

# SciTalk

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Number 4 – October 2012

## Is a new plate boundary forming?

Geologists have spent many months studying records from the Sumatran-Andaman earthquake on Boxing Day 2004 (magnitude 9.1–9.3) and from many prior and subsequent earthquakes that have occurred in the adjacent areas within the Indo-Australian plate, e.g. the high magnitude ‘twin quakes’ on 11 April 2012 (also called the 2012 Indian Ocean earthquakes) that were of magnitude 8.6 and 8.2. As a result of their findings, some geologists are now suggesting that the Indo-Australian plate is breaking up along a new plate boundary.

Scientists know that the biggest earthquakes usually occur at boundaries between tectonic plates where one plate is being subducted below another, but the ‘twin’ quakes were more than 100 kilometres from such a subduction zone. Both involved rocks grinding past each other sideways with very little vertical movement – what geologists call strike-slip earthquakes. Yet strike-slip quakes this large have never been reported before. Also, it has been found that in the period since 2004, earthquakes have occurred nearly ten times more frequently in the region, than in the eight years before the 2004 event.

Geologists have also looked at the movement of continents on the Indo-Australian Plate. This has shown that India is moving about 3.7 cm/year, while Australia is moving faster at a rate of 5.6 cm/year. As a result, pressure is building up in the centre of the Indo-Australian plate causing it to buckle and the pressure is being released in earthquakes. The April 2011

... continued on page 4

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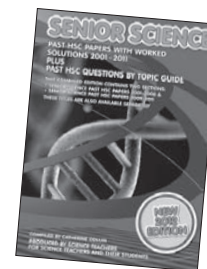
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Winners for *SciTalk* 3/12

Amanda Nieuwendyk, James Sheahan Catholic HS and Stewart Grimmert, Woodenbong Central, respectively won *Understanding Science 9&10* (rrp \$26.95) and *Understanding Science 7&8* (rrp \$32.95 ea), published & donated by Odlum & Garner.

★ 2012 editions Past HSC Questions & Worked Solutions ... see p7 ★

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# Diary Dates



2012  
INTERNATIONAL YEAR OF  
SUSTAINABLE  
ENERGY FOR ALL

## Update on BOS matters

Regularly check the BOS website to ensure you have the latest data – for syllabuses, past exam papers, news, Official Notices, Board Bulletins, statistics archive & more.

### New NSW syllabuses for the Australian curriculum

The BOS has launched a website to make it quicker and easier to access the new NSW K–10 syllabus for Science incorporating Australian curriculum content. You can now use this website to navigate the syllabuses and access support materials anytime, anywhere on a variety of devices, at <http://syllabus.bos.nsw.edu.au>

Implementation of the new Science syllabus will occur as follows:

- Years 7 & 9 in 2014
- Years 8 & 10 in 2015 (BOS 24/12)

Schools are to use the existing *Science Years 7–10 Syllabus* (updated in 2009) in 2012 and 2013 (BOS 37/11).

### New Work Health and Safety legislation & Year 7–10 and Stage 6 courses

New work health and safety (WHS) laws replaced the occupational health and safety (OHS) laws in NSW on 1 January 2012.

As a result, any reference in syllabuses and support materials to ‘occupational health and safety’ is replaced by ‘work health and safety’, ‘OHS’ is replaced by ‘WHS’, ‘Occupational Health and Safety Act 2000 (NSW)’ is replaced by ‘Work Health and Safety Act 2011 (NSW) (as amended)’, and ‘Occupational Health and Safety Regulations 2001 (NSW)’ is replaced by ‘Work Health and Safety Regulation 2011 (NSW) (as amended)’.

### Record of School Achievement (RoSA)

The RoSA credential in NSW is for students who leave school after Year 10 and before they receive their HSC. The eligibility requirements for the RoSA are essentially unchanged from the School Certificate. RoSA is explained on the BOS website.

### BOS enquiries

Ph: 9367 8111, fax: 9367 8484

Website: [www.boardofstudies.nsw.edu.au/](http://www.boardofstudies.nsw.edu.au/)

BOS contacts for Science:

- Inspector Science, K–12 & Senior
- Assessment Officer – Science

## OCTOBER 2012

15, 19, 22, 26, 29 Physics is Fun at Luna Park Sydney. ph 9939 6107, fax 9939 6105

## NOVEMBER 2012

2, 12, 16 Physics is Fun at Luna Park Sydney. Enquiries: ph 9939 6107, fax 9939 6105

19, 23, 26, 30 Physics is Fun at Luna Park Sydney. Enquiries: ph 9939 6107, fax 9939 6105

## DECEMBER 2012

3–19 Physics is Fun at Luna Park Sydney. Enquiries: ph 9939 6107, fax 9939 6105

21 Summer Solstice (10.11 pm AEDT)

## 2013 – International Year of Water Cooperation

**For:** Shell Questacon Science Circus 2012–13: [www.questacon.edu.au/html/on\\_the\\_road.html](http://www.questacon.edu.au/html/on_the_road.html)

**tba:** Astronomy Open Nights & Lectures: Macquarie Uni, [www.physics.mq.edu.au/astronomy](http://www.physics.mq.edu.au/astronomy)

**JANUARY 2013** National Youth Science Forum. For Yr 11 selected mid 2012. Enquiries: 6125 2777.

## MARCH 2013

3–9 Seaweek 2013: [www.mesa.edu.au](http://www.mesa.edu.au) & [www.ausmepa.org.au](http://www.ausmepa.org.au) Theme: ‘Sustainable Seas’

1 Schools’ Clean Up Australia Day. Ph: 1800 282 329. [www.cleanupaustaliaday.org.au/](http://www.cleanupaustaliaday.org.au/)

15, 18, 22, 25 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

20 Autumn Equinox (10.02 pm AEDT)

## APRIL 2013

5, 12 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

22 International Earth Day. [www.earthday.net/](http://www.earthday.net/) & [www.earthsite.org/](http://www.earthsite.org/)

## MAY 2013

29–31 Science at the Shine Dome teachers’ program, Australian Academy of Science:

Theme: ‘Power to the people: the science behind the debate’. Details: [www.science.org.au/events/](http://www.science.org.au/events/)

3, 24, 31 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

b/w 22–29 Big Science Competition: [www.asi.edu.au/bigscience/](http://www.asi.edu.au/bigscience/) Ph: 62012552

## JUNE 2013

3, 7, 14 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

5 World Environment Day

tba Closing date Crystal Growing Comp. [www.chem.unsw.edu.au/RACI/](http://www.chem.unsw.edu.au/RACI/) Ph: (02) 9663 4960

tba NSW Schools Titration Competition. [www.nswtitration.com/](http://www.nswtitration.com/) (see website for regional dates)

21 Winter Solstice (3:04 pm EST)

## JULY 2013

7–10 CONASTA 62 in Melbourne. ‘Transforming Science Through Innovation’. [conasta.edu.au/](http://conasta.edu.au/)

20–27 National Chemistry Week. [www.raci.org.au/national/events/chemistryweek.html](http://www.raci.org.au/national/events/chemistryweek.html)

25 National Chemistry Quiz. [www.raci.org.au/](http://www.raci.org.au/) in ‘Events’. Details: ph (02) 6331 5125

## AUGUST 2013

2 Jeans for Genes Day. [www.jeansforgenes.org.au/](http://www.jeansforgenes.org.au/)

7 Chemistry Olympiad Exam. [www.asi.edu.au/olympiads/](http://www.asi.edu.au/olympiads/) Close date: 17/7/13. Ph: 6201 2552

9, 12, 16 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

– come on one of these dates to celebrate National Science Week

10–18 National Science Week. School theme: tba

12 Biology Olympiad Exam. [www.asi.edu.au/olympiads/](http://www.asi.edu.au/olympiads/) Close date: 17/7/13. Ph: 6201 2552

14 Physics Olympiad Exam. [www.asi.edu.au/olympiads/](http://www.asi.edu.au/olympiads/) Close date: 17/7/13. Ph: 6201 2552

## SEPTEMBER 2013

13, 16 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

23 Spring Equinox (6:44 am EST)

## OCTOBER 2013

13–19 Earth Science Week. [www.earthsciweek.org](http://www.earthsciweek.org) & [www.ga.gov.au/education/public-events](http://www.ga.gov.au/education/public-events), ph 6249 9111

14, 18, 21, 25, 28 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

## NOVEMBER 2013

1, 11, 15 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

18, 22, 25, 29 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

## DECEMBER 2013

2–18 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

22 Summer Solstice (4.11 pm AEDT)

**JANUARY 2014** National Youth Science Forum. Forms to local Rotary club by 31/5/14, interviews from

July. Only for Yr 11 in 2013. Enquiries: 6125 2777, email: [nsss@anu.au](mailto:nsss@anu.au), [www.nysf.edu.au/](http://www.nysf.edu.au/)

*While all dates have been checked to ensure that information in DIARY DATES is correct, no responsibility will be accepted by the publisher or Editor for any omissions or inaccuracies in it.*

**NOTE:** Your purchase of the Odlum & Garner Past HSC Questions & Worked Solutions books for Biology, Chemistry and Physics helps to support the production of their Past HSC books for Earth & Environmental Science and Senior Science. Thank you to all the teachers who support these projects.



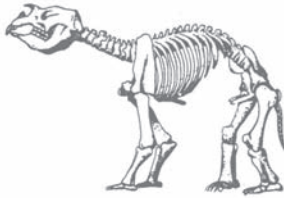


## Australian Museum School Programs 2013

Programs for 2013 include:

### Evolution of the Australian Biota Study Days

Check out 2013 dates and locations at:  
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**For visiting school group bookings and further information:**  
Ph 02 9320 6163 Fax 02 9320 6072 [www.australianmuseum.net.au/education-services](http://www.australianmuseum.net.au/education-services)

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## Science Snippets

### ● Arctic ice is disappearing faster than ever before

The extent of the Arctic ice cap will have hit a record low in 2012. It is thought that this will result in the greatest environmental change ever known to humans and will extend far beyond the North Pole.

The Arctic Ocean has been covered by a thick, floating ice cap. Its depth and size changes with the seasons and currents. It shrinks to a minimum each summer and spreads again for winter.

Climate change, due to rising air temperatures, has had more impact in the Arctic than elsewhere on Earth. Changing conditions in the Arctic will in turn affect global weather patterns.

The disappearance of ice in the Arctic will result in more light entering the ocean beneath and fuelling more life. However, it also means warmer surface waters and more energy released into the atmosphere. That energy drives cyclones, which generate enormous waves capable of ripping into the ice pack, degrading it further.

Also, the accelerating melt of Arctic ice is injecting a layer of freshwater into the surface of the North Atlantic and Baffin Bay, off the coast of Greenland. This may slow down the circulation in the Atlantic, which pushes water all through the world's oceans.

The latest climate models predict that by around 2050 the Arctic will be completely ice-free during the summers.

[Source: *NewScientist* 31 August 2012]

### ● Ice loss in Arctic appears to be a regular occurrence

Sediment cores drilled from the bed of Lake El'gygytgyn in north-east Russia have provided evidence that, at least eight times in the last 2.8 million years, the Arctic has experienced super-interglacials – periods in which summers were 5°C warmer than they are today. As a result, the Arctic ice sheets have advanced and retreated as the temperatures fell and rose.

Climate models cannot explain these unusually warm spells, however it has been proposed that the collapse of the West Antarctic ice sheet (WAIS) on the other side of the planet, could be linked to the super-interglacials. This sheet could collapse again as the world warms, perhaps resulting in super-interglacial number nine. Interestingly, sediment records from Antarctica suggest that the WAIS disintegrated during each of the super-interglacials.

Satellites have only been used to monitor Greenland's ice sheet for the last 20 years. So it is not really known whether the recent acceleration in ice loss is a new phenomenon or not. Using aerial photographs from the 1980s, Kurt Kjær from the University of

Copenhagen in Denmark, and colleagues, found that the ice sheet melted as rapidly between 1985–1993 as between 2005–2010. Their analysis of even earlier aerial photos, has suggested that Greenland also lost a lot of ice in the 1930s. Kjær has proposed that surges of ice loss in the Arctic may be a regular occurrence, although they may become more common as the world warms.

[Source: *NewScientist* 21 June, 11 August 2012]

### ● Warmer climate brings life back to icy lake

Evidence that warmer temperatures in polar regions will cause rapid ecological change has come from Kaffeklubben Sø, the world's most northerly lake. This 48-hectare lake in Greenland looks out over the Arctic Sea. This lake formed about 3500 years ago and contained silica-shelled algae called diatoms. However these vanished about 2400 years ago when regional temperatures cooled, leaving only a few cyanobacteria – as these required little light and could survive under the one to two metres of ice that covered the lake. Since around 1960, diatoms have been found once again in the lake and today there are around 20 species of diatoms present. Other high Arctic lakes that are not quite as remote show similar changes.

[Source: *NewScientist* 4 October 2012]

### ● Link between a poor night's sleep and obesity

Lack of proper sleep not only causes people to be irritable, but it has also been linked to diabetes and weight gain. Researchers tested fat cells from people after four nights of sleeping up to 8 and a half hours, and then again after four nights on just 4 and a half hours. They found that after sleep deprivation, fat cells from the same person were on average 30 per cent less responsive to insulin.

High blood glucose levels are linked to diabetes. Fat cells also normally release the appetite-regulating hormone leptin. So if sleep-deprived cells are generally malfunctioning, researchers think that this mechanism may also be disrupted, affecting weight gain.

[Source: *NewScientist* 15 October 2012]

### Is a new plate boundary forming? (... continued from p1)

twin earthquakes put stress on other fault zones and were followed by a five-fold increase in earthquake activity globally along nearly all plate boundaries. This has also never been recorded before, even after very large earthquakes.

As more earthquakes shake the region, it should become clearer for scientists as to whether a new plate boundary is forming or not.

[Source: *NewScientist* 29 September 2012]

## Science Snippets ... continued

### • Nuclear power plants pose great risks

Fortunately earthquakes and tsunamis are rare events in Europe, as scientists now realise that nuclear power plants in Europe are ill-equipped to cope with such events. This follows ‘stress tests’ to assess the readiness of Europe’s reactors should such events occur. These tests were commissioned in the wake of the disaster in Japan’s Fukushima Daiichi plant following an earthquake and tsunami on 11 March 2011. Of 145 reactors checked, 121 had no or inadequate seismic instruments to detect earthquakes, and 32 lacked venting systems to prevent pressure build-ups in reactor vessels if the primary cooling system fails. Without these systems, reactors can explode and release radioactive pollution, as happened at Fukushima. Some 81 reactors did not have adequate equipment available for coping with severe accidents such as earthquakes or floods, and 24 did not have backup emergency control rooms.

Despite these issues, the European Nuclear Safety Regulators Group decided that, overall, the reactors operate safely and none needed to be shut down. Nevertheless, they have stressed that rigid safety standards need to be implemented in all power plants. Other countries have been asked to determine how safe their power plants are and to rectify any problems uncovered.

In Japan, following the Fukushima disaster, all 50 commercial reactors were shut down for safety inspections. Two power plants have been brought back on line after being checked. Debate continues about whether others should be restarted. Anti-nuclear sentiment is high and led to the Japanese government devising a new energy policy that sought to end reliance on nuclear power by the 2030s by fostering renewable energy sources and supporting energy conservation. However, the powerful industry lobbies are fighting this decision.

[Source: *NewScientist* 9 October 2012]

### • Failed malaria drug may be resurrected

Starting in the 1950s, the cheap, effective drug chloroquine was widely used in an effort to eradicate malaria. The parasite *Plasmodium falciparum*, which causes malaria, first showed signs of resistance to chloroquine in the 1950s. This resistance became more widespread throughout the twentieth century. Then malaria became resistant to the drugs that replaced chloroquine.

In 2003, health authorities in Senegal started advising the use of other medications – such as artemisinin combined with other antimalarial drugs – in the hope that if people stopped using chloroquine, resistance might fade and chloroquine might become useful again. Researchers have recently discovered that there has been a significant decline in the prevalence of the genetic mutation that confers resistance to the chloroquine drug within the malaria parasite in Senegal. A similar phenomenon has also been reported in Kenya, Tanzania and Mozambique in recent years. The drug the parasite evolved resistance to seems to be effective once again.

These findings have given hope that chloroquine may be effective to use once again as an antimalarial drug, especially as it was able to be given to pregnant women at the beginning of their pregnancy and was able to be produced cheaply.

[Source: *NewScientist* 13 October 2012]

A pessimist sees the difficulty in every opportunity; an opportunist sees the opportunity in every difficulty.

... Winston Churchill

### • Dietary protein helps to prevent overeating and obesity

A University of Missouri researcher has found that eating a healthy breakfast, especially one high in protein, increases satiety and reduces hunger throughout the day. In addition, using functional magnetic resonance imaging (fMRI) the researchers found that eating a protein-rich breakfast reduces the brain signals controlling food motivation and reward-driven eating behaviour.

Also, another study by researchers at the University of Sydney found that by including enough protein in our diets, rather than simply cutting calories, is the key to curbing appetites and preventing excessive consumption of fats and carbohydrates. They found that people on a 10% protein diet will eat more snacks between meals and consume significantly more calories in total compared with people on a 15% protein diet.

So it would appear that dietary protein plays an important role in appetite and total food consumption in humans. Knowing this may help to address the global obesity epidemic.

[Source: 19 May & 18 Oct 2011 in ‘Health’ at [medicalxpress.com](http://medicalxpress.com)]

### • Discovery of fifth moon on Pluto reignites ‘planet’ debate

Although Pluto may have lost its status as a planet, to become a dwarf planet, it boasts more moons than the inner planets combined. A team of astronomers using NASA’s Hubble Space Telescope, in July this year, reported the discovery of a fifth moon orbiting the icy dwarf planet Pluto. Mars has two moons and Earth has just one. At last count, Jupiter had 66 satellites, Saturn 62, Uranus 27 and Neptune 13. The observations will help scientists in their planning for the July 2015 flyby of Pluto by NASA’s New Horizons spacecraft. This discovery has reignited the debate regarding the classification of Pluto as a planet or a dwarf planet.

[Source: *NASA* 11 July, *NewScientist* 21 July 2012]

### • Evolution finds a way to defeat GM crop

Corn rootworms are one of the most damaging agricultural pests in the US. They impair the corn’s ability to absorb water and nutrients from the soil. It appears that western corn rootworms have developed resistance to the insecticide produced by the genetically modified YieldGard corn that has been widely planted in the US in an effort to overcome the loss of corn crops due to the rootworms.

[Source: *NASA* 11 July, *NewScientist* 21 July 2012]

## Senior Science Fun Park Excursion to Luna Park Sydney

Many first-hand experiences in the Senior Science syllabus are covered by doing a *Senior Science Excursion* to Luna Park Sydney through *Physics is Fun*. Worksheets are provided for:

- ★ **Preliminary Topic 8.4 Humans at Work** – students assess the impact of science in the design/construction of safe rides; identify & assess potential hazards/factors that increase risk of injury; perform an occupational health & safety style audit; determine what safety measures will protect the human body from injury.
- ★ **HSC Option 9.8 Disasters** – students explore the possible consequences of a disaster such as the collapse of a ride at Luna Park Sydney, and how emergency services would assist in the minimisation of the effects of such a disaster.
- ★ **HSC Topic 9.4 Information Systems** – students investigate the need/use of these.
- ★ **HSC Option 9.5 Polymers** – students investigate the types used & their impact.

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[Note: Luna Park is also open every day in December]

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\* plus 10% GST (schools can claim this back when doing a curriculum-specific excursion).

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Email: [robertgarner@mac.com](mailto:robertgarner@mac.com)

• Send a deposit of \$100 (+ GST) to confirm your booking. Worksheets (if requested) are sent after your deposit is received.

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The original and best

Physics is Fun was co-authored in 1983 by Robert Garner and Sylvia Jennings – based on their earlier excursions at Luna Park in the 1970s. Robert has conducted these fun park excursions since their inception ... both at Luna Park (1983-1987, 1995, 2004-2012) and Wonderland Sydney (1990-2004) – covering many different subject areas.

Please remember: Our excursion notes are only for use on an excursion day booked through Physics is Fun. It is an offence under Copyright Laws to use them on any other occasion without written permission from Physics is Fun.

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# Photo Spot Biomimicry and the 'magic' of Velcro®

**B**iomimicry is the practice of developing sustainable human technologies inspired by nature – it is biologically inspired engineering. Other names for biomimicry are biometrics or bionics. There has been much research into biomimicry technologies in the search for better technologies – from Velcro® based on plant burrs, passive cooling based on termite mounds, the concept of 'gecko tape', turbine blades based on whale flippers, self-healing plastics, streamlining recurring natural designs such as the Fibonacci sequence, artificial photosynthesis for fuel production, and many more.

## Velcro – an example of biomimicry

The most famous example of biomimicry was the invention of Velcro® brand fasteners. The 2-part Velcro® fastener system uses strips or patches of a hooked material opposite strips or patches of a loose-looped weave of nylon that holds the hooks. The story of Velcro® illustrates one of the many interrelationships that exist between science and technology.

The discovery of Velcro® was actually made by the Swiss engineer, Georges de Mestral, not NASA. In 1941, while returning from the fields with his dog, Mestral noticed how difficult it was to detach the burrs from the Burdock thistle's flowers from his trousers and his dog's fur. Surprised, he removed them carefully from his clothing and observed them under a microscope. It was then that he discovered why they clung on to the fabric and fur so strongly – they were covered in hundreds of tiny, but strong hooks. These hooks caught anything with a loop – such as clothing, hair or animal fur.

Mestral saw the possibility of binding two materials reversibly in a simple fashion. He realised that these hooks were potentially a really neat way to fasten clothes and spent a number years of research and experimentation to develop a revolutionary fastening system that never jammed. He was able to patent his product by 1955. The Velcro® brand name has, since 1959, been given to an extensive range of products that have greatly simplified fastening and closure operation.

The Velcro® name came from the French words 'velours' (velvet) and 'crochet' (hook). Velcro got a major public exposure in NASA's space program. Velcro® was used to attach food pouches to walls, note pads to astronauts' legs and even to attach astronauts' bodies to the wall for sleeping. This is probably why the misconception about NASA supposedly developing Velcro® arose.

The uses and applications of Velcro® are numerous – from keeping athletic shoes on your feet, to anchoring equipment on NASA's space shuttle. Velcro® brand hook and loop fasteners have provided simple solutions to numerous fastening, storage and organisation problems.



FIGURE 5: Burrs on a Common Burdock plant. Tiny hooks cover the surface of these burrs. These burrs provided the inspiration for the creation of Velcro®. The design of Velcro® imitated this natural mechanism for seed dispersion.

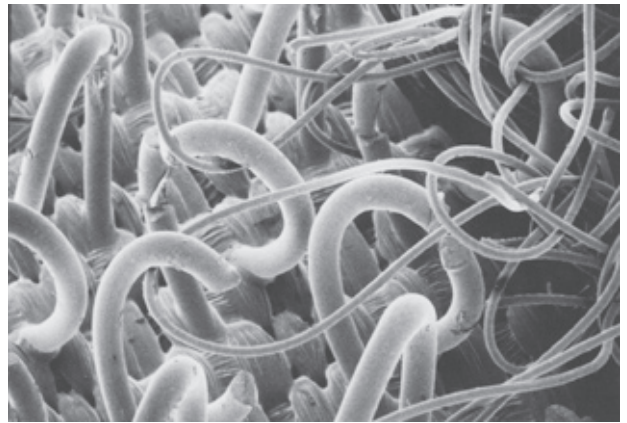


FIGURE 1: SEM of Velcro® in action – the hooks (left side) are interlinked with the loops (right side).

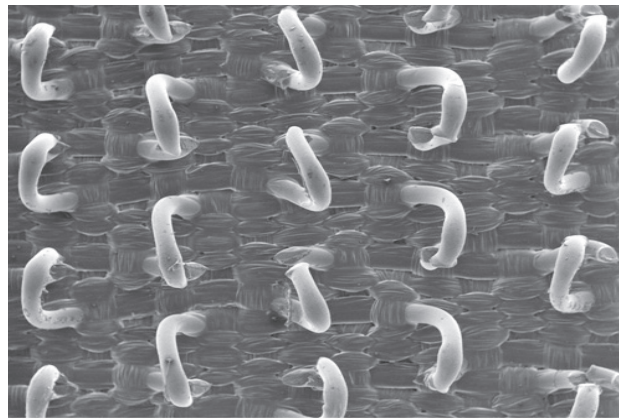


FIGURE 2: SEM photomicrograph of Velcro® loops

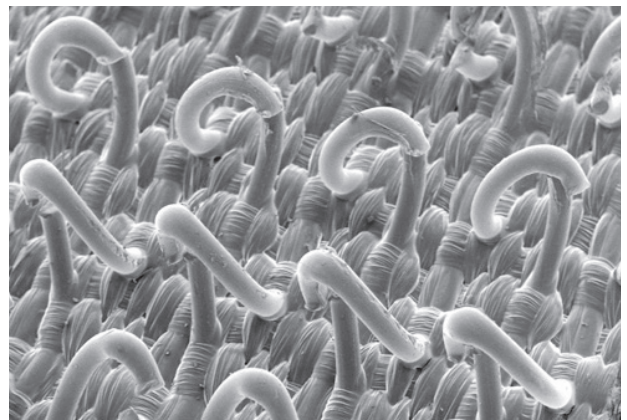


FIGURE 3: SEM photomicrograph of Velcro® hooks



FIGURE 4: A small strip of Velcro® tape

- References:**
- <http://brainz.org/15-coolest-cases-biomimicry/>
  - [www.velcro.co.uk/cms/History.6.0.html](http://www.velcro.co.uk/cms/History.6.0.html) and [www.abc.net.au/science/articles/2009/02/03/2480864.htm](http://www.abc.net.au/science/articles/2009/02/03/2480864.htm)
  - SEM photomicrograph credits: Fig 1 – Museum of Science Boston, Figs 2 & 3 – by Tracy Anderson
  - Photo of Common Burdock burrs by Anne Elliott



## Scientists use cane toads' own toxin against them

Scientists say they have found the best weapon yet to eradicate cane toads from isolated areas – using the amphibians' own toxin against them.

Professor Rick Shine from the University of Sydney's School of Biological Sciences said the system was already trapping tens of thousands of cane toad tadpoles, and might see the toads eradicated from some areas.

Given that female cane toads lay more than 30,000 eggs at a time, killing adult toads in an area is ineffective, as the few that are left can produce so many offspring. This new method should have much more success as it stops them reproducing.

The technique relies on research that two years ago found that cane toad tadpoles were attracted to the eggs of their own kind. This presumably provides them with a source of food and reduces the number of newly hatched tadpoles that would compete with them for food. The researchers worked out that the tadpoles were locating the eggs via the toad's venom. This venom can be obtained from the

shoulder glands of dead toads and used as a bait. It is cheap, easy to obtain and highly attractive to cane toad tadpoles, but repels native frogs and their tadpoles. Also, it does not attract native fauna such as fish and insects.

Funnel-traps containing the venom were trialled in a number of ponds. The scientists captured tens of thousands of young cane toads within a few days, and completely eradicated the toads from billabongs about 50 m in diameter in less than a week.

The toad's poison is dangerous to humans, so collection of this poison must be done with great care. The venom primarily affects the functioning of the heart, but is usually not fatal for humans. However, it does have some effects, such as burning of the eyes and hands, and skin irritation.

Whilst this technique will not eradicate cane toads from Australia, as it would be impossible to put traps in every body of water, it promises to dramatically decrease cane toad numbers in local areas and is thought to be the best method to date for doing this.

[Source: National Geographic 15 June 2012, www.smh.com.au 13 June 2012, Wikipedia]

### BOX 1 Cane toads

The cane toad (*Bufo marinus*) in Australia is an introduced species. It is regarded as a pest, because it is spreading rapidly with a devastating impact on native species. It has no natural predators to keep its numbers under control. When most other species try to eat a cane toad, they are killed by the its powerful toxins.

Native to Central and South America, cane toads were introduced to Australia from Hawaii in June 1935 in an attempt to control the native cane beetle (*Dermolepida albobirtum*). These beetles are native to Australia and they are detrimental to sugar cane crops, which are a major source of income for Australia. Since their release in Australia, cane toads have rapidly multiplied in population and now number over 200 million. Cane toads appear to have had no effect on the cane beetle, but are having a great effect on the biodiversity of many ecosystems.

Adult cane toad average 10–15 cm in length. The largest recorded specimen weighed 2.65 kg with a length of 38 cm from snout to vent.



Photo by Michael Linnenbach (from Wikipedia)

### Are western diets causing dementia?

A growing number of researchers believe Alzheimer's disease arises when brain tissue becomes resistant to insulin. Insulin not only controls blood sugar levels, but also plays a key role in brain signalling. Since calorific foods are known to impair our body's response to insulin, we may be unwittingly poisoning our brains every time we consume foods such as burgers and fries. Some researchers are wondering whether Alzheimer's is another version of diabetes and have nicknamed it 'type 3 diabetes'.

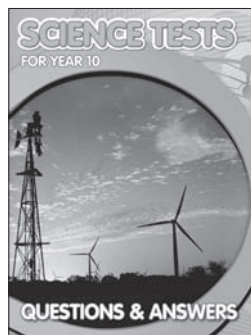
There is also some tentative evidence that certain compounds called flavonoids, found in tea, red wine and dark chocolate, can reduce the risk of dementia.

[Source: NewScientist 1 September 2012]

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... Leonardo Da Vinci

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## Summer skies

... Robert Garner

The warmer months of Summer provide great conditions for observing the constellations, planets and other celestial objects in the night sky.

### Solar eclipses

Probably the most exciting event in astronomy is a total eclipse of the Sun. A part of the Earth is plunged into daytime darkness, even if only briefly. A total eclipse is only possible because the angular diameters of the Sun and the Moon are approximately the same at this time, so the Moon can fully block out the Sun.

On 14 November 2012, soon after dawn, a total eclipse will affect the far north of Australia. This is the first total eclipse visible in Australia since 2002. The path of totality starts east of Darwin, travels south-east across the Gulf of Carpentaria and Cape York and will leave Australia's east coast between Cairns and Port Douglas. It will only be a partial eclipse in NSW/ACT, with mid-eclipse at 8.05 am (AEDT), when the Sun is 27° above the horizon. The Moon's disc will cover about 50% of the Sun, as it moves between the Earth and the Sun.

On 10 May 2013, another solar eclipse will be visible crossing northern Australia. However, this time the Moon will be at a much greater distance from the Earth and its angular diameter is not great enough to fully block out the Sun, so the outer edge of the Sun will still be seen in an annular eclipse. In Sydney, we will see another partial eclipse with mid-eclipse at 8.57 am (EST).

**WARNING:** Do NOT look directly at an eclipse of the Sun with your eyes or binoculars or a telescope – it is not worth the loss of your vision! To protect your vision, you can view an eclipse safely at an observatory using a solar filter – or by using a pinhole camera (see Box 2).

### Constellations

At this time of the year, *Crux*, the Southern Cross can be seen upside down with the two pointers to its west and the bright star, Canopus to its east. *Scorpius* and *Sagittarius* are appearing lower in the western sky, soon to disappear from view as they are replaced overhead by the Summer constellations, *Orion* and *Taurus*.

### Meteor showers

The Leonids are a good shower to look for in November. Their peak activity is just past mid-November when the Moon is setting around midnight, so viewing conditions should be good. The Geminids are better in the northern hemisphere, but can give an impressive display particularly in the Moon-free pre-dawn hours. The alpha-Centaurids will be seen during the first three weeks of February with a peak around 13 February 2013. It is a new Moon around the peak so viewing will be best pre-dawn.

### Summer Solstice

The Summer Solstice for the Southern Hemisphere occurs at 10.11 pm (AEDT) on 21 December 2012. This is when our daylight hours are longest. The Sun will be its most southerly point before heading back towards the north.

### Comet Planstarrs

The recently discovered comet, Panstarrs, is predicted to brighten from being a telescopic object at the start of February to being a naked eye object in the south-eastern predawn sky by mid-February. It should also be visible in the evening twilight towards the southwest to west, until around 0.5 hour after sunset.

### The Planets: November to February

Mercury is only ever visible just before sunrise or just after sunset, so it is hard to find because of the glare of the Sun. However, in early November and early February Mercury should be visible in the western twilight. It will be close to Mars on 8 and 9 February 2013, so locating Mars around the second week of February will help observers to find Mercury.

Venus remains low in the eastern dawn sky throughout the Summer months, sinking progressively lower towards the horizon until mid-February when it becomes too hard to see in the Sun's glare. Venus then disappears as it reaches superior conjunction (opposite side of the Sun to Earth) in late March. In May, Venus will return for the rest of 2013 as the Evening Star.

On 16 November, a three day old new Moon will be adjacent to Mars. They will both be just below and close the one of the finest globular clusters in the sky (M22). Mars will be visible in the early western evening sky over the first part of Summer, setting a little earlier each night. By January 2013, Mars will hard to see due to the glare of the Sun. It will reappear in the dawn sky in June.

Jupiter will be visible in the early eastern evening sky, rising progressively earlier as Summer progresses. Jupiter will be at opposition on 3 December and so will be at its brightest in December and will be nearly overhead by midnight. Jupiter's four Galilean moons (discovered by Galileo with his telescope in 1610) will easily be observed using binoculars or a telescope during the Summer months. On 18 February 2013, Jupiter will be occulted by the Moon, but this will only be completely visible in Victoria and Tasmania. In Sydney, we will see a very close approach of the Moon and Jupiter.

Saturn will reappear as a pre-dawn sky object in the second half of November after conjunction (opposite side of the Sun to the Earth) on 25 October. It will rise earlier each morning in November and December, rising before midnight in mid-January 2013. Saturn's rings will be easier to see from Earth at this time, because they will be at their greatest tilt to the Earth for 2012. This tilt will gradually increase over the next 5 years to a maximum, before the tilt reduces and the rings become edge-on to Earth again by 2025.

On 27 and 28 November, Venus and Saturn will be found close to the horizon in the eastern morning twilight sky. They will be less than 1° apart and about 12° below the bright star, Spica.

### Nebulae

A nebula is an interstellar cloud of dust, hydrogen, helium and other ionised gases, found throughout the Universe. These telescopic objects make spectacular astronomy images. Some well known nebulae include the Lagoon Nebula in *Sagittarius* (see front cover of *Astronomy 2013* on page 11), the Ant Nebula in the constellation of *Norma* (Fig 1) and the Horsehead Nebula in the *Orion* constellation (Fig 2).

[Credits: Figure 1: [www.eso.org/public/outreach/press-rel/copyright.html](http://www.eso.org/public/outreach/press-rel/copyright.html)  
Figure 2: R. Sahai (Jet Propulsion Lab), B. Balick (University of Washington)]



Figure 1: Ant Nebula

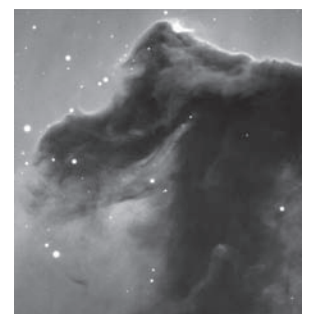


Figure 2: Horsehead Nebula

## Using a Sky Chart / Planisphere

Remember, viewing the night skies is much simpler if you have a Sky Chart / Planisphere. See Box 1 about easily obtaining one of these.

### Box 1: Sky Charts & Planispheres

- You can download free sky charts each month to explore the night sky (planets, stars & constellations) from: <http://skymaps.com/downloads.html> Make sure you scroll to 'Southern Hemisphere Edition'.
- A planisphere (star wheel) helps to find stars and locate constellations. These are inexpensive and available from astronomy shops, or you can download one from the internet – make sure it is for the Southern Hemisphere. There is a planisphere (star wheel) to print and use at: <http://members.ozemail.com.au/~starrylady/resources.html>

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Bookings are essential and must be done online at: [physics.mq.edu.au/community/observatory/](http://physics.mq.edu.au/community/observatory/) If doubtful weather, check online after 5pm.

You will be guided through the night sky by professional astronomy staff, who will show you planets, binary stars, nebulae, star clusters, and even bright galaxies through their 16” and 12” professional in-dome telescopes. Even with the light pollution of the city, you can easily see such features of the night sky. The Moon and planets, when in suitable positions, are easily viewed with any of their instruments. On dark, moonless nights with good seeing, you may also observe the brightest galaxies.

There are two planetarium sessions per semester on Friday nights from 6–7pm ... in the E7B Courtyard at Macquarie Uni. Tickets must be booked online at: [physics.mq.edu.au/community/planetarium/](http://physics.mq.edu.au/community/planetarium/)

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**WINNER:** David Creevey, Ambarvale High, won an IMAX Sydney family pass for *SciTalk* No. 3–2012.



### Box 2: Making a Pinhole Camera

Use a long box (~1 m in length and 30 cm<sup>2</sup>) – the longer the box, the bigger the image of the Sun. Cut a 10 cm hole in the centre of one end of the box and tape aluminium foil over it. On the side of the box (near opposite end to foil), cut a viewing hole (about 20 cm<sup>2</sup>). Tape a piece of white paper to the inside end of the box near the viewing hole. Use a pin to make a pinhole in the centre of the foil. Point the pinhole towards the Sun. Do not look through the pinhole at the Sun! Look only through the viewing hole at the projected image of the Sun on the white paper. For the transit, a black dot (Venus) will move across the image of the Sun. For the eclipse, the Sun's disk will be partially covered as the Moon eclipses it.

[Reference: Don Whiteman, *SciTalk* No. 3, 2002]

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... Anon



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SciTalk 3/12 answer: Flerovium

**QUIZ QUESTION:** In which hemisphere is Kaffeklubben lake located? [Hint: see page 4]

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