

SciTalk

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Number 4 – October 2014

Daydreaming can help to solve problems

How many times have you worried about whether you are daydreaming too much? Or become annoyed with students who seem to spend too much time day dreaming?

Apparently, daydreaming is actually good for us. Researchers have determined that the daydreaming mode is restorative, and as a result, we are often able to form connections between things that were not obvious before. Daydreaming can be the source of insights. It can help us to solve the problems that we don't know how to solve. In this way, it is akin to 'going to bed to sleep on a problem', and 'waking up with a solution to it in your head'.

Daydreaming can even be induced – listening to music or relaxing, e.g. taking a long walk or engaging with nature, can encourage the daydreaming mode. Being organised, rather than stressing out, e.g. by writing lists, putting events into a calendar or making plans to deal with jobs and issues that come up, helps to prioritise things and clear your mind. This will allow room for your brain to daydream. Researchers, using functional MRI (fMRI) experiments that measure brain activity, have been able to show that daydreaming occurs – as the brain's activity changes significantly as our attention changes from concentrating to daydreaming.

In this modern age, we often have to negotiate an overwhelming amount of information at a time. People often feel as if they are being taken beyond their capacity to deal with

everything. Hence the idea of saying 'no' sometimes, when given more and more tasks to do, can help prevent you from becoming overtasked. Some of the worst disasters have been caused by people who were overtasked, overworked, not had enough sleep and were at the limits of their capacity to pay attention, e.g. the Exxon Valdez spill.

Information overload occurs when information comes in faster than we can process it, e.g. we can normally drive without too many problems, but when you are trying to drive a car with your children in the back arguing with each other, you can be pushed to overload and are more likely to have a crash.

Back in 1956, research showed that humans can only pay attention to '7±2', i.e. between 5–9, items at a time. More recent research established that we can really only

... continued on page 11

2014 editions:

Earth & Environmental Science Past HSC Papers & Worked Solutions



2001–2013



2008–2013

... see page 7 to order ...

★ 2014 editions Past HSC Questions & Worked Solutions ... see p7 ★

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★★ ATTENTION ★★

After you have read this, please write/tick your name below and pass it on.

- 1.
- 2.
- 3.
- 4.
- 5.

Please return to file or noticeboard.

PRIZES TO WIN!

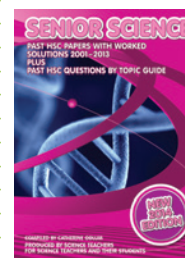
See pages 1, 9 & 12
Send in your entries now
(ALL IN THE ONE ENVELOPE if you prefer!)

Past issues of SciTalk are available at
www.odlumgarner.com

Book Giveaway

WIN a copy of ...

Senior Science 2001-2013 Past HSC Papers with Worked Solutions



Also available as
2008-2013 book
... published by
Odlum & Garner
(see page 7)

This book includes a *Past HSC Questions by Topic Guide* for ALL papers, so students can revise topic by topic or use the actual exam papers. It contains complete copies of ALL 2001–2013 exams with ALL questions, diagrams, etc, plus worked answers that are an appropriate length and would score full marks, a guide on *How to Achieve Success in the HSC*, and more. For more details about the Biology/Chemistry/Physics/Earth & Environmental Science books in this series, go to www.odlumgarner.com

TO WIN: Send your name, school & school address on an envelope by 17 December 2014 to: Book Giveaway, PO Box 442, Freshwater 2096

★★★

Winners for SciTalk 3/14

Congratulations to Rebecca Roach at Westport High, who won the *Dynamic Agriculture Years 7–10* book (rtp \$78.95 ea), published by Cengage.

Diary Dates



Update on BOSTES matters

You should regularly check the BOSTES website to ensure you have the latest data – on syllabuses, past exam papers, news, Official Notices, Board Bulletins, statistics archive and more.

Timeline for new Stage 6 Science syllabuses

BOSTES is working on the development of new NSW syllabuses for Stage 6 Science. Consultation on the proposed directions for syllabus development took place in Term 3 as planned. Final directions should be finalised by the end of 2014.

Writing briefs will then be developed during the first half of 2015, and the final writing briefs developed mid 2015. Once these are endorsed, the draft syllabuses will be developed, prior to the final syllabuses being ready along with support materials. Writing and consultation for the draft syllabuses should occur in 2015–2016. The implementation date is still to be advised. For more details, see the BOSTES website.

BOSTES enquiries

Ph: 9367 8111, fax: 9367 8484
www.boardofstudies.nsw.edu.au
 and www.bostes.nsw.edu.au

BOSTES contacts for Science

Inspector Science, K–12



Handwriting better for learning than typing

Students preparing for the HSC should practise handwriting answers to past HSC questions. Research has shown that the act of handwriting helps us to clarify our thoughts and to remember things better. Not only has it been shown to affect memory, but it has also been shown to improve cognitive ability.

The HSC Examination papers still require students to handwrite responses. Students who want to maximise their marks should be aiming to improve their exam skills. To do this, they should practise by handwriting answers to past HSC questions – looking at digital copies and typing answers is not the same at all and is much less effective than handwriting for revision and building up a deeper understanding and long-term memory.

NOTE: When you purchase the Odlum & Garner Past HSC Questions & Worked Solutions books for Biology, Chemistry and Physics, you are helping 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.

2014

For Shell Questacon Science Circus 2014: www.questacon.edu.au/outreach/programs/science-circus

OCTOBER 2014

17, 20, 24, 27, 31 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, www.odlumgarner.com

NOVEMBER 2014

3, 10, 14 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, www.odlumgarner.com

17, 21, 24, 28 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, www.odlumgarner.com

DECEMBER 2014

2–17 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, www.odlumgarner.com

22 Summer Solstice (10:03 am AEDT)

2015 International Year of Light www.light2015.org/

JANUARY 2015 National Youth Science Forum. Forms to local Rotary club by 31/5/14, interviews from July. Only for Year 11 in 2014. P: 6125 2777, E: nsss@anu.au, www.nysf.edu.au/

FEBRUARY 2015

27 Schools' Clean Up Australia Day. www.cleanup.org.au/au/

MARCH 2015

1–7 National Seaweed 2015. www.mesa.edu.au/seaweed.asp & www.ausmepa.org.au

20, 23, 27, 30 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

21 Autumn Equinox (9:45 am AEDT)

APRIL 2015

24, 27 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

22 International Earth Day. www.earthday.org

MAY 2015

1, 22, 25 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

b/w 20–27 Big Science Competition: www.asi.edu.au/bigscience/ Ph: 62012552

JUNE 2015

1, 5, 12, 26 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, www.odlumgarner.com

5 World Environment Day

21 Winter Solstice (2:38 am AEST)

tba NSW Schools Titration Competition: www.nswtitration.com/

JULY 2015

5–8 CONASTA 64 in Perth: 'Science: A kaleidoscope of wonder & opportunity', asta.edu.au/conasta

AUGUST 2015

1 Jeans for Genes Day. www.jeansforgenes.org.au/

5 Chemistry Olympiad Exam. www.asi.edu.au/olympiads/ Close date: 6/7/15. Ph: 6201 2552

7 Earth & Env Science Olympiad Exam. www.asi.edu.au/olympiads/ Close date: 22/7/15.

10 Biology Olympiad Exam. www.asi.edu.au/olympiads/ Close date: 22/7/15. Ph: 6201 2552

12 Physics Olympiad Exam. www.asi.edu.au/olympiads/ Close date: 22/7/15. Ph: 6201 2552

14, 17, 21 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

15–23 National Science Week. Schools theme: Making waves – the science of light.

www.scienceweek.net.au/schools/

SEPTEMBER 2015

7, 11 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, www.odlumgarner.com

23 Spring equinox (6:20 pm AEST)

OCTOBER 2015

11–17 Earth Science Week. www.earthsciweek.org

16, 19, 23, 26, 30 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, www.odlumgarner.com

NOVEMBER 2015

2, 13, 16 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, www.odlumgarner.com

20, 23, 27, 30 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, www.odlumgarner.com

DECEMBER 2015

1–16 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, www.odlumgarner.com

22 Summer solstice (3:48 pm AEDT)

JANUARY 2016 National Youth Science Forum. Forms to local Rotary club by 31/5/15, interviews from

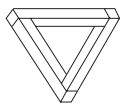
July. Only for Yr 11 in 2014. Enquiries: 6125 2777, email: nsss@anu.au, www.nysf.edu.au/

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.

▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶ **OUT AND ABOUT**

Science Centre & Planetarium

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The film also peers into wonders too small for the human eye to see – from the minute structures on a butterfly's wing and the tiny organisms that inhabit the human body, down to nano-scale structures.

Ph: 02 9213 1600 Email: education@imax.com.au
Book online at: www.imax.com.au/schools

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The Museum of Human Disease is Australia's only publicly accessible medical Pathology collection and offers a unique opportunity for Biology, Senior Science and junior Science students to gain a deep understanding of body and disease elements in the curriculum.

Further information and bookings:
T 02 9385 1522
E diseasemuseum@unsw.edu.au
W www.diseasemuseum.unsw.edu.au



SHIPWRECKS, CORROSION & CONSERVATION
STAGE 6 CHEMISTRY

This program relates to the *Shipwrecks, Corrosion and Conservation* option. Students attend an AV presentation on conservation and restoration, including footage taken during the recovery of material from HMS *Bounty*. Students then participate in a hands-on workshop focusing on desalination of metal objects, metal and corrosion product identification, methods of protecting metals and rates of corrosion.

This is followed by a guided tour of shipwreck material in the museum. Students may also visit the destroyer HMAS *Vampire* and submarine HMAS *Onslow*.

Program is 4 hours, at a cost of \$22.00 per student (teachers free).

Bookings & Information:
Phone: 02 9298 3655 Fax: 02 9298 3660
Email: bookings@anmm.gov.au
Location: 2 Murray Street, Sydney 2000
Website: www.anmm.gov.au/



**WHY NOT COMBINE
A FUN PARK EXCURSION
BOOKED THROUGH PHYSICS IS FUN
WITH A SEEING A FILM AT IMAX?**

Combine your Fun Park Excursion at Luna Park Sydney booked through **PHYSICS IS FUN** with a visit to IMAX for a great action-packed, fun time of interactive learning.

- **DETAILS:**
IMAX: www.imax.com.au/schools
FUN PARK EXCURSION (through Physics is Fun): www.odlumgarner.com
- **WHAT TO DO:** Allow 1 hr for IMAX (any film), then 2-3 hours for Physics is Fun at Luna Park Sydney (rides open at 11 am, Mon/Fri + any school day in December)

BOOK & PAY SEPARATELY FOR EACH EXCURSION

National Science Week
15-23 August 2015

Plan to participate in this annual event, so your students can enjoy and explore the wonders and benefits of Science.

There will be many Science Week happenings. Details will be available in 2015 at:

www.scienceweek.net.au

Celebrate the 2015 National Science Week by going on a Science excursion. You could go to a fun park excursion through *Physics is Fun* to Luna Park Sydney on 14, 17 or 21 August 2015, or visit one of the other excursion venues on this page for National Science Week.



Learning another language slows your mental decline

Learning another language takes time, patience and perseverance – but the benefits are worth it. It will make you smarter, more decisive and improve your memory.

The results of a study that has tracked hundreds of Scottish people for decades has provided strong evidence that speaking an extra language slows the mental decline that can come with age. These results showed that the benefits occurred regardless of your IQ and the age at which you learn your second language. The study confirmed the findings of several other studies, that being bilingual delays the onset of Alzheimer's and dementia by at least four or five years, irrespective of education level, income level, gender, and physical health.

The study of Scottish people required the participants to undertake a battery of cognitive tests when they were aged 11. All were monolingual English speakers. They were given cognitive tests again when in their 70s. Those who had learned a second language performed much better in their cognitive tests than was predicted from their earlier scores.

Educators often liken the brain to a muscle, because it functions better with exercise. Learning a language involves memorising rules and vocabulary, which helps strengthen that mental 'muscle'. This exercise improves overall memory, which means that multiple language speakers are better at remembering



From Frankenstein to Robocop

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E diseasemuseum@unsw.edu.au

W www.diseasemuseum.unsw.edu.au

lists or sequences, and are therefore better at retaining shopping lists, names and directions.

Language speakers also develop a better ear for listening, since they are skilled at distinguishing meaning from discreet sounds.

Other studies have shown that people who speak more than one language are more perceptive, e.g. they are better at observing their surroundings, focusing on relevant information and editing out the irrelevant, as well as better at detecting misleading information. They can better handle problem-solving tasks. A study done at the

University of Chicago showed that bilinguals tend to make more rational decisions.

So, if you have not spoken a foreign language since you left school, your brain might not be reaping these bilingual benefits. However, it is not too late – you can begin language study in your adult life and achieve similar levels of fluency as a young learner and reap the same mental benefits too.

References: (last accessed 10/10/14)

- *NewScientist* 7 June 2014
- Anne Merritt (2013). *Why learn a foreign language? Benefits of bilingualism.* (www.telegraph.co.uk)

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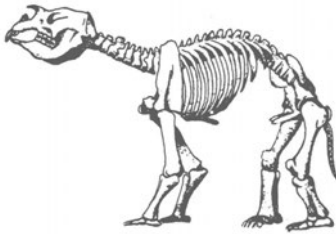
As seen on NAT GEO WILD



Australian Museum School Programs 2014

Evolution of Australian Biota Study Days

Check out our 2014 dates and locations at:
<http://australianmuseum.net.au/Evolution-of-Australian-Biota-Study-Days>



For visiting school group bookings and further information:

Ph 02 9320 6163 Fax 02 9320 6072 www.australianmuseum.net.au/education-services

Australian Museum Science Festival Tour

to Western Sydney & Port Macquarie

The Australian Museum Science Festival is heading off on tour with the Sydney-based Science Festival. We will be at the University of Western Sydney on November 4 and in Port Macquarie at Charles Sturt University on November 12 & 13.

To get on the interested schools list, email or call the festival team on 9320 6389 or scicom@australianmuseum.net.au

Videoconferencing

Schools can now access the Australian Museum's collections and staff via virtual excursions through an amazing selection of video conferences.

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www.australianmuseum.net.au/Video-Conferencing

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 (opp. Hyde Park)
 open daily 9.30 am – 5 pm
www.australianmuseum.net.au



Ebola outbreak is time to act

Ebola is linked to the eating of wild animals. According to the World Health Organisation, the Ebola virus enters human populations when people handle or eat infected wildlife, especially fruit bats, chimpanzees, monkeys, forest antelopes and porcupines. Eating bushmeat remains common throughout Africa, either for subsistence or as a luxury.

Based in Nairobi in Kenya, animal protection campaigner Tennyson Williams has called for more stringent controls to reduce the smuggling and consumption of wild animals that has helped Ebola to spread in West Africa. This would help the forests to recover, as well reducing the chance of future outbreaks of disease. At a minimum, Williams points out, governments should zealously enforce bans on the hunting and consumption of bats and apes, the two groups most commonly associated with Ebola.

Such bans exist in Africa, but are rarely enforced. Williams says this would be an ideal time for the governments in Africa to enforce the bans, as the population is fearful about the Ebola epidemic and so would be more supportive at this time.

Another way to reduce the chance of future outbreaks is for the world to act together to stop the illegal trade in live wildlife out of Africa. This trade results in considerable potential contact between infected animals and people, including traffickers, collectors, drivers, airport cargo handlers, airline passengers and the wider public in destination countries. As Williams points out, it would only take one sick chimpanzee trafficked through a major airline hub to spawn a new Ebola outbreak.

If the world is serious about preventing outbreaks of dreadful diseases, then it must act. Airlines, as the international transporters of live wildlife, need to stop the transport of these animals.

Reference: *NewScientist* 6 September 2014

Fun Park Excursions

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 at **Luna Park Sydney**



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Handwriting is better for learning – the pen is mightier than the keyboard

The digital age, with its typing, texting and emailing, may seem like it is helping us and, in many ways, it is. Typing is faster, often more convenient and results in legible work. Using the internet is great for research and a great resource for Science activities.

However, research has shown that handwriting helps people to understand, learn and remember much better than typing. Students who used handwriting remember much more and have a deeper understanding of the material.

The researchers, Anne Mangen from the University of Stavanger in Norway, and Jean-Luc Velay, a French neuroscientist, said their research indicates that any increase in digital writing in schools needs to be examined more closely. They found that writing by hand is fundamentally different from typing on a computer and results in people retaining the information much better. The physical act of holding a pencil and shaping letters sends feedback signals to a part of the brain called the Reticular Activating Centre (RAS). The RAS filters everything your brain needs to process, giving more importance to what you are actively focusing on at the moment – something that the physical act of writing brings to the forefront. The RAS in turn sends a signal to the cerebral cortex: ‘Wake up! Pay attention! Don’t miss this detail!’ All this leaves a ‘motor memory’, which later makes it easier to recall the information connected with the movement, according to the study.

When adults in Velay’s study were asked, either through typing or handwriting, to learn ten new, unfamiliar letters, those who had learned them by hand were more likely to remember the letters correctly. Brain scans showed that when they remember each

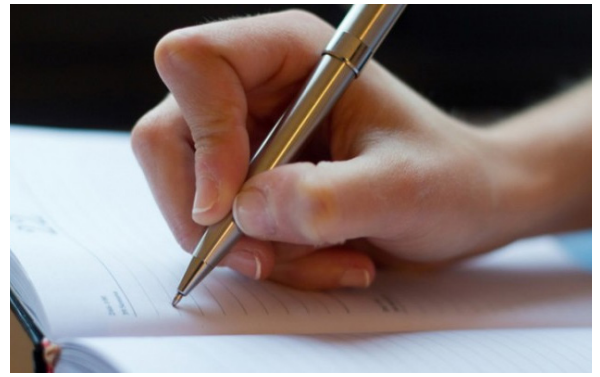
letter, the motor-function part of their brain was also active. Conversely, this did not happen for the people who learned new letters with a computer. Their minds had not connected the letter with a motor function.

This means that learning to write by hand can strengthen reading skills. Mangen said she understands the benefits of typing – how it is much faster and easier to edit. However, the fact that writing by hand can be comparatively ‘long and difficult’ might be the reason it can be so helpful in triggering brain processes, she said.

Brain imaging studies have also revealed that multiple areas of the brain become co-activated during handwriting, as opposed to typing or just visual practice.

New research and extensive experiments by Pam Mueller from Princeton University and Daniel Oppenheimer from the University of California have shown that students who write out their notes on paper actually learn more – they had a stronger conceptual understanding and were more successful in applying and integrating the material than those who took notes with their laptops.

They postulated that taking notes by hand forces the brain to engage in some heavy ‘mental lifting’ and these efforts foster comprehension and retention, whereas typing does not require as much processing of the meaning. It is readily acknowledged today that laptops do in fact allow students to do more, like engage in online activities and demonstrations, collaborate more easily on papers and projects, access information from the internet, and take more notes as most



people can type faster than they write. The innovative tools offered by technology are shaping educational experiences for students, often in positive and dynamic ways.

However, the research by Mueller and Oppenheimer serves as a reminder that even when technology allows us to do more in less time, it does not always foster learning. Learning involves more than the receipt and regurgitation of information. If students are to synthesise material, draw inferences, see new connections, evaluate evidence, and apply concepts in novel situations, we need to encourage the deep, effortful cognitive processes that underlie these abilities.

Hence cognitive processes need to be kept in mind when implementing new ideas in schools. Writing by hand engages students in their work or a lecture more because of the neural activity that takes place. It helps their capacity to remember and retain information, whereas typing requires less brain activity and is not considered effective in helping students to remember or retain information.

References: (last accessed 5-10-14)

- www.psychologytoday.com/
- www.scientificamerican.com/article/a-learning-secret-don-t-take-notes-with-a-laptop/
- news.medill.northwestern.edu/chicago/news.aspx?id=177291&print=1

Biotechnology could save chestnut trees

The near-extinct American Chestnut tree (*Castanea dentata*) used to grow in vast numbers across most of the eastern United States (US). However, by the 1950s it had all but vanished from its natural region.

Chestnut blight, a devastating Asian fungus (*Cryphonectria parasitica*) has almost completely wiped out more than four billion of the once mighty trees in the US. This fungus is believed to have been brought to the US from China at the start of the 20th century.

Researchers at the State University of New York, initially tried cross-breeding the American chestnut with the resistant Chinese chestnut. They produced a hybrid that holds most of the characteristics of the American Chestnut, but without the vulnerability to the blight. However, the cross-bred trees were not fully resistant.

Now, after 20 years of work, scientists have engineered new strains of American

chestnuts that are resistant to the Chestnut blight fungus. By adding a single gene called OxO from wheat, they have created fungus-resistant trees that will pass their resistance onto their offspring. This gene causes an enzyme, oxalate oxidase, to be made. This destroys the toxic oxalic acid made by the fungus, thus preventing cankers forming on the tree. By-products from the enzyme’s action also help the tree’s natural defences to work.

The genetically modified (GM) trees have now produced the first resistant chestnuts. From these seeds, countless resistant trees could be grown in the wild. Since 2006 more than 1000 modified chestnut trees have grown in contained pots. The researchers are now applying for permission to plant them in the wild and have them considered acceptable to eat. If approved, it will still be another 20 years before the tree will be re-established across the US. Modified strains that are even



Figure 1 American chestnut tree

[Photo by Megzee-Cha, Flickr]

more resistant are also not far behind.

So unless blocked by anti-GM (genetic modification) activists, biotechnology could save the American chestnut. This will be a critical test of public opinion about the role of GM in conservation.

References: • www.geneticliteracyproject.org (last accessed 10-10-14) • *NewScientist* 7 June 2014

2014 editions: Past HSC Papers with Worked Solutions

All books include: PAST HSC QUESTIONS BY TOPIC GUIDE

- *Biology* • *Chemistry* • *Physics*
- *Senior Science* • *Earth & Environmental Science*

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Frozen poop pills for more palatable faecal transplants

Researchers in the US have figured out a new less unsavoury, but equally effective way of doing a faecal transplant. Faecal transplants have been around for a while – this is just the next level!

Faecal transplants can be life-saving for people with stubborn bacterial infections, but they are not for the faint of heart. So doctors have come up with a way to make them more ‘palatable’: a frozen, encapsulated poop pill.

People with gastrointestinal *Clostridium difficile* infections suffer debilitating diarrhoea and this bacterium often defies antibiotics. *C. difficile* infections cause around 250,000 hospitalisations and 14,000 deaths each year in the US alone, and up to 30% of patients infected with it do not respond to antibiotics. Chronic infection can lead to debilitating digestive issues.

Traditional Chinese medicine from over a millennia ago included treating intestinal problems with faecal matters. Patients were given ‘yellow soup’ – made from faeces mixed with water. Doctors have been successfully using faecal transplants for over 50 years to help restore good intestinal bacteria and displace pathogenic organisms. Up until now, faecal transplants have been very awkward as they involve the donation of fresh faeces, usually from a healthy relative, and the transfer of faeces into the patient using either an enema, colonoscope or nasogastric tube. As you can

imagine, this is not very pleasant. At this stage, this treatment is too expensive and uncomfortable to be used widely.

The US researchers have managed to put frozen faecal matter into capsules that can be taken orally – they had previously found that frozen samples were just as effective as fresh samples. Small-scale trials have shown that these capsules have a similar 90% success rate as do traditional faecal transplants against the potentially fatal *C. difficile* bacteria. The use of capsules simplifies the procedure immensely, potentially making it accessible to a greater population.

Larger studies are now needed to confirm whether this method will be effective and safe to use on a wide range of people in the future. Great care will need to be taken, as unknown infectious agents could be transmitted this way.

The reason faecal treatments work is because the faeces contains intestinal bacteria from the healthy donor’s intestines, and these microbes can overcome *C. difficile* infections within days. A big issue to consider in using this treatment in the future will be that you’re asking people to ‘eat poop’!

Unfortunately for the recipients, the capsules used need to be acid resistant so they can make it through the stomach and into the large intestine – and only translucent



Figure 2 Faecal transplant pills. [Photo: Hohmann Lab]

acid-resistant capsules are available. Hence the faecal capsules have a brownish colour ... which is not very aesthetic!

These frozen poop pills haven’t yet been named – but some amusing suggestions that have been made include: pooberry pancakes, sweet corn and chicken poop, dump-plings, shit-take mushrooms, kangapoo steak, chocolate cust-turd, soft-shell crap, bum-ble gum, a trans-poo-sion, fecaled onions, nuggets, dung beans, raspberry stoolis, Christmas logs, cheese and vegeshite sandwich, tiramapoo, poo-veined cheese, bum-Alaska, peanut butter and smelly sandwich, consti-pâté, cheese and crappers, organe deuce!

References: (last accessed 15/10/14)

• jama.jamanetwork.com (11-10-14)

• www.sciencealert.com.au/news (13-10-14)

• Rajeev Verme & Amelia Reid • en.wikipedia.org/

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Quest for peanuts that won't cause allergic reaction

Teachers are trained to be aware that allergic reactions to peanuts can range from skin rashes to anaphylaxis, which can be fatal. Currently, the best way for those allergic to peanuts to stay safe is to avoid them. Many people carry epinephrine injectors that help offset their allergy symptoms until they reach a hospital. Children's parties with 'peanut hunts' have become a thing of the past, due to the worry of guests being allergic to peanuts.

So scientists have been trying to find a way to produce safer peanuts that are less likely to trigger life-threatening allergic reactions for many years. The problem is that they might not taste so good after the processing.

Back in 2003, food engineers discovered that the maturation, curing and roasting of peanuts increases their allergen content. These three processes give roasted peanuts their special flavour. The first, maturation, simply involves leaving peanuts to ripen in the field. Immature peanuts are renowned for their bad taste. Curing, the second process, involves dehydrating the nuts by warming them to between 35–70°C. Finally, they are roasted at around 160°C for about 20 minutes.

So by tweaking these processes the nut industry may be able to make them safer. Unfortunately, many of the proteins and sugars blamed for allergies are thought to give roasted peanuts their distinctive, rich flavour. So getting rid of them could destroy the taste.

Researchers have been hopeful that modifications to processing could minimise the allergenicity of roasted peanuts while keeping most of the taste. Curing below 60°C, for example, does not generate new allergens.

In 2014, scientists at the University of Florida successfully removed 80% of the allergens from whole peanuts, moving them a step closer to eliminating 99.9% of peanut



Figure 3 Raw peanuts in their shells (top). Blanched peanuts (shelled raw peanuts with the shells and skins taken off) (bottom).

allergens. The scientists must eliminate peanut allergens below a certain threshold for patients to be safe, said Wade Yang, assistant professor of food science at the University of Florida. However, eliminating all peanut allergens is a challenge, because doing so may risk affecting texture, colour, flavour, and nutrition.

In the 2014 study, researchers used a pulsating UV light system to direct concentrated bursts of light to modify the peanut allergenic proteins. That way, they say, human antibodies cannot recognise them as allergens and begin to release histamines. Histamines create allergy symptoms such as

itching, rashes and wheezing. The pulsing light reduced the allergenic potential of the major peanut proteins Ara h1-h3.

This technique was used previously in 2012 by Yang on peanut extract. He removed up to 90% of the allergic potential from peanut protein extracts. The current tests were done on the actual peanuts, which of course, is what people eat.

Yang hopes to eventually conduct clinical trials on animals and humans. This will reveal if the taste has been affected or not, and whether sufficient allergens have been removed.

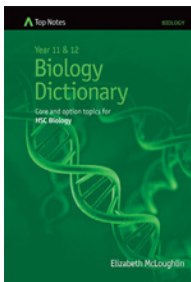
In the meantime, people who eat peanuts should choose their peanuts with care. Recent experiments in 2014 on mice suggest that dry-roasted nuts may be more likely to trigger allergies than raw nuts, possibly because of chemicals formed during roasting. The results may help explain why people in the West are more likely to be allergic than in East Asia, where dry-roasting is uncommon.

References: (last accessed 5-10-14)

- www.sciencedaily.com, 29 September 2014
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is equally as
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Heading into summer

... Robert Garner

As we progress from spring into summer, the nights are getting shorter and warmer, without the humidity getting too high. So there should be some good conditions for observing the night sky.

The Planets

Mercury, being the closest planet to the Sun, is only ever visible just before sunrise or just after sunset – so it is usually hard to find because of the Sun's glare. Mercury passes between the Earth and the Sun on 17 October returning to the eastern dawn sky in the last week of October. Mercury barely shows above the horizon before sunrise at the beginning of November. It then moves behind the Sun again for superior conjunction (far side of the Sun) on 8 December. Mercury returns to the evening twilight in mid-December. This time there will be a better opportunity to find Mercury. From Christmas to around 11 January 2015, Mercury will be seen getting closer to Venus each evening just after sunset. Venus and Mercury will be less than 1° apart on 11 January, but then move further apart. Binoculars may be needed to see Mercury and Venus against the twilight glare.

Venus is not visible in October, being in superior conjunction (Venus and Earth on opposite sides of the Sun) on 25 October. Venus will reappear as the Evening Star in the western sky in late November, but will be difficult to see due to the glare of twilight. By the end of December, Venus will be setting more than an hour after the Sun, making it easier to see. Venus will remain as the Evening Star until August 2015.

Mars is visible in the western evening sky throughout October, November and December. It is fairly high in the sky in October setting a little earlier each night to be setting around 11 pm (AEDT) by the end of December. Mars is becoming a much fainter object to observe as it is much further away from Earth than back in April when it was at its closest to Earth. On 28 October, on 26 November and again on Christmas night, the 4-day-old crescent Moon will appear adjacent to Mars, making Mars easy to locate.

Jupiter, the giant planet, is rising not long before dawn in the eastern sky in early October. On 18 October, around 3 am, Jupiter will be seen passing within 0.6° just below the waning crescent Moon. The planet rises about ½ hour earlier each day, so by mid-November it is rising before midnight. Another good time to view Jupiter will be on 15 November, as the Last Quarter Moon will be 5° above the planet. By December, Jupiter will be visible in the late eastern evening sky. On 9 December, Jupiter begins a period of four months in retrograde motion when it moves from west to east against the background stars. It also gets significantly brighter in appearance as the Earth and Jupiter are getting progressively closer to one another.

Saturn is visible low in the early western evening sky early in October. It then disappears from view as it approaches conjunction (far side of the Sun) on 18 November. It will reappear in the eastern pre-dawn sky in mid-December.

Solstice

The summer solstice for the Southern Hemisphere occurs at 10:03 am (AEDT) on 22 December 2014. This is when our daylight hours are longest. The Sun will be at its most southerly point before heading back towards the north.

Meteor showers

The *Orionids* will be visible from 2 October to 7 November. Peaking around 21 October this year (with rates of 14–35 meteors per hour going on past years), they will be best seen from late evening until dawn. The *alpha-Monocerotids*, a minor shower, will be active from 15–25 November, and peak around 21 November. They are best seen after midnight. Viewing of both meteor showers will be favoured by the new Moon in both months.

Constellations

For the whole of the Term 4 period, *Crux*, the Southern Cross constellation, can be seen upside down in the southern sky with the two pointers, α and β Centauri to the west of *Crux* and the bright star, Canopus to the east of *Crux*. Canopus is the 2nd brightest of the stars we ever see in the night sky. Further towards the east is Sirius, the brightest star in the night sky. The 3rd brightest star is one of the *Crux* pointers, α Centauri. So these three brightest stars can all be seen from east to west across the southern sky at this time.

The *Scorpius* and *Sagittarius* constellations will be low in the western sky, setting soon after sunset, but will disappear from view by the end of November.

By November, the summer constellations of *Orion* and *Taurus* will be rising in the eastern evening sky to become prominent over summer, and the *Magellanic Clouds* will be high in the southern sky.

During December, you will be able to see a further four of the ten brightest stars – high in the southern sky and to the right of Canopus and Sirius, you will see Achernar, the 9th brightest star. In the northeast you will be able to see Rigel (7th brightest) and Betelgeuse (10th brightest), both of which are in the *Orion* constellation. Betelgeuse is the brightest red giant star that we can see from Earth. Lower down you will see Procyon (8th brightest) and close to the northern horizon is Capella (6th brightest). A sky chart or planisphere will help you to find out where to look for these bright stars (see Box 1).

The *Pegasus* constellation (the 'winged horse') contains four second magnitude stars. These four stars form a great 'square' (or trapezium), as *Pegasus* moves across the northern horizon. They are the body of the horse. It is one of the few constellations that is the right way up for viewers in the Southern Hemisphere and so the pattern of stars actually looks like the flying horse that gives the constellation its name.

Using a Sky Chart / Planisphere

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

Box 1: Sky Charts & Planispheres

- You can download free sky charts each month to explore the night sky from: www.skymaps.com/downloads.html Make sure that you scroll down 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 – make sure it is for the Southern Hemisphere. While the site itself is out-of-date, there is a planisphere (star wheel) to print and use at: <http://members.ozemail.com.au/~starrylady/resources.html>

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There are also two **planetarium sessions** per semester on Friday nights from 7–8 pm, in the E7B Courtyard at Macquarie Uni. Tickets must be booked online at: physics.mq.edu.au/community/planetarium/

An optimistic outlook on cane toads

Cane toads (*Bufo marinus*) were introduced into Queensland in 1935 in an attempt to control cane beetles. Cane toads have become a pest and are still spreading at alarming rates, further and faster than anyone expected into many regions of Australia. They appear to have evolved to be more aggressive and to move faster than previously – they are spreading further by around 55 kilometres per year.

These toads were not at all successful in controlling cane beetles and have a devastating impact when they first arrive in a new area. However, biologist Rick Shine from the University of Sydney is more optimistic about the presence of cane toads than other scientists. Shine has observed that most animals are actually adapting to the presence of cane toads. He admits that cane toads eat any animal they can fit into their mouths, produce toxins in their skin that can stop the heart when absorbed through the mouth or eyes, and most animals that try to eat them die.

After cane toads have been in an area for a while, Shine has observed that the native species that were initially affected and



Figure 4 Cane toad [Photo by Michael Linnenbach, en.wikipedia.org]

Continued from page 1 ...

deal with about four items at a time. Each item that we start to pay attention to involves a metabolic cost as the brain requires glucose to operate. The brain will quickly become exhausted if we do not allow it to rest.

We are constantly being asked to do more. It seems that the expectations of employers, colleagues, friends and family are that we do more and more things. So it is important that we prevent ourselves from becoming overloaded, so that we can pay attention to what is important and achieve those things that are necessary ... and, most importantly, have time to daydream.

[Reference: Interview with neuroscientist Daniel Levitin from NewScientist, 16 August 2014]



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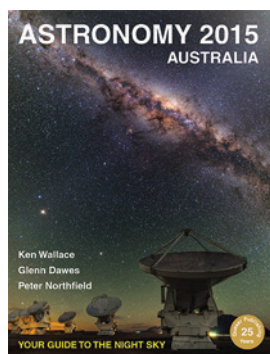


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seemingly disappearing, have become more common, e.g. the quolls and goannas at Fogg Dam and in the Kakadu region. Shine has also found toad invasions have had almost no effect on the abundance of native frogs. Perhaps the presence of the toads had led to predators of frogs avoiding all of them, Shine has suggested. Other animals appear to be evolving features to avoid toads, e.g. red-bellied black snakes and tree snakes living in toad-infested areas have evolved smaller heads over time, preventing them from eating large toads.

So cane toads are not the disaster once feared apparently. There is no evidence that any extinctions have occurred as a result of cane toads. However, this could change in the future, as cane toads carry a lungworm parasite that is deadly to tree frogs found in the Kimberley. Since tree frogs will huddle together with cane toads, the transmission of this lungworm into tree frogs is possible.

Nevertheless, scientists are still working on ways to stop the spread of cane toads, e.g. by developing pheromone traps, pheromone repellents and fences. As the toads head towards desert areas, it is hoped the lack of water there will halt their progress south. Scientists have abandoned their quest to develop a virus to kill the toads.

Shine also claims that for all the talk of their viciousness, cane toads seem remarkably tame. Their weapon is toxicity, so when threatened, they just sit still. He has even commented that their eyes are magnificent and look 'like an exploding star with black and gold speckles'.

Reference: NewScientist 26 April 2014



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