Providing support and promoting excellence in science education

SciTalk

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Number 2 – May 2005

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Join us during National Science Week for Physics is Fun at Luna Park Sydney

NATIONAL SCIENCE WEEK 2005 August 13–21

Enquiries/bookings: (02) 9939 6107. See p7.

You can celebrate the 2005 International Year of Physics on any school day with a Physics is Fun excursion to Luna Park Sydney

INSIDE SCITALK ▶▶▶▶

A copy of *SciTalk* is available at http://homepage.mac.com/robertgarner

PRIZES TO WIN!
See pages 1, 3 & 12
Send in your entries now
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After you have read this, please write/tick your name below and pass it on.

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by 1 July 2005 to

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★ ★ ★

Winner for *SciTalk 1/05*

Congratulations to V Simon-Lambert, Coverdale Christian School, who won *Spotlight Chemistry Preliminary* ($42.95), *HSC* ($47.95) & CD $79.95) by Heffernan *et al*, donated by Science Press.

Diary Dates

Einstein International Year of Physics

MAY 2005

21 Astronomy Open Night & Lecture. Macquarie Uni. E7B. 6–10 pm. (02) 9850 7111. http://www.physics.mq.edu.au/astronomy/cal.html

JUNE 2005

3, 6 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

5 World Environment Day. http://www.unep.org/wed/2005

8 World Ocean Day. www.theoceanproject.org/news/oceanday.html

17,18 & more Schools Titration Competition. Alasdair Hey, email: ajhey@nswtitration.com

various RACI Nyholm Youth Lectures. Yrs 10–12. Two lectures: 'What Gas Am I?' & 'Green chemistry: not different, just smarter.' Details: www.chem.unsw.edu.au/raci/ny2003.htm

21 Winter solstice

JULY 2005

1 BHP Billiton Science Awards (students &/or teachers) – closing date for entries

4–7 CONASTA 54: *Science Education Unplugged*. VIC. www.conferences.unimelb.edu.au/conasta54

13–16 International Science School: Yr 11 & 12 students, Uni of Syd. Details last *SciTalk*

23–30 National Chemistry Week. http://www.raci.org.au/national/events/chemistryweek.html

28 National Chemistry Quiz. Enquiries: A/P Charles Fogliani, cfogliani@csu.edu.au

AUGUST 2005

5 Jeans for Genes Day. Enquiries: CMRI, 1800 677 260, at http://www.jeans4genes.com.au/

13–21 National Science Week: Theme is *Energy–Future Challenges*. http://scienceweek.info.au/

19, 22 National Science Week: Physics is Fun at Luna Park. http://homepage.mac.com/robertgarner

13–21 Australian Science Festival, ACT. School Activities: 17/8-19/8. www.sciencefestival.com.au

24 Physics Olympiad National Qualifying Exam. Closing date: 29 July. (02) 6125 9645

31 Biology Olympiad National Qualifying Exam. Closing date: 29 July. (02) 6125 9645

SEPTEMBER 2005

1 (–16 Oct) Great Australian Marsupial Night-stalk http://www.perthzoo.wa.gov.au/nightstalk/

7 National Threatened Species Day. www.deh.gov.au/biodiversity/threatened/information/

7 Chemistry Olympiad National Qualifying Exam. Closing date: 29 July. (02) 6125 9645

13, 19 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

23 Spring equinox

OCTOBER 2005

8 Astronomy Open Night & Lecture. Macquarie University E7B. 6–10 pm. (02) 9850 7111. http://www.physics.mq.edu.au/astronomy/cal.html

9–15 Earth Science Week 2005. http://www.earthsciweek.org/

17 HSC exams commence … see box on this page for science exams timetable

21, 24, 25 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

26, 31 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

NOVEMBER 2005

1, 4, 14, 15, 18 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

7, 8 School Certificate Tests – 7/11: English / Science. 8/11: Maths / AH,G,C&C

22, 23, 25, 28, 30 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

DECEMBER 2005

1, 2, 6, 7 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

16 HSC results released

JANUARY 2006 National Youth Science Forum. Forms to local Rotary club by 15/5/05, interviews in July. Only for Yr 11 in 2005. Enquiries: 6125 2777, fax 6125 8015, 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.

The Great Australian Marsupial Night Stalk

in partnership with Tiwest

1 September–16 October 2005

Many Australian marsupials are on the brink of extinction and need your help. If you would like to help Australian scientists and conservationists, you can take part in this year's Night Stalk.

Anyone can do a Night Stalk survey – all you need is a torch. It's fun! It's free, and easy to do! Get a group together, count the number of marsupials you see in your local bush, record your findings on a spotter's log and send to Perth Zoo.

This annual survey, now in its 7th year, can be done any night from 1 September–16 October, and is designed to collect information about marsupial and feral animal numbers and their distribution.

For more information, please contact:
The Great Australian Marsupial Night Stalk
in partnership with Tiwest
Ph: (08) 9474 0497 Fax: (08) 9474 4113
Email: nightstalk@perthzoo.wa.gov.au
Visit: www.perthzoo.wa.gov.au/nightstalk/

PERTH ZOO TIWEST

BOARD OF STUDIES NEW SOUTH WALES

Update on BOS matters

2005 HSC Notes from HSC Marking Centre (including **Marking Guidelines**) are available for all science subjects on the BOS website.

Past HSC exams and **SC Science Tests** are available on the BOS website.

Approved scientific calculators for 2005 HSC *(refer to BOS 15/05)*

- An updated list is at: www.boardofstudies.nsw.edu.au/manuals/calculators_hsc05.html
- Criteria for using calculators in **SC tests** are at: *www.boardofstudies.nsw.edu.au/manuals/calculators_hsc_gen_maths.html*
- Exams in which scientific calculators are allowed: *www.boardofstudies.nsw.edu.au/manuals/equipment_list.htm*

HSC Chemistry and Physics exams – amendments to periodic table *(refer to BOS 22/05)*

Periodic table for HSC exams in 2005 has been updated in line with IUPAC recommendations. A copy is in the updated Chemistry data sheet and Physics formulae sheets at: *www.boardofstudies.nsw.edu.au/syllabus_hsc*

REMINDERS: • Stage 6 Science Syllabuses with amendments are for 2005 HSC • New SC Science Syllabus implementation: Yrs 7 & 9: 2005, and Yrs 8 & 10: 2006

BOS enquiries
Ph (02) 9367 8111, fax (02) 9367 8484
Website *www.boardofstudies.nsw.edu.au*

2005 HSC Science Examination Dates

25 Oct	Earth & Environmental Science: 9.25 am–12.30 pm
28 Oct	Biology: 9.25 am–12.30 pm
31 Oct	Senior Science: 1.55 pm–5 pm
2 Nov	Chemistry: 9.25 am–12.30 pm
4 Nov	Physics: 9.25 am–12.30 pm

OUT AND ABOUT

The Australian Society for Medical Research

Careers Seminar for Secondary Students in Years 10–12

Medical research – is it the career for me?

Thursday 9 June 2005, 10 am–12 noon
Coles Lecture Theatre, The Powerhouse Museum, Ultimo
in ASMR Medical Research Week (6–12 June 2005)

For information contact Dr Sheridan Henness,
by email: S.Henness@pharm.usyd.edu.au or ph: 9351 4698
To download a booking form: www.asmr.org.au/states/nswevents.html

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  - **The Changing Earth**
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  www.uow.edu.au/science_centre

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  Excellent resource materials support this film and can be downloaded free from: http://www.sharks3d.com
- ★ **For School Bookings:** Call IMAX Education on (02) 9213 1600, fax: (02) 9281 3833, or email: sydgroups@imax.com.au
- ★ Check our website for session times and a full listing of films available for schools at: ***www.imax.com.au/schools***

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★ ✧ ★ ✧ ★ ✧ ★

TO WIN A FREE FAMILY PASS* TO IMAX: (for 2 adults and 2 children) worth $45 (for a 2D movie) or $49 (for a 3D movie) … send in your name, school, home address and home phone number on an envelope **by 1 July 2005** to:

IMAX Give Away, PO Box 442, Harbord NSW 2096

* This pass will be valid for any one film for 2 adults & 2 children, for any session, except public holidays and films advertised as 'no free list'.

WINNER: Josephine Ursino, St Ursula's College, won the IMAX Sydney family pass for *SciTalk No. 1–2005.*

Today's Periodic Table – and the role of IUPAC

The Periodic Table is a good example of how scientific ideas develop as new information becomes available.

Although a number of metals had been known since ancient times, it was not until the nineteenth century that there was a marked increase in the number of known elements. With these discoveries came the attempts by scientists to classify them in some sort of systematic way.

Although Dmitri Ivanovich Mendeleev and Luther Meyer independently published similar schemes for classification of the elements in 1869 based on the periodic occurrence of properties, Mendeleev is known as the 'father of the modern periodic table' as his scheme had gaps which enabled more accurate predictions about elements which had not been discovered. The periodic table came about as a result of the work of others before Mendeleev, such as Lavoisier (1789), Döbereiner (1829), Berguyer de Chancourtois (1862) and Newlands (1864). The inclusion of more elements later on came from the work of others since then, such as Ramsay, Rayleigh and others (1893–1898), Moseley (1913), and many others.

The Periodic Table has grown as new elements have been discovered or synthesised. It went from 63 elements in 1869, to 96 by 1949. Between 1950 and 2003, elements 97–111 were synthesised and are now officially part of the Periodic Table after having gained approval from The International Union of Pure and Applied Chemistry[1] (IUPAC).

Thus the largest confirmed element has 111 protons! There have been claims for larger nuclei such as 112, 114, and 116, however, it takes replication of an experiment for it to be accepted and this has yet to occur for these larger nuclei.

Naming a new element

When a new element is discovered, its existence must first be established by a joint IUPAC-IUPAP (International Union of Pure and Applied Physics) Working Group. Then the discoverers are invited to propose a name and a symbol to the IUPAC Inorganic Chemistry Division. Elements can be named after a mythological concept, a mineral, a place or country, a property, or a scientist. After examination and acceptance by the Inorganic Chemistry Division, the proposal follows the accepted IUPAC procedure for recommendations and approval. If a particular name has been used unofficially for a given element but a different name is ultimately chosen, the first name cannot be transferred at a later time to designate a different element.

Provisional naming system

There have been conflicting claims over who first synthesised element 104 and the next few elements of the table for almost a quarter century. During this long impasse, Joseph Chatt (of IUPAC's Inorganic Chemistry Division) suggested the provisional naming of new elements in terms expressing their atomic numbers using Latin/Greek, for example "ununnilium" (one-one-zero for 110), "unununium" (one-one-one for 111), and "ununbium" (one-one-two for 112). Discoverers were asked to use an atomic number rather than a name in literature until IUPAC approval of a proposed name.

Official naming of elements 101–109

In 1997, a joint working party from IUPAC and IUPAP was formed to review the scientific data for elements 101–109 and to resolve the controversy over the names of these short-lived, artificially produced elements. Their official names (which replaced the 1994 provisional ones) are: 101–Mendelevium, 102–Nobelium, 103–Lawrencium, 104–Rutherfordium, 105–Dubnium, 106–Seaborgium, 107–Bohrium, 108–Hassium, and 109–Meitnerium.

New elements 110 and 111

A joint IUPAC/IUPAP working party determined by 2001 that element 110 was initially made by the German group (Hofmann *et al*) at the Heavy Ion facility in Darmstadt, Germany. The Germans suggested the name darmstadtium with the symbol Ds, which is now accepted both by IUPAC and IUPAP.

Then in 2003 they concluded that the criteria for discovery of an element by Hofmann *et al* had been fulfilled with respect to element 111 and the discoverers were invited to propose a name and symbol for element 111. They proposed the name roentgenium and the symbol Rg which have been accepted.

Controversy persists today

IUPAC's recommendations in a wide range of chemistry carry no legal force, but are normally viewed as authoritative around the world. The naming of the newer elements however has remained controversial, despite IUPAC being considered the official international authority.

Dual names and symbols have been used for some elements, e.g. niobium and columbium, beryllium and glucinium, and wolfram and tungsten, to name a few. This practice persists today in the cases of both aluminium and aluminum, and of sulfur and sulphur, plus a few others. Some people in the US still refer to the element 105 as Hahnium rather than Dubnium – as it was shown by Glenn T Seaborg (after whom element 106 is named) that the research from the Dubna lab in Russia on this element was incorrect. It should be noted that in France, nitrogen is still referred to as Azote. Germany calls Tungsten, Wolfram. In the US and in the metals industry, element 41 Niobium is often called Columbium[2] to this day!

Latest IUPAC Periodic Table

The latest IUPAC Periodic Table can be found at: *http://www.iupac.org/reports/periodic_table/index.html#names* This version is interesting as it indicates the general time of discovery of the various elements.

From 2005, the HSC science papers and SC Science Tests in NSW will be using the latest IUPAC version of the Periodic Table (*refer to BOS 22/05*). This is available at: *www.boardofstudies.nsw.edu.au/syllabus_hsc* □

1. IUPAC is an international non-governmental organisation devoted to the advancement of chemistry. It has as its members national chemistry societies. It is the recognised authority in developing standards for the naming of chemical compounds.
2. Current periodicals on metals published in the US have ads for 'Columbium', symbol Cb, and its alloys. However, you will not find this metal in a European catalogue of metals and their compounds, or in the IUPAC-approved Periodic Table. Instead you will find the element niobium, symbol Nb, with the same physical and chemical properties. And thereby hangs a tale. You can read about this in 'The Curious Case of Columbium' by Peter E Childs at: *www.ul.ie/~childsp/CinA/Issue65/TOC43_Columbian.htm*

Roo poo used to make paper

A new type of paper using kangaroo and wallaby dung is being made by a hand-made paper company, Creative Paper Tasmania.

Paper-maker Joanna Gair says production of the 'roo poo paper' only started this year and was inspired by the dung paper made in other countries, with Africa making paper from elephant dung and Scandinavia from elk poo. This paper has an ecofriendly message as it recycles a waste rather than use wood pulp.

Gair has a reputation as an eccentric paper-maker. She used to teach papermaking in Scotland where she made paper from thistles, mosses, and even cat fur balls and cigarette butts.

Some 90% of the paper Gair's company makes is from cotton, sourced from such things as recycled jeans, towelling off-cuts and cotton thread. It also makes paper from plant fibre such as hemp, flax, native leaves and stringy bark.

Like other herbivores, kangaroos produce a poo that is perfect for paper production. It is quite fibrous and consists mainly of cellulose from which textiles like paper or material are made. After the poo is collected and dried, it is washed to isolate the fibres, boiled for 5 hours, then pulped. The fact that roo poo is already partially digested assists the pulp process.

While collecting the poo needs to be done carefully to minimise health risks, roo poo paper is considered safe to use as the bleaching process would kill any bacteria, even though it has a dark appearance. A little bit of cotton can be added to lighten it up. And it does not smell! □

[www.abc.net.au/science/news 18/2/05]

Miracle weed – medical use being debated

The first documented use of cannabis as a medicine was in China in 2800 BC for gout, malaria, constipation and rheumatism, then as an anaesthetic in India in 1000 BC. By AD 500 its medical use had spread through the Near and Middle East, mainly as an antiseptic and analgesic, and then its use spread through Africa and eastern Europe. By the 1800s it was being used in the West, mainly as a sedative, and pain reliever, as well as an intoxicant that made people feel relaxed and happy.

But by 1900 it was considered dangerous and made illegal in UK (1928) and in the US (1937). Despite cannabis' therapeutic values for many illnesses, particularly in MS sufferers for pain and muscle spasms, most countries will not allow doctors to prescribe it. This has resulted in otherwise law-abiding citizens in many countries having to buy it illegally.

The medical use of cannabis is still being debated in Australia, but it is allowed in Canada, parts of the UK and some US states. With the recent development of standardised, licensed pharmaceutical preparations such as Sativex and Cannador from cannabis, it is hoped this leads to more clinical studies and wider medical use.

Interestingly, research in the US and UK over the last 17 years has shown that the human body has many receptors for cannabinoids (found in cannabis) and that our neurons may release endocannabinoids which play many different roles in pain control and memory, for example. THC, the active ingredient in cannabis, has also been found to have anti-inflammatory effects. In mice, it has been found that eating low doses of THC helps prevent arteries clogging up. □

[newscientist 5 February, 16 April 2005]

Latest Nova topics at www.science.org.au/nova/

- **The buzz about insect robots**
  Scientists are studying how insects walk, fly and navigate to overcome some of the obstacles in the development of robots.
- **Population and environment …**
  The world's population is growing and the natural environment is deteriorating as a result, but the relationship between them is complex and not fully understood.
- **Calculating the threat of tsunami**
- **The dope on drug-impaired driving**
- **Putting on a good face – the chemistry of cosmetics** □

BHP BILLITON SCIENCE AWARDS

Are your student entries ready yet?

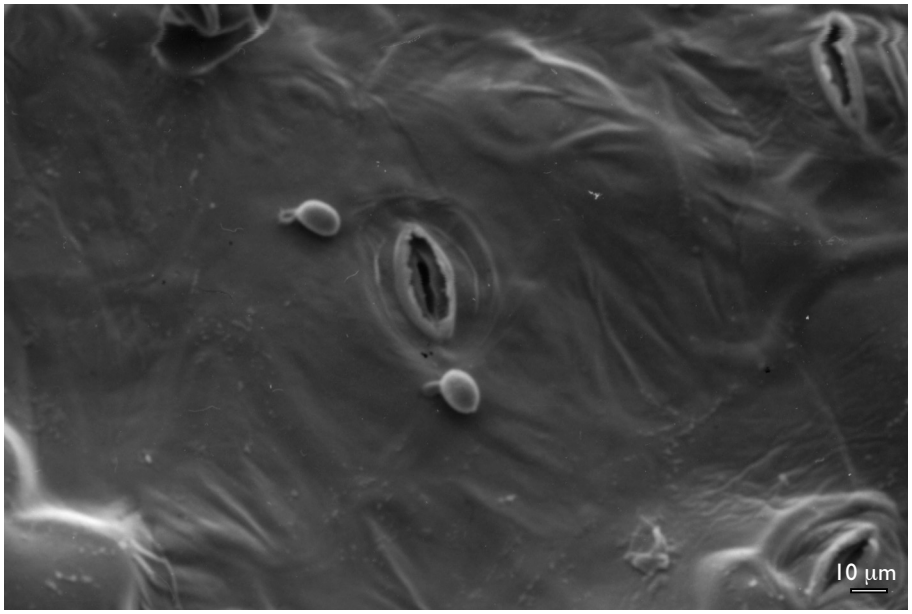
Have YOU thought of entering the 2005 BHP Billiton Teachers Awards?

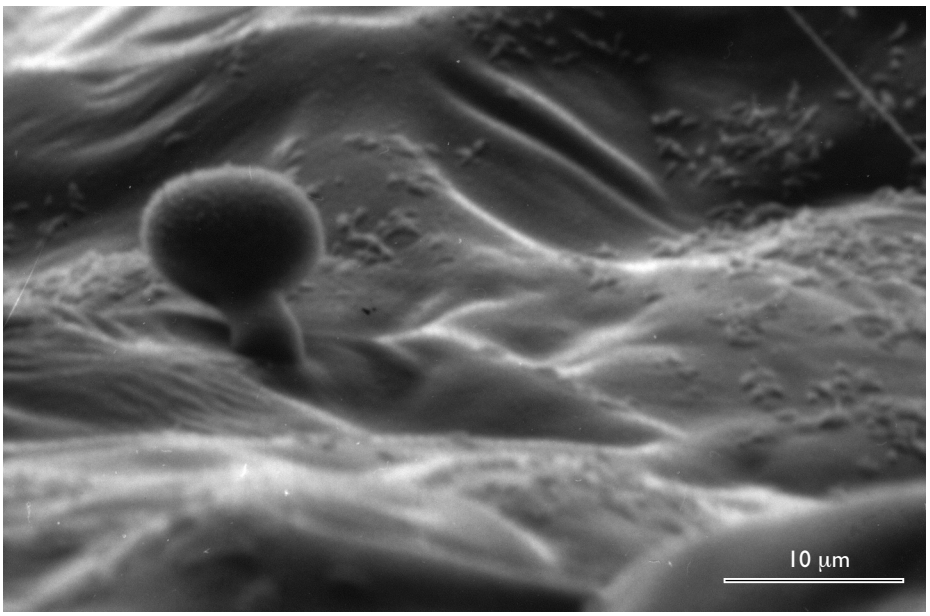
Entry is free and there are great prizes to be won in: • Biology and Microbiology, • Chemistry and Biochemistry, • Physics, Engineering and Technology, or • Environmental and Earth Science. The **closing date** is Friday 1 July 2005. Details: ***http://scienceawards.bhpbilliton.com***

PhoTo Spot A tale of rot

'And so, from hour to hour, we ripe and ripe;
And then, from hour to hour, we rot and rot;
And thereby hangs a tale.'

Shakespeare: *As You Like It*, Act II Sc 7.





Photos are by Dr Louise Cole, Electron Microscope Unit, The University of Sydney.

ABOVE: Two Botrytis spores with germ tubes penetrating the surface of a broad bean leaf near a stomate.

LEFT: A closer view of one Botrytis spore and its germ tube penetrating the leaf surface.

Botrytis cinerea is a ubiquitous[1] polyphagous[2] fungus. It is often referred to as 'grey mould' because of the appearance of the fungus as grey-brown clusters of spores on the plant host. The 'egg-shaped' spores are dispersed by air currents, water droplets and insects and once they alight on a plant host, if given sufficient moisture, they can germinate rapidly to form a short germ tube that penetrates the plant host surface directly.

The photo shows how the fungus can quickly invade a broad bean leaf where it causes widespread collapse of the leaf surface. This image was captured by cryo-scanning electron microscopy that involved rapidly freezing an infected leaf in liquid nitrogen slush and then transferring the sample at low temperature into a scanning electron microscope.

This fungus is responsible for the post-harvest spoilage of many fruits and vegetables. It causes significant economic losses in the cut-flower industry and is also particularly important in wine-making.

In wine-making, it can affect the grapes in two very different ways. It may affect grapes as the deadly grey mould, or by a more favourable

Continued from page 8 …

association as 'noble rot' – and whether it develops this 'friend or foe' relationship is dependent on the weather conditions and the time of infection.

In the right weather conditions fungal spores form on the outside of the grape, piercing the skin and extracting water from the berry. The skin shrivels and the fruit may lose up to 50% of its original weight. In the process, the grapes become an unlovely purple-grey colour. A range of chemical compounds forms in the grape juice so that it not only has increased sugar levels, but it is chemically different from 'normal' grape juice. All is well as long as the berry remains intact: if it splits, the destructive form of botrytis sets in. The sweet wines produced from *Botrytis*-affected grapes are known as 'noble wines' or 'stickies'.

Botrytis occurs naturally in vineyards and for growers who are not planning to produce sweet wines, the rot is a curse producing useless grapes. Generally vineyards will be forced to spray to reduce the spread of the rot. For those growers who regard botrytis as the highly desirable 'Noble Rot', *Botrytis* must attack the right grapes at the right time. Only fully ripened grapes can withstand the impact of *Botrytis* and the weather must be just right to ensure that the fungus does not spread too rapidly – the grapes need sufficient sunlight to dry out regularly, as well as sufficient moisture in order for the fungus to grow and spread.

Picking of *Botrytis*-affected grapes is usually only able to be done by hand (due to the mushy nature of the grapes) and even then may be done in phases as individual bunches reach an optimum level of rot! Some growers, forced by low prices, take shortcuts, e.g. they pick the grapes as normal prior to rot setting in and then induce the rot in the temperature controlled surrounds of the winery, and some people simply pick the grapes well before the *Botrytis* has finished its work and add sugar to make up the difference.

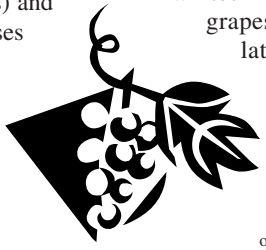
Making 'noble wines' properly is slow and difficult, as the shrivelled grapes are reluctant to yield their juice. Fermentation is slow and can take several months. It's not easy for the winemaker to get the right balance of sweetness, acidity and alcohol. Also, the wine's high residual sugar level can make it prone to secondary fermentation, so bottling requires great care. The wine is often bottle aged before it comes on the market. Stickies are usually sold in half-bottles and because of all this handling, they are not cheap. Although some are considerably lower in alcohol by volume than most dry white or red wines, their concentrated, sweetness means that one small glass is usually satisfying on its own.

* * *

Note: Sweet wines can be produced using several different techniques. The simplest is to just add sugar manually – this shortcut often requires the addition of substantial sulphur dioxide to the bottle to prevent bottle fermentation and also does not offer the marvellous sweet/acidic complexity of a true sweet wine. The classic approach is through the use of the naturally occurring *Botrytis* rot.

Other alternatives include simply picking the grapes when they are ultra ripe or picking them and then drying them on trays to increase the concentration of sugar. There are also plenty of delicious sweet whites not made from *Botrytis*-affected grapes, which are generally labelled late-picked, late-harvest, spätlese, auslese, etc. □

– Louise Cole & Catherine Odlum



1. ubiquitous – present everywhere at once, or seeming to be; 2. polyphagous – feeding on many different kinds of food

Ways to promote PHYSICS for the 2005 Einstein International Year of Physics

- **Physics is Fun at Luna Park Sydney**
Go to: *http://homepage.mac.com/robertgarner*

- **2005 World Year of Physics Trivia**
A fun activity for your science classes, or for a contest between classes! 50 questions range in subject from Einstein to Galileo. Download the questions and answers from: *www.physics2005.org/events/projects.html#teachers*

- **Eratosthenes Project – Australia: Measure the Earth with Shadows**
Students from Years 10–12 can re-enact Eratosthenes' experiment in measuring the angle of the Sun at local noon to determine the Earth's radius during Science Week (13–21 August 2005). Closing date for entries: 17 June 2005. Schools work in pairs. A $1000 prize will be awarded to each school in the pair with a correct result for the Earth's radius allowing for the expected uncertainty, and the best justified uncertainty analysis. More details at: *http://www.rmit.edu.au/scienceweek*

- **ArtSci in the City: Physics Photo Exhibit**
Are you interested in physics and in photography? The Australian Science Festival is having an exhibition from 31 July–13 August in Canberra. Anyone over 18 years can enter. People's choice award is worth over $1000. Images to be in by 17 June, 2005. Details at: *http://lists.asc.asn.au/pipermail/asc-list/2005-May/001612.html*

- **RACI Crystal Growing Competition**
Remember, entries are due in by 17 June 2005 *www.chem.unsw.edu.au/raci/crystal_grow/index.htm*

- **International Science Poetry Competition**
Post your poem/s or rhyme/s, together with a completed Entry Form, to be in by 17 June 2005. For ages 9–11, 12–14, and 15+ years. *www.sciencetime.com.au/ser/poetcomp.html*

Astronomy

A season of spaceflights and great night viewing

As I watch Scorpius rise earlier each night I am reminded that winter is indeed upon us. The evenings are cooler and Saturn now low in the west is all but gone until Spring. Jupiter is getting lower in the west and the smaller frozen planets of Uranus and Neptune are rising to overhead.

Opposition of Mars approaches

Mars is getting more and more noticeable in the night sky, rising just after midnight in June and then earlier each night and it will reveal more of itself as each month passes. Mars will be at opposition (opposite the Sun) on 7 November, although the best viewing will be on 30 October at its closest approach to Earth. This is still some time off, but now is the time to start observing its movement.

The images of Mars during the August 2003 Opposition were stunning and whilst this opposition will not be quite as close, it will still reveal great detail to those keen enough to get out and have a look with small to medium telescopes.

Some great night viewing

In **June**, Saturn will be low in the north-west at evening twilight whilst Jupiter will be high and setting before dawn.

Our winter constellations will be getting higher with the Southern Cross at its highest point in the sky about 7 pm. Don't forget to look out for the dark patch (= the Coalsack, a dark nebulae) just below alpha Crucis (= brightest star in the Southern Cross). This represents the head of the Emu (a constellation in Aboriginal culture). To the left are the two pointers to the Southern Cross (= emu's neck), The body runs across into Scorpius and Sagittarius. The legs extend down into the Scutum constellation (see diagram on p11, *SciTalk No.2–2004*). Scorpius and Sagittarius will be almost overhead as twilight ends.

On 21 June the Earth is at Solstice and so it is the shortest day of the year.

From 23–30 June, a rare view of a planetary trio will occur in the early north-western night sky – Mercury, Venus and Saturn will be within 5° of each other.

During **July**, Saturn will be lost in the twilight, but will return in the dawn in late August–September. Jupiter will be high in the north-west on July evenings and close to the Moon on 13–14 July. Mercury and Venus are both in the early western evening sky and will be close together until mid-July.

In **August-September,** Mercury will become a dawn star. Venus and Jupiter (the two brightest planets) will be in the western night sky and will be involved in some interesting alignments with each other, the Moon and Spica (in Virgo) – this should be particularly spectacular in the early evening of 7 September.

A **coming event** to put in your diary is the partial lunar eclipse on 17 October.

Deep Impact

This year 4 July will be a day of great astronomical and scientific interest. NASA's 6-year mission will culminate then. 'Deep Impact', which sounds more like the name of a blockbuster movie than a scientific space mission, has been sent to have a first-time look at the inside of Comet Tempel 1.

It will do this is, just as the name suggests, by impact. The Deep Impact spacecraft, launched on 5 January 2005, is a combination of two separate spacecraft that are heading towards the comet. The flyby craft carries very high precision telescopes and as it approaches the comet, it will be collecting images and then, 24 hours before impact, it will release the smaller 'Smart Impactor' spacecraft, a 370 kg battery powered mass of mostly copper. The Smart Impactor, so called as it will navigate itself into the path of the comet, will collect images of the comet until it collides into the sunlit, icy side of the comet. It is planned that the impact should leave a crater somewhere between the size of a house and a football stadium, and 2–14 stories deep. The ejection material will be studied by, not only the flyby craft, but by every available telescope both in space and on Earth. It is hoped that the crater will reveal the fresh material that the comet is made from which should brighten dramatically from between 10th magnitude and possibly as high as 5th magnitude, which is over 100 times brighter. The greater hope is that a gas hole will be exposed allowing the gas from within the comet to escape into space. It should be observable with amateur instruments around 20 cm in diameter and could last for weeks.

Comet Tempel 1 is named after Wilhelm Tempel who discovered it in 1867. It is a very regular visitor to our solar system as it orbits the Sun on a 5.5 year cycle.

For more information on this mission check out the NASA website: *http://deepimpact.jpl.nasa.gov/*

A mission to Mars

August 10 will be the lift off of a robotic mission to Mars. The Mars Reconnaissance Orbiter will take 7 months to make it journey to Mars where it will begin a 6 month exercise of aerobraking. This is where the spacecraft will make very calculated dips into the atmosphere to slow it down and into the correct orbit rather than using fuel, which is heavier to carry. It will have 6 instruments on board, including the most powerful telescope ever taken to another planet. It will be able to resolve detail as small as a kitchen table from its low orbit. It will orbit Mars for 2 years recording and sending back to Earth details on weather, atmosphere, complex landforms and terrain, and search for water amongst many other scientific experiments.

For more details on this mission contact the NASA website: *http://marsprogram.jpl.nasa.gov/mro* ☆

Enjoy the skies.
Don Whiteman

The world changes some people … some people change the world.
… www.scienceisgolden.com/

Did you know? ★★★★★★★★

Why do stars twinkle? Do planets 'twinkle'?

Stars twinkle because of turbulence in the atmosphere of the Earth. As the atmosphere moves about, the light from a star is refracted in different directions depending on varying densities of each particular part of the atmosphere. This causes the star's image to change slightly in brightness and position, hence 'twinkle'. This is one of the reasons the Hubble telescope is so successful, because in space, there is no atmosphere to make the stars twinkle, allowing a much better image to be obtained.

Planets do not twinkle in quite the same way that stars do. This is because stars are so far away that they are essentially points of light on the sky, while planets actually have finite size. The size of a planet on the sky in a sense 'averages out' the turbulent effects of the atmosphere, presenting a more relatively stable image to the eye. This can be seen when away from city areas with all their air pollution, but only on still clear nights when there is little air turbulence.

Both planets and stars appear to twinkle more over cities than in the countryside due to the increased amount of air pollution in and near cities.

Sometimes as stars 'twinkle' they appear to change colour. This is because when the starlight is refracted, different colours are sometimes refracted in different directions and so a star can appear to change colour when it is twinkling strongly. ☆

Planisphere – free copy to print and use

A simplified Southern Hemisphere planisphere (30°S to 35°S) for night sky viewing is available to download and print from: *http://members.ozemail.com.au/~starrylady/Planis1.htm*

The planisphere comes with instructions for easy assembly. All you need are scissors, cardboard, glue and a split-pin.

A planisphere is a celestial sphere on a flat surface (or plane). It consists of a pair of concentric discs: one has part of the celestial sphere, the other has a window representing the horizon. Scales about the perimeters allow it to be set to locate stars and constellations at any time of night, any time of year, and any year. ☆

Notes: 1. The authors allow you to freely copy and distribute this in its original form, but it must not be sold. 2. More detailed planispheres are sold for only $9/$10 at shops such as The Binocular & Telescope Shop, 55 York St Sydney, ph 9262 1344, info@bintel.com.au

Explaining the brightness of stars

When you look at the night sky, some stars appear bright and others faint. A star differs in brightness either because it is inherently more/less luminous, or because it is closer/farther from Earth, e.g. from Saturn, the Sun will not appear like the brilliant Sun we see from Earth, but will look like a very bright star in the sky, because Saturn is much further away from the Sun than Earth is.

When stargazing, it is important to understand the concept of distance and brightness of stars – this is called 'apparent magnitude'.

The idea of 'apparent magnitude' dates back to 2 BC when the Greek astronomer Hipparchus looked at the stars in the sky and classified them into six brightness groups – the brightest stars were 'magnitude 1' and the faintest were 'magnitude 6'. The brightness was later quantified in 1856 by Norman Podgson of Radcliffe Observatory when he rated a star with magnitude 1 as 100 times brighter than the faintest star visible without a telescope. Hertzsprung and Russell, made observations about star brightness early in the 20th century and created diagrams describing star brightness, colour and temperature.

Today, a difference of five 'magnitudes' is defined as exactly equal to a brightness ratio of 100. Also, the whole scale is linked to the star Vega, which is defined to have a magnitude of 0 (although modern, precise readjustments of the magnitude scale actually now put Vega at closer to 0.03). Hipparchus' scale only went from 1–6, but today's scale can go further in either direction, e.g. anything brighter than Vega has a negative number for its apparent magnitude!

The apparent brightness of stars (= apparent magnitude) depends on their distance away from us and so is only a measure of how bright a star appears to us on Earth (and is not measure of how bright they are). The apparent brightness of a star decreases by $1/\text{distance}^2$. The observer must also know the true brightness (luminosity) to determine the distance to the star.

The true brightness (= absolute brightness/ magnitude or luminosity) of a star tells us how much power is actually emitted from its surface in the form of light. Scientists often compare the luminosity of stars with the power output of Earth's Sun which is 4×10^{26} Watts. Scientists set this amount of power equal to one Sun. Stars that have half the power output of the Sun are said to have a luminosity of 1/2. The 'absolute magnitude' measures how bright objects actually are, and is defined as the apparent magnitude that an object would have if it were located at a distance of 10 parsecs (= 33 light years)* away. ☆

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* Note: Astronomers cannot use kilometres to refer to distance of stars as it would be too large a number, and so use astronomical units (AU), parsecs and light years: 1 AU = 150 million km, 1 parsec = 3.3 light years = 206,000 AU.

How to demonstrate the brightness of stars in the classroom

The apparent brightness of a star is proportional to $1/\text{distance}^2$, i.e. if you took a star and moved it twice as far away, it would appear 1/4 as bright, and if you moved it 4× the distance, it would appear 1/16 as bright.

Two ways to show this to your students:

★ Effect of distance on light received

- Get them to imagine that they are a star, sending out imaginary light rays in all directions.
- Ask them to take each of their hands and touch their thumb to their forefinger to make a circle that they can look through the circle.
- They must then hold both hands up in front of their face and imagine that each circle is a 'telescope' through which someone is looking at them and that they (the star) are sending their light rays to that observer.
- Get them to move one hand twice as far away from their eyes as the other and look at the distant 'telescope' through the nearby one. They should see that it is about 1/4 the size. They can also check this by looking at the size of the same object when seen through each 'telescope'.

Explanation: The distant circle's two dimensions have shrunk by 1/2, so when these are multiplied together to get the area it has gone down by 1/4. This means that the second circle would only collect 1/4 as many of the light rays that they are sending it, so it would measure them (the star) to only be 1/4 as bright.

★ Brightness of flashlights

Hold a flashlight in each of your hands and show your students that both lights have the same luminosity, i.e. they both emit the same amount of light. Ask a student to volunteer to hold one of the flashlights at the very back of the room (as far away from the rest of the class as possible) and to shine it over your shoulder as you slowly walk past the other students to the very front of the room. Ask the observing students to compare the apparent brightness of each of these lights. They will notice that the light that is far away appears dimmer than the light that is closer. ☆

★ CONGRATULATIONS ★

The winner for the *SciTalk No. 1-2005* "WIN A BOOK" was Bronwyn Gilmore, from Murwillumbah High who has received a copy of:

Irresistible Forces
AUSTRALIAN WOMEN IN SCIENCE
by Claire Hooker

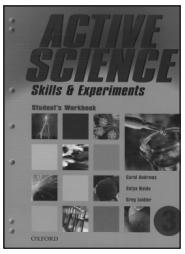
(available from ABC Books: rrp $34.95)

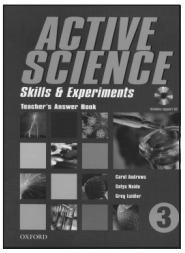
COMPETITION CORNER

Send in an entry NOW to win these books and CD:

Active Science 3: Skills & Experiments

by Andrews, Naidu & Laidler. Published & donated by Oxford University Press





Active Science 3: Student's Workbook and *Teacher's Answer Book + CD (rrp $19.95 & $32.95)* are now out. *Active Science* is an activity-driven approach to teaching science. Each topic has a concise summary of the theory, clear diagrams/photos, science facts, write-in activities, fill-in questions, demonstrations and practical experiments with scientific reports to fill in, a review, research activities and glossary. *Book 3* includes skills, processes & procedures, plus chemical, physical, biological and earth & space science topics. The *Teacher's Answer Book* is a complete text with all the answers in a second colour, plus a CD with 24 extension activities & answers, risk assessment for each experiment, & more.

QUIZ QUESTION: Give the atomic no. & name of the element named after proposer of the Theory of Relativity?

HOW TO ENTER: Send an answer to the Quiz Question, your name, school, address, & home ph. no. on the back of an envelope to: Competition Corner, PO Box 442 Harbord NSW 2096 – by 1 July 2005.

Winner for *SciTalk 1/05*: *Science Focus 1 & 3: Coursebook, CD & Homework Book* ($62.90), from Pearson Education Australia, were won by: Liz Fell, St Raphael's Central School, Cowra.

Answer for *SciTalk 1/05*: Green

Did you know these Australian facts?

- Australia is the smallest continent in the world, with an area (incl Tasmania) of 7 682 300 km^2. Australia is the sixth largest country on Earth (Vatican City is the world's smallest country).
- The northern, eastern, southern & western mainland Australian extremities are respectively: Cape York (Qld), Cape Byron (NSW), Southeast Cape (Tas), & Steep Point (Shark Bay, WA). There is no official geographic centre, but an area just to the west and south of Alice Springs would be it.
- Australia's tallest mountain is Mt Kosciuszko (NSW), largest desert is Great Victoria Desert (in WA & SA), lowest point is Lake Eyre (SA), largest body of water is Gordon Dam (Tas), longest river is Murray River.
- Uluru (Ayers Rock) is the world's largest monolith.
- Great Barrier Reef is the world's largest coral reef and is 2 000 km long.

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 $16 per 4 issues. Please send a cheque for $16 + GST = $17.60 (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 is in its 11th year, and is produced quarterly by Odlum & Garner as a service to Science teachers. It is sent FREE-of-charge to all secondary Science faculties in schools and TAFE 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.

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:
http://homepage.mac.com/robertgarner

CONTRIBUTIONS

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

CLOSING DATES

- *SciTalk* No. 3–August 2005 … July 2
- *SciTalk* No. 4–November 2005 … Sept 24
- *SciTalk* No. 1–February 2006 … Jan 27
- *SciTalk* No. 2–June 2006 … April 14

ADVERTISING & INSERTS

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