Providing support and promoting excellence in science education

SciTalk

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Number 2 – May 2011

Progress of the Australian Curriculum for Science

K–10 Science

The K–10 Science curriculum is being developed as one of the courses in the first phase of the development of a National Curriculum. The draft curriculum for K–10 Science was consulted on by both the Board of Studies NSW (BOS) and the Australian Curriculum, Assessment and Reporting Authority (ACARA) during 2010.

The development of the K–10 syllabuses for NSW by the BOS will follow the usual syllabus development processes. This will include extensive consultation and during this process implementation plans will be developed with all NSW stakeholders across all sectors with a view to substantial implementation by 2013. There will be no implementation in 2012.

Senior secondary Science

There are four proposed areas for Science: Physics, Chemistry, Biology and Earth Environmental Science. Initial consultation on the draft senior secondary Australian Curriculum for these areas took place in 2010. The consultation focused on the curriculum content and the feedback will inform the next draft of the senior secondary curriculum content and achievement standards. Further national consultation by ACARA is planned, hopefully in 2011.

Any subject, such as Senior Science, not included in the development of the Australian Curriculum will continue to be the responsibility of state and territory education authorities.

... continued on page 11

Get 12, 15 or 19 August 2011 into your school calendar for this year's Physics is Fun in National Science Week

INSIDE SCITALK ▶▶▶▶

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★ ★ ★

Winner for *SciTalk 1/11*

Congratulations to Blake Ashcroft, Narrandera HS, who won a *studyON HSC Chemistry Value Pack* (rrp $94.90) published by Jacaranda.

Diary Dates

International Year of CHEMISTRY 2011

For: Shell Questacon Science Circus 2011 program: www.questacon.edu.au/html/on_the_road.html

MAY 2011

- 4–6 Science at Shine Dome conference, Australian Academy of Science
- 6, 27 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

JUNE 2011

- 1 Rio Tinto Big Science Comp: www.asi.edu.au/bigscience/competition.php (close date 2/5)
- 3, 6, 10 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 5 World Environment Day
- 17/18 (metro) NSW Schools Titration Competition. www.nswtitration.com/
- 22 Winter Solstice (3.16 am EST)
- 24 Biology Teachers PD Day. Museum of Human Disease, UNSW, Ph: 93851522
- 30 Closing date Crystal Growing Comp. www.raci.org.au/branches/nsw-branch Ph: 9663 4960

JULY 2011

- 3–16 International Science School: *Light & Matter*. Details: science.edu.au/science/physics/foundation
- 10–13 CONASTA 60 in Darwin: *Science at the Top*. Details: www.conasta.edu.au/
- 25–30 National Chemistry Week. www.raci.org.au/branches/nsw-branch Ph: 9663 4960
- 28 National Chemistry Quiz. http://www.ancq.com/ Ph: 9663 4960. Closing date: 9 May
- 31 Robotics Fun Day. Macquarie Uni, 2–4 pm, E7B Courtyard, ph: 9850 7413

AUGUST 2011

- 5 Jeans for Genes Day. www.jeansforgenes.org.au/
- 12, 15, 19 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105 ... you can celebrate National Science Week on one of these days with Physics is Fun!
- 13–21 National Science Week. *React to Chemistry.* www.scienceweek.gov.au
- 15 Phys Olympiad Nat.Qualify.Exam. www.asi.edu.au/olympiads/ Close date:22/7. 6201 2552
- 17 Chem Olympiad Nat. Qualify. Exam. www.asi.edu.au/olympiads/ Close date:22/7. 6201 2552
- 18 Biology Olympiad Nat. Qualify. Exam. www.asi.edu.au/olympiads/Close date:22/7.62012552

SEPTEMBER 2011

- 9, 12 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 23 Spring Equinox (7.04 pm EST)

OCTOBER 2011

- 9–15 Earth Science Week. www.earthsciweek.org & www.ga.gov.au/education/events, ph (02) 6249 9111
- 17 HSC Examinations start: EES 21/10, Bio 28/10, Chem 2/11, Phys 4/11, Sen Sc 9/11
- 17, 21, 24, 28 31 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

NOVEMBER 2011

- 5 Astronomy Open Night. Macquarie Uni, 6.30–10 pm, use E7B courtyard entrance, no bookings required, ph: 02) 9850 7111, www.physics.mq.edu.au/community/FFA/opennight/
- 7–11 School Certificate tests take place: Science Test is on 7 Nov ... 12.50–3 pm
- 4, 14, 18 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 21, 25, 28 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

DECEMBER 2011

- 2, 9, 12, 16 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 22 Summer Solstice (4.30 pm AEDT)

JANUARY 2012 National Youth Science Forum. Forms to local Rotary club by 29/5/11, interviews from July. Only for Yr 11 in 2011. Enquiries: 6125 2777, email: nsss@anu.au, www.nysf.edu.au/

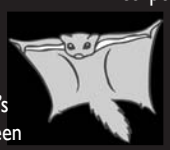
While all dates have been checked to ensure that information in DIARY DATES is correct, no responsibility will be accepted by the publisher or Editor for any omissions or inaccuracies in it.

Night Stalk

1 September–16 October 2011

You can help Australian scientists and conservationists to save our native species by taking part in this year's national Tiwest Night Stalk spotlight survey.

It's easy, fun and free. Schools can participate by focusing on the numbers and distribution of native animals and feral pests. All you need is a torch and a Spotter's Log. Choose one or several nights between 1 September and 16 October and spotlight in your local bushland. Record all native/introduced animal species: mammals, birds, bats, reptiles and frogs that you find and send your Spotter's Log to Perth Zoo. You can download a Night Stalk Teacher Support Pack to find out how to incorporate conservation into your science program. Student Activity Sheets are also available.



Now in its 13th year, this survey collects information about animals still living in the wild, especially near urban areas, and their distribution over time.

For information: Tiwest Night Stalk
PO Box 489 South Perth WA 6151
Visit: www.perthzoo.wa.gov.au/Act/Nightstalk/ to download a Spotter's Log or complete one online.

STOP PRESS: The Australian Science Festival, that has been held in Canberra over the last 19 years, will not take place in 2011.

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.

2011 School Certificate Rules and Procedures (18 March 2011)

All students sitting School Certificate tests can access this on the BOS website.

Changes to format of HSC exam papers and writing booklets.

From 2010, the parts of HSC exam papers and writing booklets that must be handed in for marking will be identified by an orange-coloured stripe. See 'Official Notice (BOS 29/10) 22 July 2010'.

Curriculum to use in 2011 (BOS 18/10)

All NSW schools are to continue to use the existing NSW K–12 syllabuses for 2011.

New NSW K–10 Syllabuses

The BOS is working on new K–10 Syllabuses with a view to substantial implementation of the Australian curriculum by 2013. Consultation on these will include an online survey and teacher meetings in metropolitan and regional areas. Details will be posted on the BOS website.

BOS enquiries

Ph: (02) 9367 8111, fax: (02) 9367 8484
Website: *www.boardofstudies.nsw.edu.au/*
BOS contacts for Science:
- Inspector Science, K–12 & Senior
- Assessment Officer – Science

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

OUT AND ABOUT

MUSEUM OF HUMAN DISEASE

2011 EXCURSION OPTIONS & TEACHERS DAY

The Museum of Human Disease is a pathology museum at UNSW offering interactive programs with amazing insights into the nature and progression of disease in its many forms. We offer 2 hour curriculum-based programs in the following areas:

HSC Biology – *The Search for Better Health*
HSC Senior Science – *Bionics*
Junior Science – *Infectious & Non-infectious diseases, microorganisms*

The **2011 Professional Development Day** for teachers of Senior Biology will be held on Friday 24 June. Information and registration forms will be distributed to schools in Term 2.

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

MUSEUM OF HUMAN DISEASE

UNSW THE UNIVERSITY OF NEW SOUTH WALES

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*.

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

Bookings & Information:
Phone: 9298 3655 Fax: 9298 3660
Email: bookings@anmm.gov.au
Location: 2 Murray Street, Darling Harbour

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45 minutes. Rated G. Bookings are now available. Call (02) 9213 1600 or email *education@imax.com.au* for school bookings.

Visit our website for session times up to 12 months in advance for schools: *www.imax.com.au/schooltimetables*

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  - **Stellar Evolution** – planetarium program for HSC Physics
  - **Superconductors & Liquid Nitrogen** – live science show
  - **Energy and Motion**
  - **Changing Worlds and Visions**
  - **Dinosaurs, Fossils & Coal**
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- ★ ***Also available***: environmental field trips, science shop, kiosk, science fun bags, membership programs.
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- **DETAILS:**
  IMAX: www.imax.com.au/schools
  AQUARIUM: www.myfun.com.au
  SWW: www.myfun.com.au
  FUN PARK EXCURSION (through Physics is Fun): www.odlumgarner.com
- **WHAT TO DO:** Allow 1 hr for IMAX (any film), or 2 hrs for a Sydney Aquarium/Wildlife World excursion. Allow 2–3 hours for Physics is Fun at Luna Park (rides open 11 am, Mon/Fri only).

BOOK & PAY SEPARATELY FOR EACH EXCURSION

THE SCIENCE EXPERIENCE 2011–2012

An invitation to all Year 9 and 10 students in 2011

This involves 3 days of hands-on Science in universities and tertiary institutions for Year 9 and 10 students in 2011.

Students will experience some of the wonders of Science, Technology and Engineering, perform interesting experiments, hear talks by scientists, meet new friends, and learn about careers in these areas.

The cost of the 3 day program is $110 (incl GST). Rotary clubs help to promote this program. So students should contact their local Rotary Club well ahead to give them time to consider sponsoring them.

Students can attend any program on the 'Where and When' page on The Science Experience website. Each includes a BBQ or social activity.

This program is run by The Science Schools Foundation, which makes arrangements with and assists, universities and tertiary institutions to conduct more than 35 programs annually.

For more information on how to apply, contact:

The Science Experience

Ph 03 8288 1001 or go to: *www.scienceexperience.com.au*

Science Update

Unnatural selection

Many plants and animals are evolving because of humans, who have become the greatest force in evolution. This will lead to the extinction of many species and changes to others.

Even just a small religious ritual can trigger rapid evolution, e.g. molly fish in Mexico are becoming resistant to rotenone, a poisonous chemical from plants that the Zoque people grind and pour into the river during one of their religious ceremonies. Elephant tusks are shrinking in the face of intensive hunting by humans, e.g. in eastern Zambia the number of tuskless female elephants had risen from 10% in 1969 to 40% in 1989. Other parts of Africa and Asia are now reporting tuskless bull elephants, e.g. in Sri Lanka under 5% of males now have tusks. Plants are also being affected, e.g. in Tibet, the height of the snow lotus has nearly halved over the last century as a result of flowers being picked for use in traditional medicine. By 1966, over 165 insect species, including bedbugs, had developed resistance to pesticides. Rats and mice around the world have become resistant to warfarin. Climate changes will affect many species, especially reptiles. In Finland, as winters become milder, brown tawny owls are increasing in numbers compared to grey ones as brown subtypes are better camouflaged in less snow. Elsewhere plants are flowering earlier in spring, coral reefs are declining. The introduction of pests has had a big effect on several of their predators, e.g. introducing Cane Toads into Australia has led to smaller jaws in red-bellied black snakes and green tree snakes, as snakes with bigger mouths have eaten large toads with enough toxin to kill them. Pollution from industrial activities and waste disposal is also affecting many species. □

Source: *NewScientist, 30 April 2011*

Biogas – a renewable resource

Methane and biogas

Methane (CH_4) is a hydrocarbon gas found in underground pockets as a fossil fuel. It is the main component of 'natural gas', which is commonly burned for cooking, warmth and heating water.

Organic agricultural wastes such as liquid and solid animal wastes or green crops result in the release of significant quantities of methane into the atmosphere due to their natural decomposition by bacteria. This occurs anaerobically (in the absence of oxygen) and results in the production of 'biogas'. Biogas is a mixture containing methane and carbon dioxide, and often contains small amounts of hydrogen sulphide and water.

The biogas produced by farm wastes can be trapped and the methane in it is destroyed by burning in a process called methane flaring. This releases carbon dioxide, which is a less potent greenhouse gas than methane and so it has less impact on global warming. However the methane would be better used as an energy resource. So Australian scientists are trying to develop more effective ways of using biogas digesters to deal with the methane released into the atmosphere from animal wastes, such as from piggeries.

Biogas and its uses

The breakdown process of organic materials such as animal wastes can be encouraged by placing it in large airtight cylindrical tanks known as 'biogas digesters'. The biogas produced can be captured and stored for use. As a result, odours are removed and the pollution potential of the wastes is reduced.

Biogas can be burnt directly in thermal applications displacing natural gas in cooking, space heating, water heating and for generating electricity. Biogas can also be cleaned and upgraded to natural gas standards and so it becomes biomethane. This enables it to be used as a fuel gas for machinery or to power motor vehicles.

The carbon dioxide produced is carbon neutral because it originally came from atmospheric carbon dioxide sequestered by plants as they grew. The small amount of potentially damaging sulfides that are produced can be removed from the biogas with scrubbers, traps and dehumidifiers. The remaining nutrients form a liquid food slurry that can be used as a fertiliser. Using such fertilisers helps to slow down the gradual loss of nutrients from soils during the food production cycle and reduces reliance on fossil fuel based fertilisers.

Biogas digesters can be incorporated into the energy supply of urban or rural communities. They are relatively cheap and easy to design, install and maintain and the system size ranges from small backyard systems through to large-scale industrial plants powering 1000's of homes. The use of biogas digesters is an ecologically sustainable alternative to sending organic waste to landfill, and so allows farmers to run their farms more sustainably.

An Australian biogas digester

One Australian example is Berrybank farm, at Windermere, west of Ballarat in Victoria. This farm is home to 15,000 pigs that produce the same quantity of effluent as a city of 40,000 people. In 1989, this farm reduced its impact on the environment by implementing a new Total Waste Management System involving a biogas digester. An initial $2 million outlay to improve farm efficiency was repaid in five years through sales of the products and efficiency savings, and significantly reduced their impact on the environment.

Berrybank have been able to recover all the odorous pig waste produced by the farm, treat it, and use the by-products on the farm or sell them at a profit. The biogas produced is used to generate electricity for use on the farm and to feed into the electricity grid. The by-products include large amounts of fertiliser as well as mineralised and recycled water that can be used for crop irrigation. This system resulted in a 70% reduction in water usage, improved conditions for the pigs, improved working conditions for staff, elimination of odour, and elimination of groundwater contamination. Berrybank was able to change its image in the community from an environmental problem to an accepted industry offering a good working environment.

To find out more about Berrybank go to: *www.ballarat.edu.au/projects/ensus/case_studies/piggery/*

Limitations of biogas digesters

Whilst the removal of waste has several advantages, such as preventing eutrophication of waterways and contamination of drinking water, there are limitations to incorporating biodigesters that tend to revolve around cost effectiveness and limited scales of operation. For example, the larger the amount of waste that is produced, the larger the amount of biogas that can be produced. Therefore for a relatively small farm with cows in a paddock, the impractical nature of collecting dung as feedstock for the biodigester becomes apparent. However with higher concentrations of animals in a small space, the collection of wastes becomes technically easier.

While the cost of a system may seem to be the most obvious barrier to implementation, this is not always the case. Connecting a system to the electricity grid involves technical and practical challenges as the system must meet the local standards and safety requirements. Operating, maintaining and servicing biodigesters is not a simple task and the costs and time involved may be another barrier to implementing such a technology.

Conclusion

There is a large potential for the application of biogas technologies to provide sustainable power supplies. The burning of methane in biogas for useful work before it is released into the atmosphere is beneficial in reducing climate change, especially as it displaces some other fuel that may be used to perform the useful work. Although landfill gas contains methane, many scientists do not consider it a safe source of energy (see Box 1).

Unfortunately the energy supplies that humans currently use to provide energy services are mostly derived from unsustainable sources, such as coal, oil, gas, and radioactive isotopes. The development of biogas technology makes social, environmental and economic sense and it is being applied in many areas of developing and industrialised nations to complement other renewable energy supplies.

Biogas is considered a renewable fuel, so it qualifies for renewable energy subsidies in some parts of the world. In 2007 an estimated 12,000 vehicles were being fuelled with upgraded biogas worldwide, mostly in Europe. With the many benefits of biogas, it is starting to become a popular source of energy in various parts of the world, e.g. in China, India, other parts of Asia, UK and USA.

References:

- www.ceres.org.au/greentech/biogas
- www.see.murdoch.edu.au/resources/info/Applic/Biogas/index.html
- Methane to Markets in Agriculture R&D Plan 2007 – 2009

Box 1. Landfill gases are different to biogas

A landfill is a site for the permanent disposal of waste materials by burial. The 'landfill gases' released by these sites are very different to both biogas and natural gas. Most landfills are highly heterogeneous environments, both physically and biologically, and the gas composition sampled can vary radically within a few metres, depending on what wastes were put into the landfill.

Landfill gases often contain significant corrosives such as hydrogen sulphide and sulphur dioxide, volatile organic compounds, as well as other contaminants (e.g. mercury, benzene, toluene, chloroform, vinyl chloride, carbon tetrachloride, and 1,1,1 trichloroethane) that may cause cancer and other health problems in local communities.

As a result, many scientists are not in favour of burning landfill gases because of the risks associated with releasing hazardous/toxic compounds into the atmosphere.

So the issues involving the burning of landfill gases should not be confused with the burning of biogas, which is considered safe. As long as the sulfides have been correctly removed from the products formed in biogas digesters, then the burning of the biogas produced from animal wastes should not pose health problems to humans.

Photo Spot Nylon fabric

Nylon is a large molecule made of identical repeating units. It is a 'condensation polymer' because it is formed through a condensation reaction that releases a water molecule when the two monomers that make up each repeating unit are joined.

Each repeating unit in nylon consists of a diamine monomer with two amino ($–NH_2$) groups, and a dicarboxylic acid monomer (with a –COOH group at each end). The repeating units are linked by amide bonds and so nylon is frequently referred to as *polyamide*.

The most common type of nylon is nylon 6-6, which refers to the fact that the diamine (1,6-diaminohexane) and the diacid (hexane-1,6-dicarboxylic acid) each donate 6 carbon atoms to the polymer chain.

Nylon fibre was the first commercially successful synthetic polymer and was first used commercially in a nylon-bristled toothbrush (1938), followed more famously by women's stockings (1940). Nylon was discovered in an attempt to find a substitute for silk. Due to its silky texture, nylon fabric was used as a synthetic replacement for silk, especially after silk became scarce during World War II. It replaced silk in military applications such as parachutes and flak vests.

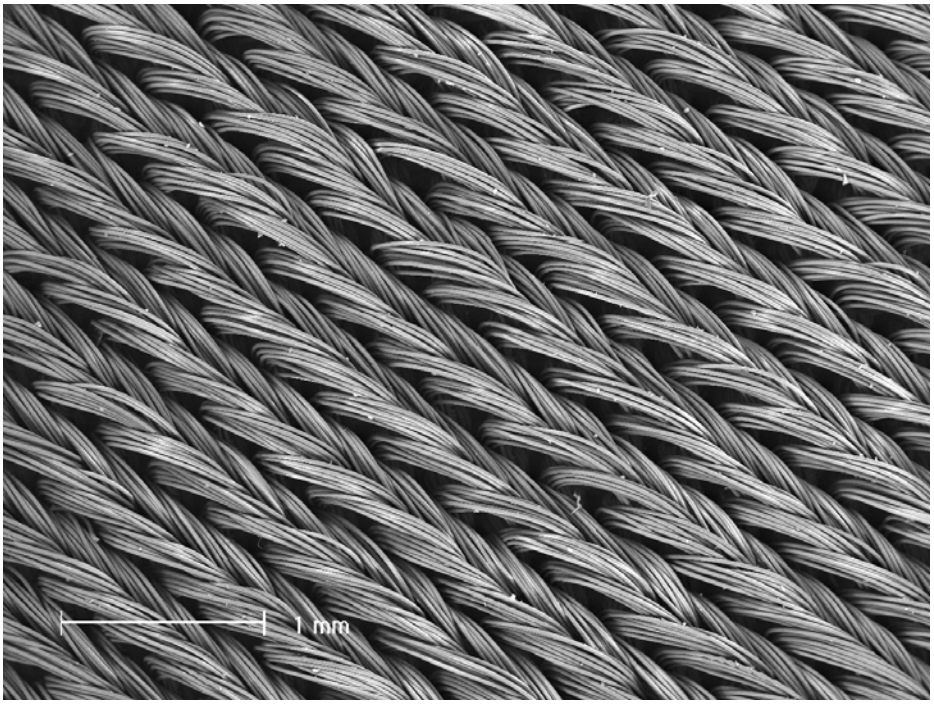

FIGURE 1: Nylon fabric. ... taken using a scanning electron microscope by Ian Kaplin, The University of Sydney

Nylon has a high resistance to insects, fungi, animals, as well as moulds, mildew and many chemicals. This characteristic, combined with its soft, smooth, good colour-fastening and anti-tearing properties have made it an ideal fabric for garments, sportswear and tents production. Nylon's high strength and elasticity allows very sheer, lightweight fabrics to be made. However, one drawback is that nylon builds up static easily, so in clothing it is often blended with natural fibres to reduce this problem.

Nylon fibres have many other applications because of its durability, e.g. in carpets, as musical strings, for rope and fishing lines, as surgical sutures and to make tyre cords – the inner structure of a vehicle tyre underneath the rubber.

Solid nylon is used for mechanical parts such as machine screws, gears and other low- to medium-stress components previously cast in metal. Engineering-grade nylon is processed by extrusion, casting, and injection molding. Solid nylon is used in hair combs.

Various nylons break down in fire and form hazardous smoke, and toxic fumes or ash, typically containing hydrogen cyanide. Incinerating nylons to recover the high energy used to create them is usually expensive, so most nylons reach the garbage dumps. Nylon is non-biodegradable. Like many other plastics, most nylons are resistant to degradation in the natural environment and remain in the environment for a very long time e.g. nylon fabric decays very slowly, taking about 30–40 years to break down. □

[Note: The nylon fabric seen in the image in Figure 1 is one of the high tech swimsuit fabrics that were around at the time of the Sydney Olympics. However, it is not the 'sharkskin' that was worn by Ian Thorpe!]

"Behold the turtle. He makes progress only when he sticks his head out."

... James B Conant

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Total cost of order

	Price	Tick to order
Senior Science Trial	$80	
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Trial Science School Certificate	$100	

All prices include delivery, are current for 2011 and are not inclusive of GST.
(10% GST will be added to invoice)

All papers will be delivered in **Week 1 of Term 3**. Invoices will be sent with the papers.
Papers can be used as exams at any time after delivery but are not to be released to students before 15 August (Trial) or 19 September (Preliminary and School Certificate).

Astronomy

Autumn Skies

... Robert Garner

As Autumn moves into Winter, the pre-dawn sky is where all the action is to be found. So get out your sky maps (see Box 1) and binoculars and start viewing.

The Planets

As Autumn moves into Winter, the night sky is getting dark early with evening twilight ending around 6.30 pm. Morning twilight begins around 5 am, so there is lots of time to search the night sky!

Mercury, Venus, Mars and *Jupiter* are all fairly close to one another in the eastern pre-dawn sky throughout May. *Mercury* is often hard to see, however it will be near the much brighter *Venus, Jupiter* and *Mars* during May. *Mercury* will gradually drop towards the horizon, before moving behind the Sun for superior conjunction on 13 June (Mercury and Earth on opposite sides of the Sun). Mars will remain visible in the pre-dawn sky throughout May, June and July. *Venus* also starts to drop towards the horizon and will disappear by mid-July, as it starts its journey behind the Sun to superior conjunction in mid-August. It returns to the evening sky in mid-September. In the second half of May, *Jupiter* climbs higher in the sky and will move from Pisces into Aries where it will remain until late in the year.

Meanwhile, high in the northern sky, *Saturn* can be seen in the night sky during May–July, until it is joined by *Mercury* on its return to the evening sky near the western horizon at the end of June.

Earth is at its solstice at 3.16 am (EST) on 22 June. This is when the Sun is furthest north from the equator. Earth will be at aphelion at 1 am on 5 July, when it is at its furthest from the Sun.

Meteor showers

Although the *eta-Aquarid* meteor showers peak on 6 May, their rates should remain reasonable until 28 May for a few hours before dawn. The meteors appear to come from Aquarius in the NE and appear each year as Earth passes through the trail of Halley's comet. The *Southern delta-Aquarids* also appear to come from Aquarius and should be visible in July from late evening until dawn. They will peak on 29 July.

Lunar eclipse

During the night of 15 June, there will be a total lunar eclipse (i.e. in the morning of 16 June, EST). We will see the first half only, as our view will be interrupted mid-eclipse by the onset of dawn. The eclipse will start at 3.25 am, with totality commencing at 5.22 am – just before the start of twilight. Sunrise is just before 7 am, so it will still be worth getting up to watch.

Note: A second total lunar eclipse will occur on 10 December. This one will start at 9.34 pm with totality from 12.06 am until 12.57 am on 11 December. This time the whole eclipse will be able to be seen.

MACQUARIE UNI OBSERVATORY FRIDAY NIGHT OBSERVING

On clear nights, our 'starfinder' (planisphere) sessions demonstrate how to identify bright stars, constellations and planets. This is followed by observing with the 12" & 16" Meade telescopes. Even with the light pollution of the city, we can easily see double and multiple stars, open and globular star clusters, and the brighter nebulae. The Moon and planets, when in suitable positions, are easily viewed with any of our instruments. On dark, moonless nights, we may also observe the brightest galaxies. In the event of cloud, our program includes a mixed al fresco presentation of slides, posters and scale models.

Located in the grounds of Macquarie Uni (access via Gymnasium Rd), the observatory is open to the public every Friday night, March–Nov inclusive, 7.30–9 pm (in non-DST), 8.30–10 pm (when DST). Bookings are essential – ph 9850 4409 or email *starinfo@mq.edu.au* before 4 pm. If doubtful weather, phone 9850 8914 or check at *www.astronomy.mq.edu.au/observatory/* □

Constellations

To the south, *Crux* is at its highest level in the sky over winter with the bright star, *Achernar* well below it. *Orion* is now lying on its side in the western sky, setting soon after sunset in May. It will soon disappear from the evening sky. By following the direction of Orion's belt upward in the sky, you find *Sirius*, the brightest star in the sky. *Sirius* is also low towards the western horizon. Prominent to the north is the constellation of *Leo*, the Lion, with the star, *Regulus* being its brightest star. We see *Leo* up-side down. To find *Leo* look for an inverted question mark or sickle shape. To its east lies *Virgo* with the bright star, *Spica*. Further to the east, *Scorpius*, the scorpion, rises in the south-east. The prominent red star, *Antares* is the scorpion's heart. *Scorpius* actually looks like its name and stretches high and wide across the mid-winter sky. *Sagittarius* rises a little later than *Scorpius*.

Oops!! ... re Transits across the Sun

A reader of *SciTalk* has pointed out that I had an error in my description of transits across the Sun.

When one of the inner planets or the Moon transit across the Sun as they move directly between the Earth and Sun, the dark spot that appears to move across the Sun is actually the planet/Moon blocking part or all of the Sun's light as it moves in front of the Sun (not just 'shadow' as I put previously) ... sorry about that! □

Box 1: Sky Charts & Planispheres

- You can download free sky charts each month to explore the night sky from: *http://skymaps.com/downloads.html*
  Make sure you scroll down to the 'Southern Hemisphere Edition'.
- A planisphere (star wheel) is a great aid for exploring the stars and locating 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/Planis1.htm □

Box 2: Cumulative index for 'Some Aboriginal perspectives on astronomy' series

You can read past articles in the 'Aboriginal perspectives on astronomy' series by going to the following past issues of *SciTalk* at *www.odlumgarner.com* –

- The Emu … *SciTalk No. 1-2004*
- The Southern Cross … *SciTalk No. 3-2008*
- The Moon … *SciTalk No. 1-2009*
- Pleiades … *SciTalk No. 2-2009*
- The Milky Way … *SciTalk No. 3-2009*
- Magellanic Clouds … *SciTalk No. 4-2009*
- The Beehive Cluster … *SciTalk No. 1-2010*
- Venus … *SciTalk No. 2-2010*
- The Sun and Moon … *SciTalk No. 3-2010*
- Colour of stars in Hyades … *SciTalk No. 4-2010*

Remember that dreaming stories and characters vary among Aboriginal groups. Although they may share many of the same beliefs, the messages and the characters in their stories are different. The various Aboriginal groups divided the night sky into about 40 different constellations. They named them after different native birds and animals, including crows, eagles, parrots, lorikeets, emus, eagles, tortoises, kangaroos, brolgas, dancing men and song men. □

Use science to teach about calendars

Our calendar is a solar calendar

The calendar we use today is the Gregorian calendar. It is a calendar based on the solar year. The mean time between two successive vernal equinoxes is called a solar year (or tropical year) – and is 365.2422 days long. The vernal equinox is the time when the Sun is directly above the Earth's equator, moving from the southern to the northern hemisphere.

A calendar cannot have a fraction of a day, so leap years are used to keep our calendar in alignment with Earth's revolution around the Sun. A leap year has an extra day at the end of February, so a leap year consists of 366 days, whereas other years, called common years, have 365 days. Every year that is exactly divisible by 4 is a leap year, except for century years that are exactly divisible by 100. In a century year there is only a leap year if the year is exactly divisible by 400.

The Gregorian calendar was introduced by Pope Gregory XIII, after whom the calendar was named, in 1582. It replaced the Julian calendar and improved the approximation made by the Julian calendar by skipping three Julian leap days in every 400 years. This gave the Gregorian calendar an average year of 365.2425 mean solar days.

[Note: The term 'day' is used to mean 'solar day' – which is the mean time between two transits of the Sun across the meridian of the observer.]

Only 14 possible calendar combinations

There are 14 possible combinations for the calendar. A year can begin on one of 7 weekdays, and the year can be either a common year or a leap year. So there are 7 possible leap year calendars and 7 possible common (non-leap) year calendars.

Note that the cycle doesn't repeat on a 14 year basis. Because the year can start on one of 7 days, and a leap year comes every 4 years, the cycle is more complicated, but any given year can have its calendar taken from one of the 14 possible calendars.

Beware internet and urban myths

Beware any emails stating that something about the calendar in a particular year will not occur again for hundreds or even thousands of years – as they are all wrong!

One current email says that October 2011 has '5 Saturdays, 5 Sundays and 5 Mondays', which is true. But the email then goes on to falsely claim that 'this happens only once every 823 years'. Such emails are just a myth!

There are only 14 possible calendars. A non-leap year calendar starting on a Saturday has '5 Sundays, 5 Mondays and 5 Saturdays' in October, and a leap year calendar starting on a Friday has '5 Sundays, 5 Mondays and 5 Saturdays' in October. You can look up the 14 possible calendars (e.g. by looking up perpetual calendars on the internet, such as at *www.accuracyproject.org/perpetualcalendars.html*) and see that these combinations of days occur quite frequently, e.g. in the non-leap years of 1994, 2005, 2011, 2022, 2033, 2039 and 2050, and in the leap years of 1988, 2016 and 2044. This is much more frequently than 'in every 823 years', as in the email.

The email also refers to 2011 as being a 'Money Bag Year' because of October having '5 Sundays, 5 Mondays and 5 Saturdays'. What nonsense! Any month of any year that results in 5 paychecks in the month can be referred to as a 'Money Bag Month'. Pay days are not just on Sundays, Mondays or Saturdays. Every 31 day month has 3 days that are repeated 5 times. Also, whether a month or year can be described this way, would depend on what day of the week you are paid! The moral of this is to look up the 14 possible calendars yourself – and you will be able to see that most claims like the example given regarding the calendar are outrageous and not true. □

Progress of Australian Curriculum for Science

... continued from page 1

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NSW is working with the Australian Government and all other states and territories in a joint endeavour to develop an Australian curriculum. The BOS is responsible for advising the NSW Minister for Education and Training on the appropriateness of curriculum for NSW schools and the structure and process of its implementation, including with regard to the Australian curriculum.

Teachers can follow the development of the Australia Curriculum for Science on both the BOS website (*www.boardofstudies.nsw.edu.au*) and ACARA website (*www.acara.edu.au*). ACARA is the independent authority responsible for the development of a national curriculum. NSW teachers can also be involved during consultation periods. □

WINNER OF A SYDNEY AQUARIUM FAMILY PASS

Congratulations to Kim Hurley from Redlands, who won the Sydney Aquarium family pass for *SciTalk No. 1–2011.*

"Success makes life easier.
It doesn't make living easier."

... Bruce Springsteen

WIN A FAMILY PASS TO LUNA PARK SYDNEY

One lucky family can win this special offer through Physics is Fun and Luna Park Sydney. To find out more about Fun Park Excursions for schools, go to the Physics is Fun website at:

www.odlumgarner.com

To find out more about shows/concerts in Luna Park Sydney's Big Top, or their function venues or The Deck restaurant with their spectacular harbour views, go to: *www.lunaparksydney.com*

* * * * *

TO WIN A FAMILY PASS TO LUNA PARK SYDNEY:
(unlimited ride passes for 2 adults & 2 children worth $190) … send in your name, school, & school address on an envelope by **1 July 2011** to:

Physics is Fun - Luna Park Sydney Teacher Offer
PO Box 442, Freshwater NSW 2096

WIN A FAMILY PASS TO IMAX

IMAX Sydney, at Darling Harbour, is open every day. More than 8 storeys high, it has the world's biggest cinema screen to give the ultimate film experience. IMAX films are entertaining and educational. They constantly change and cover a wide range of themes. Quality resource materials & teacher guides are provided.

★ ✧ ★ ✧ ★ ✧ ★

TO WIN A FAMILY PASS* TO IMAX: (for 2 adults and 2 children worth $58) … send in your name, school, & school address on an envelope **by 1 July 2011** to:

IMAX Give Away, PO Box 442, Freshwater NSW 2096

* This pass will be valid for any one film for any session, except public holidays/films advertised as 'no free list'. Details at: *www.imax.com.au*

WINNER: Cal McDonald, Emmanuel Anglican College, won the IMAX Sydney family pass for *SciTalk No. 1–2011.*

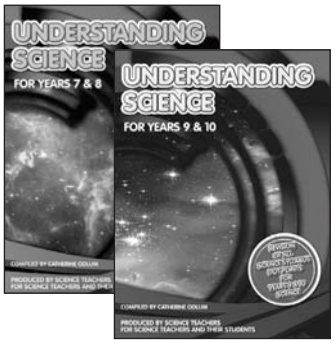
COMPETITION CORNER

Send in an entry to WIN a set of:

Understanding Science

… for Years 7 & 8 AND *… for Years 9 & 10*

Compiled by Catherine Odlum
Published & donated by Odlum & Garner



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HOW TO ENTER: Send an answer to the Quiz Question, your name, school, school address & subject area to win on an envelope to: Competition Corner, PO Box 442 Freshwater 2096 – by 1 July 2011.

SciTalk 1/11 answer: Solid

QUIZ QUESTION: Name the water cycle process in which water in lakes changes into water vapour in the atmosphere.

Winner for *SciTalk 1/11*: *Science Tests for the School Certificate (2nd Ed)* published by Odlum & Garner was won by Surekha Chander, Rosebank College.

SUBSCRIPTIONS … *SciTalk* **is available FREE to all secondary science faculties in NSW and the ACT. However, if you would like to receive your OWN personal copy or extra copies of *SciTalk*, subscriptions are available for just $20 per 4 issues. Please send a cheque for $20 + GST = $22.00 (to *SciTalk*), plus your name, address and telephone number … and you will receive the next four issues of *SciTalk*.**

SciTalk

***SciTalk* is a newsletter for secondary Science educators. Now in its 16th year, it has been produced quarterly by Odlum & Garner as a service to Science teachers since 1995. It is sent FREE-of-charge to all secondary Science faculties in schools and TAFEs throughout NSW and the ACT.**

***SciTalk* aims to provide science teachers with up-to-date information, important dates, the latest products available, plus 'what's on' in various excursion venues, and more.**

Please pass *SciTalk* on to all Science teachers at your school so they can benefit from it – or put it up on your notice board for reference.

Contributions, advertising and inserts are welcome.

Copies of *SciTalk* are also available at:
www.odlumgarner.com

CONTRIBUTIONS

***SciTalk* is due into schools mid-term. All contributions for *SciTalk* should be directed to the Editor (see below).**

CLOSING DATES

- ***SciTalk* No. 1–January 2011 … Dec 17**
- ***SciTalk* No. 2–May 2011 … April 8**
- ***SciTalk* No. 3–August 2011 … July 1**
- ***SciTalk* No. 4–October 2011 … Sept 23**

ADVERTISING & INSERTS

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