



# Science, Technology and Education News from Australia, April 2014

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## 1. Technology

### Innovation could drop brown coal emissions by up to 50 percent

(April, 28, 2014)

Australia's *Commonwealth Scientific and Industrial Research Organisation* (CSIRO) and its industry partners plan to trial the Direct Injection Carbon Engine (DICE) in Victoria's Latrobe Valley, the second largest and lowest cost brown coal resource in the world, with the aim of reducing emissions from brown coal-generated electricity by 50 per cent compared to current technology.

Brown Coal Innovation Australia (BCIA) has allocated A\$1 million to the technology trial, which is designed to maximise the value of Australia's unique resource by significantly reducing emissions associated with the use of brown coal. The collaboration was announced today by Victorian Minister for Energy and Resources, Russell Northe, at the third International Low Rank Coal Industry Symposium in Melbourne.

CSIRO Energy Group Executive, Dr Alex Wonhas, said DICE technology may allow Australia to economically develop coal reserves while reducing the environmental impacts of the sector.

To read the full article click [here](#).

### Droplet lens turns smart phones into microscopes

(April, 24, 2014)

Australian scientists have invented a simple and cheap way of making a high-powered lens that can transform a smart phone into a high-resolution microscope.

Costing less than a cent, the lenses promise a revolution in science and medicine in developing countries and remote areas. The lens fabrication technique was invented by Dr Steve Lee from The Australian National University (ANU) Research School of Engineering, who collaborated with Dr Tri Phan from Sydney's Garvan Institute of Medical Research to find ways to transform the lentil-sized lens into a medical imaging tool.

The lenses are made by using the natural shape of liquid droplets.

"We put a droplet of polymer onto a microscope cover slip and then invert it. Then we let gravity do the work, to pull it into the perfect curvature," Dr Lee said.

"By successively adding small amounts of fluid to the droplet, we discovered that we can reach a magnifying power of up to 160 times with an imaging resolution of four micrometers."

To read the full article click [here](#).

## 2. Life Science

### Scientists in Australia make cochlear implants even better

(April, 24, 2014)

Cochlear implants have changed the life of many people with hearing loss, allowing them to hear the world that surrounds them.

But the implants aren't perfect. Most users report not being able to distinguish musical pitches or have trouble hearing a conversation in a very noisy room.

The tiny hair cells in the cochlea translate sound into nerve impulses. Hearing loss usually occurs when these hair cells are lost due to exposure to loud noises, ageing or other factors. Cochlear implants play the part of the missing hair cells, sending electrical impulses to auditory nerves in the brain. A better connection between the implants and the auditory nerves could improve tonal hearing.

Researchers at the University of New South Wales have now implanted bionic ears in deaf guinea pigs and then injected a protein that encourages nerve grow. "The DNA was taken up by the cells in the cochlea and, after two weeks, the nerves had grown significantly toward the electrodes," explained Breanna Draxler from the magazine



*Discover.* “When the guinea pigs’ hearing was tested they found the animals that were once completely deaf had their hearings restored to almost normal levels.”

To read the full article click [here](#).

### 3. Health Care / Biology

#### **Pap smears could be history by 2016**

(April, 29, 2014)

Pap smears are great - since they were introduced in 1991, Australia has developed one of the lowest rates of mortality for cervical cancer in the world.

In fact, in the first 10 years of the program, Pap smears reduced deaths from cervical cancer by 50 percent, Ian Oliver, Chief Executive of Cancer Council Australia told the Sydney Morning Herald.

But despite the positives, women everywhere will probably be relieved to know that the Australian Medical Services Advisory Committee have recommended that a new test for cancer-triggering human papillomavirus (or HPV) replaces Pap smears from 2016.

Unfortunately, the new test involves a very similar procedure to Pap smears, but it will only need to be carried out every five years after a women turns 25 (currently Pap smears are given every two years from 18).

The plan would drastically reduce the number of tests women would need throughout their lifetimes, while still protecting them against cervical cancer.

To read the full article click [here](#).

#### **Australian scientists find new way to fight Malaria drug resistance**

(April, 15, 2014)

An anti-malarial treatment that lost its status as the leading weapon against the deadly disease could be given a new lease of life, with new research indicating it simply needs to be administered differently.

The findings could revive the use of the cheap anti-malarial drug chloroquine in treating and preventing the mosquito-borne disease, which claims the lives of more than half a million people each year around the world.

The parasite that causes malaria has developed resistance to chloroquine, but research carried out at the Australian National University (ANU) and Germany’s University of Heidelberg has shown that the parasite protein that causes resistance has an Achilles’ heel.

“We studied diverse versions of this protein and in all cases found that it is limited in its capacity to remove the drug from the parasite,” said malaria researcher Dr Rowena Martin, from the ANU Research School of Biology.

“This means malaria could once again be treated with chloroquine if it is administered twice-daily, rather than just once a day”. Once hailed as a wonder drug, chloroquine is still used in developing nations in the South Pacific, Africa, Asia and South America, but has been withdrawn from use in many developed countries.

To read the full article click [here](#).

#### **Virtual mouth for healthier food**

(April, 15, 2014)

The 3D mastication modelling from Australia’s *Commonwealth Scientific and Industrial Research Organisation* (CSIRO), demonstrated for the first time in Melbourne in April, is starting to provide researchers with new understanding of how to reduce salt, sugar and fat in food products, as well as how to incorporate more fibre and nutrients, and even how to create new food sensations.



CSIRO biomechanical engineer and computer modeller, Dr Simon Harrison, said the world's first 3D dynamic virtual mouth can provide detailed insight for developing healthier foods.

Just in time for Easter, Dr Harrison has modelled a caramel filled Easter Egg to see what happens when the virtual mouth takes a bite.

"In polite company, we can't see inside someone's mouth while they're eating and, until now, it has not been possible to view how the chewing process alters food," Dr Harrison said.

"Using a cutting-edge technique called smooth particle hydrodynamics, we've developed a virtual mouth built on real data about the physics of chewing. It predicts how a particular food breaks down and how flavour is released in the mouth. It also shows the distribution and interaction of components such as salt, sugar and fat.

"Through this technology, we can view and analyse how food at the microscopic level works in the mouth, and how it influences our taste perception."

To read the full article click [here](#).

## 4. Physics / Astronomy

### **NASA has crashed its spacecraft into the moon**

(April, 20, 2014)

LADEE, a NASA probe that spent the past six months measuring moon dust and testing laser-based broadband, has been crashed onto the lunar surface.

The spacecraft completed its mission in early March and shortly afterwards ran out of the fuel needed to keep it in orbit.

The vending-machine-sized probe reportedly smashed into the moon at a speed of about 5,800 kilometres per hour. NASA intentionally crashed LADEE into the far side of the moon away from historically important sites.

Although LADEE's mission was short, its results proved that a laser-based communication system would work wonderfully and could one day be used to stream high-def video from space.

Swinburne University of Technology astronomer Dr Alan Duffy explained: "LADEE has taught us much about the Moon's thin atmosphere, as well as a testing out a new laser 'broadband' link between Earth and the Moon that's fast enough to stream Netflix, but after 100 days its fuel had run out and this was a chance to get one last scientific result from the craft."

To read the full article click [here](#).

### **There is now a little slice of Australia on Mars**

(April, 09, 2014)

NASA's rover Curiosity has started exploring a new area of the Red Planet, nicknamed "The Kimberley" after the Western Australian region.

But the rover also got a little more of Australia than it anticipated in the region when it rolled across a vaguely Australia-shaped rock.

To read the full article click [here](#).

### **New tool for galactic archaeology**

(April, 07, 2014)

Reconstructing the history of our Galaxy has just become a whole lot easier, thanks to a team of international astronomers led by Dr Luca Casagrande from the Research School of Astronomy and Astrophysics at the Australian National University.

By examining both the light and soundwaves from stars, the team has developed a more precise way to deduce the ages of stars and to pinpoint when our Galaxy's big events happened.



The development will help astronomers study the properties of ancient stars and help them better understand the formation and evolution of the Milky Way.

"We might also uncover evidence for violent events in the past, such as collisions with other galaxies," Dr Casagrande said.

Exactly how a giant prehistoric gas cloud condensed to form the stars and planets of our Galaxy, and why it formed its familiar spiral shape, are the kind of questions Dr Casagrande's team are addressing.

Until now, a celestial version of the carbon-dating used by terrestrial archaeologists has been missing. That is now changing, thanks to Dr Casagrande's approach, which harnesses the light and sounds from the stars.

To read the full article click [here](#).

## 5. Environment and Climate Change

### **New mineral has been discovered in Australia**

(April, 22, 2014)

The new mineral is unique in structure and composition among the world's 4,000 known mineral species. 'Putnisite', described in *Mineralogical Magazine* by a visiting research fellow at the University of Adelaide, was found in a surface outcrop at Lake Cowan in central Western Australia.

After x-raying a single crystal of the mineral, Dr Peter Elliott realised it was completely unlike anything currently known.

"Most minerals belong to a family or small group of related minerals, or if they aren't related to other minerals they often are to a synthetic compound – but putnisite is completely unique and unrelated to anything.

"Nature seems to be far cleverer at dreaming up new chemicals than any researcher in a laboratory," he said in a press release.

Named after Australian mineralogists Andrew and Christine Putnis, Putnisite occurs as tiny crystals, no more than about 0.5mm in diameter, and is found on a volcanic rock. It appears as dark pink spots on the dark green and white rock, and under the microscope looks cube-shaped.

It's made up of an unusual combination of the elements strontium, calcium, chromium, sulphur, carbon, oxygen and hydrogen.

To read the full article click [here](#).

### **Ancient sea-levels give new clues on ice age**

(April, 17, 2014)

International researchers, led by the Australian National University (ANU), have developed a new way to determine sea-level changes and deep-sea temperature variability over the past 5.3 million years.

The findings will help scientists better understand the climate surrounding ice ages over the past two million years, and could help determine the relationship between carbon dioxide levels, global temperatures and sea levels.

The team from ANU, the University of Southampton (UoS) and the National Oceanography Centre (NOC) in the United Kingdom, examined oxygen isotope levels in fossils of microscopic plankton recovered from the Mediterranean Sea, dating back as far as 5.3 million years.

"This is the first step for reconstructions from the Mediterranean records," says lead researcher Eelco Rohling from the ANU Research School of Earth Sciences.

To read the full article click [here](#).



## Ocean acidification is making fish crazy

(April, 17, 2014)

A world-first study has revealed that fish in the wild are responding to ocean acidification with some very risky behaviour.

Scientists led by a team from James Cook University in Australia looked at wild fish populations living near carbon dioxide seeps off the coast of Papua New Guinea, which create conditions similar to those predicted to be standard across the ocean in the second half of this century.

What they found mirrored the results of previous studies done in the lab - the fish were acting crazy.

The research, published in *Nature Climate Change*, revealed that instead of avoiding the smell of their potential predators, fish in these regions were actually attracted to it. They also ignored the smell of their preferred habitats and started roaming further from shelter, putting them at increased risk of predation.

Interestingly, fish behaviour didn't improve over time, even in fish who had lived in the carbon dioxide seep and its resulting acidic waters its entire life.

To read the full article click [here](#).

## Australias made a significant contribution to the IPCC's latest climate change report

(April, 15, 2014)

Two experts from the Australian National University have made a significant contribution to the IPCC's latest climate change report. The senior researchers from Crawford School in the ANU College of Asia and the Pacific are lead authors in the world's most significant report on climate change policy, released 14 April.

Associate Professor Frank Jotzo and Professor David Stern were among the authors of two different chapters of the Intergovernmental Panel on Climate Change (IPCC) Working Group III report.

The global report assesses the options for mitigating climate change and maps out current and past knowledge on greenhouse gas emissions, their future paths, and policy efforts to reduce emissions.

It is produced every seven years and this time around involves 235 of the world's leading researchers. They cite almost 10,000 research papers, and responded to 38,000 expert comments.

Professor Stern says that global emissions have increased significantly in the past 10 years especially in middle-income countries. "Global greenhouse gas emissions rose more rapidly between 2000 and 2010 than in the previous three decades and this is mainly because of rapid growth in emissions in middle-income countries like China.

To read the full article click [here](#).

## 6. Education

### Deregulation of student contributions

(April, 23, 2014)

The Australian National University's (ANU) Vice-Chancellor Professor Ian Young and Chancellor Professor Gareth Evans have called for the deregulation of student contributions so Australian institutions can offer courses which better compete with those on offer from the world's best universities.

In an opinion piece published in *The Australian*, they said the proposal would provide the best outcome for students, and would allow universities to focus on delivering a quality education comparable to universities such as Harvard and Stanford in the United States.

"We want to provide an education that is comparable to that offered by the great universities of the world," Professor Young said. "In an ideal world, government would fund that. But we know in the current circumstances it won't. "So we propose a potential policy solution to make sure ANU and other Australian universities can offer the best education possible for our students. It is a policy solution that is part of a broader discussion about funding universities."

To read the original article click [here](#).



## Growing concern on teacher quality in Australia

(March, 24, 2014)

Over the past few years there has been growing concern with and focus on the quality of teachers in Australia. There have been a range of simplistic, unproven or disproved remedies promoted by various bodies to 'fix' teachers and teaching. These have included merit and bonus pay for the best performing teachers ('carrots') and sacking poorly performing teachers or denying them salary increments ('sticks').

The context in which these measures have been proposed includes Australia's declining performance on international measures of student achievement and the seemingly intractable achievement gap.

In addition to this focus on teacher quality there are powerful new developments emerging in Australia. These have largely been copied from Britain and the USA, despite a lack of supporting evidence, something that epitomises the Australian approach to educational innovation where we have a tendency to copy the worst of both worlds.

To read the original article click [here](#).

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