Top 5 innovators

By Antonia Maiolo | 27th August, 2013

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We asked you to nominate an academic who has made an extraordinary breakthrough in their field this year. Here is our first Top 5 round-up, as chosen by you. By Antonia Maiolo.

Reinventing research funding

Deb Verhoeven is using crowd funding and social media to help small research projects launch and survive

Name: Deb Verhoeven

University: Deakin University

Position: Professor of media and communication

Faculty: Arts and Education

Under the expert guidance of professor Deb Verhoeven, Deakin University researchers have discovered crowd funding – an innovative way to finance academic projects.

Wanting to help small-scale research projects get off the ground, Verhoeven set up the first official partnership between crowd-funding website Pozible and a university – the Research my World initiative.

Pozible allows people to promote their idea or project to drum up financial support. Verhoeven voluntarily led eight diverse research groups from across the university as they ran their crowd-funding campaigns.

The media campaigns lasted 45 days. Members of the public were able to pledge donations. Once a project achieved its funding target, pledges were converted into paid donations. Of the eight projects, six were successfully funded within the timeframe, raising more than $60,000 altogether.

“There are so many barriers for young, early researchers with small-scale projects, Verhoeven said. “They just want a small amount of money, so I thought, ‘Why couldn’t we do this?’ It just looked like a brilliant way to reconnect universities to the public.”

With the assistance of other media experts, Verhoeven coached and mentored the researchers through the process – helping them set up their social media feeds and promotional materials and guiding them throughout their entire campaigns.

The campaigns helped generate more than 200 stories in traditional and online media over the 45 days. The projects were mentioned in TV reports and received more than 3000 tweets. The campaigns also worked closely with smaller communities – led mostly by the researchers themselves, who attended town hall meetings, gave lectures to community groups and attended fetes and festivals. Such involvement allows research success to be measured in terms of a project’s importance to the public rather than just

the view of other academics, Verhoeven said.

"By going directly to the public to fund their projects, researchers break down the walls between universities and the community, giving the public greater insight and involvement in what we do as academics," she said.

Verhoevens' efforts have been praised by the researchers, who are grateful to her for helping them get their message out to the public to build their profile on a local and global scale.

Verhoeven said she and her team were now working with Pozible to extend the project to the wider university sector.

Reinventing Sanskrit study

McComas Taylor is reviving study of an ancient language around the world

Name: McComas Taylor

University: Australian National University

Position: Head of the South Asia program

Faculty: Asian Studies

McComas Taylor, an expert in the classical Indian language Sanskrit, has given students across the globe access to a world-first online course, sparking renewed interest in the ancient tongue.

This year, for the first time ever, the entire content of the first-year Sanskrit curriculum was packaged into an eTextbook, which is helping the material reach a new demographic.

Offered by Australian National University, the entire course, including materials, was preloaded onto iPads and couriered out to students worldwide – all over Australia and as far as Singapore and the US.

"All over the world, Sanskrit departments are in decline," Taylor said. "But my program reaches out to a new demographic – Hindus, Buddhists, yoga teachers and students and people who have deep engagement with different facets of Indian art, music, dance and song."

He explained that there will never be more than a handful of students wanting to learn Sanskrit in any given location. He said the trick was to find ways to reach out to this scattered demographic.

"I spent three months last summer teaching Sanskrit to my iPad, so the iPad can teach Sanskrit to my students. This frees me up to spend quality time interacting with them, practising conversation, chanting and helping out with questions.

"I always loved the idea of teaching one of the oldest languages with the newest technologies."

Each week, students view introductory videos, watch Taylor model the pronunciation and patterns in Sanskrit conversation, practice a short poem and listen to a series of mini-audio lectures. Taylor then meets with all the students for 90 minutes in a virtual classroom so they can interact with him and each other.

Today, Taylor teaches 52 students across five classes, a jump from the six enrolled when he first began teaching in 2006.

"The result has been remarkable … Early indications are that overall learning outcomes have improved," Taylor said, adding that there are now students from Europe, the US and south Asia in his classes.

Taylor's passion for Sanskrit began 20 years ago when he first read the Indian epic the *Mahabharata* in a potted translation. He pledged that he would spend the next 10 years studying Sanskrit so he could read it in the original.

Sanskrit is an Indo-European language and the key to classical Indian civilisation, which can be traced back as far as 300BC.

Reinventing fly ash

Sri Bandyopadhyay has found a way to make a cheap by-product of coal power attractive to many industries

Name: Sri Bandyopadhyay

University: The University of New South Wales

Position: Associate professor

Faculty: Science

A common waste material is being converted into engineering gold thanks to the research efforts of UNSW researcher Sri Bandyopadhyay.

For the past seven years, Bandyopadhyay has been working to promote the use of fly

ash – a freely available by-product from coal-fired power stations – in Australia.

To make the fly ash more attractive to Australian consumers, Bandyopadhyay and his research team developed a technique to turn the powdery material from black to near white.

“People call it a waste material. I do not like this notion,” Bandyopadhyay said.

In fact, fly ash is a cost-effective alternative to calcium carbonate (mineral used as filler in plastics in huge quantities) and can be used to strengthen commercial polymers, such as plastics, ceramics, cement, potteries and even white paints.

Bandyopadhyay is committed to getting Australia to use 100 per cent of all fly ash material, not only because it is cheap, but also because using it in the manufacture of products and energy storage could stop it from being dumped back into the environment.

Australia now uses only about 40 per cent of its fly ash, whilst China, for example, already use 67 per cent of the amount it produces.

“Our near-whitened fly ash will save lots of other valuable minerals such as calcium carbonate.”

Bandyopadhyay worked closely with Cement Australia to advance the technology that can take fly ash from black to nearly as white as calcium carbonate.

The whitening might encourage coal power stations, the utility industry and governments to use fly ash in whitethermoplastics/thermosets, cement, concrete, non-load bearing bricks, non-ferrous metals and geo-polymers.

Fly ash also has potential in dielectric and capacitor applications. The project is now ready to be adopted for large-scale applications and has already drawn the attention of India, Singapore and China.

Bandyopadhyay plans to set up and lead a fly ash recycling engineering centre to further promote the use of the material.

“I would like to see that this is done for Australia,” he said. “It is not my personal gain but it is my personal love and dream.”

Reinventing arthritis research

Matthew Brown’s genetics discovery has created new possibilities for treating a rare and crippling disease

Name: Matthew Brown

University: University of Queensland

Position: Director of the University of Queensland Diamantina Institute and professor of immunogenetics at UQ

A Queensland medical researcher is paving the way for new treatments of ankylosing spondylitis (AS), a severe type of arthritis that affects more than 80,000 Australians.

The breakthrough came when professor Matthew Brown, a leading international researcher in musculoskeletal disease genetics, alongside his team at the University of Queensland Diamantina Institute, found the two major gene determinants of AS. “The genes that we identified are involved in the causation of the disease and hadn’t been considered in AS at all,” Brown explained.

His groundbreaking research has led to treatment trials, in which pharmaceutical professionals are working with researchers to find therapeutic treatments for the disease, which ultimately cripples its sufferers.

AS causes inflammation and pain in the spine and other joints. It occurs when the immune system attacks the joints in the spine and then new bone grows around the affected areas, fusing the spine together and stiffening it permanently.

It can also affect other organs, such as the eyes and less commonly the heart, lungs and kidneys.

Brown, who is also principal investigator in international consortia studying AS, says the disease is as common as type 1 diabetes. It usually first appears between the ages of 15 and 45 and is about three times more common in men than women.

As of now, there are no treatments available to prevent the long-term physical effects of the disease, Brown said.

He has been awarded the $1.25 million Premier’s Science Fellowship to develop his work on the diagnosis and treatment of rheumatoid arthritis and tuberculosis.

He said research into these two diseases was related, as they share susceptibility factors.

“The techniques we are developing have real commercial possibilities and healthcare benefits,” he said.

He recalls that he became interested in a career in genetics research in the late 1980s, when the causative gene for cystic fibrosis had just been detected. He said that discovery created a huge amount of interest and excitement amongst patients and the

research community.

“I’d always been interested in genetics and although I enjoyed clinical medicine a lot, I realised I could make a better contribution by doing research,” Brown said.

“Genetics research in rheumatic diseases was just taking off, and so that’s how I got involved.”

Reinventing solar power

David Jones is producing extra-large cells that have the potential to make solar power much cheaper

Name: David Jones

University: University of Melbourne

Position: Associate professor and project coordinator for Victorian Organic Solar Cell Consortium (VICOSC)

Faculty: Science

Dr David Jones has led a team of researchers from the University of Melbourne, CSIRO and Monash University in producing the largest flexible solar cells ever to be printed in Australia.

Jones is the project coordinator of the Victorian Organic Solar Cell Consortium (VICOSC) – a partnership of research and industry associates.

After six years of working on the development of printed organic solar cells, Jones and his team discovered a way to print organic photovoltaic cells the size of an A3 sheet of paper.

Thanks to a new solar cell printer, worth $200,000, the cell is 10 times the size of ones they had previously made.

“We have shown that it is possible to use commercial printers to print solar cells,” Jones said.

Using semiconducting inks, the solar cell modules are printed straight onto a paper-thin flexible plastic film. The researchers then encapsulate it in a protective sheet, just like laminating a piece of paper. With the ability to print at speeds of up to 10 metres a minute, they can produce one cell every two seconds.

“This is truly a great opportunity to change the way we perceive renewable energy,” Jones said.

He said sun-powered cells are generally still expensive when compared with other sources of renewable energy or traditional power. So in order to allow a large-scale roll out of solar energy, new technologies need to make it cheaper. Jones said the new process is a fundamentally different approach that could do the job.

Studies have indicated that organic solar cells can generate power cheaply. “Low-cost, printed, organic solar cells could be printed on and embedded into many building materials, so that when you build a house you would automatically install solar arrays.

“I would like to see every house, factory, school or warehouse covered with solar cells,” Jones said.

The benefits could potentially be much broader, however. “When affordable renewable energy becomes available, we will be able to drive power storage systems, use the energy to drive chemical transformations or simply deliver purified water to millions of people worldwide who do not have daily access to clean drinking water,” Jones said.

“As the technology develops and our ability to print and integrate printed solar cells into more products progresses, so will the range of applications and products that become available.”

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