irresistible and figuring out how the University might provide the best environment for that to happen is a big challenge in such a complex institution.

Early in my career I was influenced by the idea that the science community needed to ‘collaborate to compete’. This has had a profound effect on how I try to work. I am most proud of having built great teams who recognise what they are here to do, who innovate to go beyond the necessary, and who achieve more because they understand that together they are more.

What does the General Manager for the Division of Natural Sciences do?

The big picture answer is to support the University’s education and research. This can mean anything from making a process work better, to improving the student experience, from pulling information together about our research performance to report to government, through to supporting major academic initiatives. I spend a lot of time with my team on preparing proposals for new equipment or infrastructure, and I participate in forums about how the University can remain competitive, relevant and connected with the community at large – in Australia and internationally. Those answers keep changing, and so we must keep innovating. 18 years on, I still have a dream job!
Continued from front page.

Henry Cook (BSc 2005; MWildHlthPopMgt 2006) offered a tonic to despair in his crowdfunded project Parrots, the Pardalote & the Possum. “In the lead-up to launch there had been quite a lot of sad news regarding species declines and environmental degradation, so a lot of people were despairing about the state of our natural environment,” explained Henry. “It’s very hard for people to know where to begin if they want to help the environment. And here [in the project] was a researcher who had identified a problem and had figured out a solution.” Henry’s Pozible campaign aimed to fund nest boxes for the endangered Tasmanian swift parrot. “For many people, purchasing a nest box was an accessible starting point. They were paying for something tangible that would make a difference.” And there, I think, is the crux. People want to feel like they’re making a contribution.

The Nosey Little Neighbours: Manly Bandicoots in Backyards project engendered a sense of community pride in the locals of North Head. “The people are proud of their bandicoot population,” said Dr Catherine Price (MWildHlthPopMgt 2004). “I try to focus on how special it is to have this type of native animal around given the loss of so many of our small-medium sized marsupials.” And in this way Catherine also hopes to turn around the negative perceptions of bandicoots as tick hosts, lawn destroyers and renovation stoppers. These successful community projects have many things in common – social media presence, special interest group engagement, “feel good” factors and a conservation focus. The challenge and caveat to citizen science and crowdfunding may therefore be in selecting the right projects with which to involve the community. But Henry, Catherine, Ricky and Adrian all agreed that they would do it again!

EVENTS

SO LONG AND THANKS FOR ALL THE FISH - FRIDAY 6 NOV 2015

ANNUAL ALUMNI PARTY

The School of Biological Sciences will join with other like-minded life-science focused Schools next year to form the new School of Life and Environmental Sciences. Join us for one final garden party before the union takes place (and then join us again next year under a new name).

Nibble on canapés and devour a crêpe; play a game of bocce, quoits and giant jenga; enjoy a glass of wine or a beer; and go into the draw to win a field-trip inspired terrarium.

VENUE: Macleay Foyer/Botany Lawn, University of Sydney.
TIME: 5pm-8pm
COST: Free, with registration. Drinks and finger food provided, children welcome.
REGISTRATION: RSVP to Cecily Oakley by Monday 2 November, via phone to 02 9351 4543 or email biorsvp@sydney.edu.au

FACULTY OF SCIENCE

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