Providing support and promoting excellence in science education

SciTalk

ISSN 1323-7667

Number 2 – June 2004

Have fun, learning at Luna Park Sydney

School visits to Luna Park Sydney are just as much fun as always. Schools can come for just a **fun day** or go on one of the **educational excursions**.

Over a thousand students have already been to Luna Park Sydney on one of the Fun Park Excursions conducted by Physics is Fun since Luna Park Sydney re-opened in April 2004. The smiles on their faces were a great testimony to the excitement that comes from such interactive learning.

Over the years, students have come to these Fun Park Excursions from as far away as Coffs Harbour, Temora, Cobar, Wagga Wagga and Canberra to name but a few places. It is obvious that their teachers consider the benefits more than compensate for the distance travelled!

You can choose from a wide range of excursions.

Secondary students can do either Junior Science, Physics, Senior Science, Biology, Design & Technology, Peer Support or Business Studies. Primary students can do Science & Technology, Mathematics, and/or English.

Luna Park Sydney is also a great venue to have a special reward day for your students, or to have your school's foundation day celebrations, or simply to have just a fun day out of school, especially for those end-of-year celebrations.

Let your school Principal know that any faculty can book a Fun Park Excursion through Physics is Fun and save $$$.

Bookings can be made on either one of the special education days, or on another school day by special arrangement.

Plan your visit now! It can be just a fun day at the end of the year, or an educational excursion. □

★ ✧ ★ ✧ ★

EDUCATIONAL EXCURSIONS & FUN DAYS
are available for primary & secondary students

Secondary: Junior Science, Physics, Biology, Senior Science, Design & Technology
Primary: Science & Technology, English, Mathematics

NEW excursions now available: Peer Support & Business Studies

Save $$$ … special DISCOUNT PRICES FOR SCHOOLS: see page 7

BRINGING HEALTH TO LIFE
The Australian Society for Medical Research

the Australian Society for Medical Research

Careers Seminar for Secondary Students in Years 10–12

Medical research – is it the career for me?

Thursday 10 June 2004, 10 am–12 noon
Coles Lecture Theatre, The Powerhouse Museum, Ultimo
in ASMR Medical Research Week (7–11 June 2004)

For information, contact Dr Sheridan Henness by email: S.Henness@pharm.usyd/edu/au or ph: (02) 9351 4698

INSIDE SCITALK ▶▶▶▶

PRIZES TO WIN!
See pages 1, 3, & 12
Send in your entries now
... all in the one envelope if you prefer!

★★ ATTENTION ★★

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

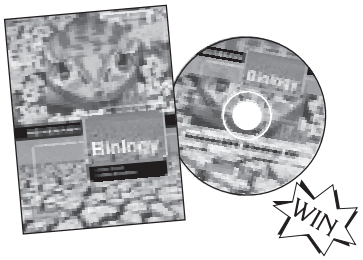
□ 1. .....
□ 2. .....
□ 3. .....
□ 4. .....
□ 5. .....
□ 6. .....

Would the last person please return this for filing or for the noticeboard.

Book Giveaway

You could WIN …

Heinemann Biology
2nd Edition
Mudie & Brotherton



Student pack: $63.80

Heinemann Biology (2nd edition) is fully revised to match the structure and sequence of the latest Stage 6 Biology Syllabus and has the latest developments in biology. It comes with a Student CD that contains option modules (Genetics: The Code Broken, Communication, Human Story, Biochemistry) and interactive tutorials.

This great full colour senior biology text comprehensively covers all core modules for both the Preliminary and HSC courses. It will be available by the end of Term 3.

TO WIN: Send in your name, address, ph. no. & school on the back of an envelope
by 2 July 2004 to
Book Giveaway, PO Box 442, Harbord 2096

★ ★ ★

Winner for SciTalk 1/04
Congratulations to John Sodeau, Liverpool GHS, who won *Heinemann Achieve Science 1 & 2* by Elizabeth Downey, donated by Heinemann (rrp Bk1: $99, Bk 2: $99, Pk 1&2: S165).

Diary Dates 2004

JUNE

2, 4 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

4 Program for students/teachers at Sydney Observatory: *The Transit of Venus – its meaning to Australia*. 5–8 pm. Details: (02) 9217 0485. Details on page 10.

5 World Environment Day. Details: www.unep.org/wed/

5–20 Dec Exhibition at Sydney Observatory: *Transit of Venus: the scientific event that led Captain Cook to Australia.* Details on page 10.

6 Sydney Observatory: A discussion 'Science meets history: the Transit of Venus', 4 pm.

8 Transit of Venus. Viewings at Wollongong Science Centre, and at Sydney Observatory.

17–18 Science Teachers' Workshop on HSC Physics Syllabus: Syd Uni. Details on page 5.

18 / 19 Schools Titration Competition 2004. Alasdair Hey, email: ajhey@nswtitration.com

21 Winter solstice

JULY

2 Closing date Eureka Prize School entries (for Earth, Environmental and Planetary Sciences, and for Biological Sciences). Enquiries: www.amonline.net.au/eureka

2 Closing date BHP Billiton Science Awards. See page 4 of this *SciTalk* for details.

18–24 National Chemistry Week. Details: www.raci.org.au/national/events/chemistryweek.html

22 National Chemistry Quiz. Details: Charles Fogliani, (02) 6338 4758, email: cfogliani@csu.edu.au

23 HSC Biology Teachers Professional Development Program. See page 12 for details.

30 Closing date Olympiad National Qualifying Exams. Details: www.rtaso.org.au/

AUGUST

3–5 Science in the City – for secondary schools. Ph (02) 9320 6389, www.scienceinthecity.net

6 Jeans for Genes Day: To raise money for Children's Medical Research Institute's work into the causes of childhood genetic diseases. 1800 677 260, www.jeans4genes.com.au

10–12 Science in the City – for primary schools. Ph (02) 9320 6389, www.scienceinthecity.net

14 Great Australian Marsupial Night Stalk. http://www.perthzoo.wa.gov.au/nightstalk/default.htm

14–22 National Science Week 2004. Enquiries: http://scienceweek.info.au/

16, 20 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

18, 19, 20 Australian Science Festival – school events. Canberra. Ph: (02) 6205 0588, www.asflimited.com.au

25 Physics Olympiad National Qualifying Exam. Closing date: 30 July. (02) 6125 9645

SEPTEMBER

1 Biology Olympiad National Qualifying Exam. Closing date: 30 July. (02) 6125 9645

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

14, 17, 20 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

26–30 CONASTA 53: ACT. Ph (02) 6281 6624, fax (02) 6285 1336, www.conlog.com.au/CONASTA53/

OCTOBER

18 Oct–13 Nov Shell Questacon Science Circus Tour – Hay, Deniliquin, Mildura, Wilcannia, Broken Hill, Swan Hill, Echuca/Moama. $4/student (GST free). Details/bookings: www.questacon.edu.au

18 HSC examinations commence. Details of science HSC exams below.

20 Chemistry Olympiad National Qualifying Exam. Closing date: 30 July. (02) 6125 9645

22, 25, 26, 27 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

23 Astronomy Open Night & Lecture. (02) 9850 7111. http://www.physics.mq.edu.au/astronomy/cal.html

NOVEMBER

1, 2, 3, Physics is Fun at Luna Park Sydney. Enquiries: ph/fax (02) 9939 6107

8–9 School Certificate Tests. 8/11: English / Science. 9/11: Maths / AH,G,C&C

15, 16, 19, 23 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

24, 26, 30 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

DECEMBER

1, 2, 3, 6, 7 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

7 Ocean Care Day

17 HSC results released

JANUARY 2004 National Youth Science Forum. Forms to local Rotary club by 15/5/04, interviews in July. For Year 11 students in 2004 only. Enquiries: (02) 6125 2777, fax (02) 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.

2004 HSC Science Examination Dates

22 Oct	Chemistry: 9.25 am–12.30 pm
27 Oct	Senior Science: 1.55 pm–5 pm
29 Oct	Earth & Environmental Science: 1.55 pm–5 pm
1 Nov	Biology: 9.25 am–12.30 pm
3 Nov	Physics: 9.25 am–12.30 pm

BOARD OF STUDIES
NEW SOUTH WALES

Update on BOS matters

Amendments to Outcomes & Content of Science Years 7–10 Syllabus (BOS 19/04)
A tracked document showing changes to the outcomes and content of the new Science Years 7–10 Syllabus from the current (1998) Science Stage 4–5 Syllabus has been posted on the Board's website during Term 2, 2004.

This document will assist teachers in identifying the essential (core) content of the current (1998) syllabus that has been identified as additional content in the new Science Years 7–10 Syllabus. The tracked document should also assist teachers in making decisions about the level of programming change required to implement the new syllabus.

Implementation of new syllabus is in Years 7 and 9 in 2005 and in Years 7–10 in 2006.

Approved calculators for HSC (BOS 11/04)
These are listed on BOS website.

BOS website
Teachers and students should go to the BOS website for the latest information and syllabuses – *www.boardofstudies.nsw.edu.au*

BOS enquiries
Ph (02) 9367 8111, fax (02) 9367 8484.

OUT AND ABOUT

I TER CTI E C ST L ST DIES

land's edge
COASTAL INTERPRETATION

15% OFF ALL PROGRAMS DURING TERM 2

Land's Edge, the Illawarra's highly acclaimed Coastal Interpretation company provides scientific exploration and investigation of coastal environments in a stunning and unique location.

Fieldwork programs for Stages 4 to 6 ranging from three hours to three days, some examples include:

Rainforest and Mangrove Investigations (by canoe)
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Land's Edge is committed to providing the highest quality programming for students through:

- *Fully qualified, passionate teaching and instructing staff*
- *Sample programs for teachers*
- *Pre and Post-visit curriculum material* • *All necessary equipment*

We specialise in customising programs to suit the specific needs of your school; fieldwork components can be added to your Outdoor Education and Recreational Programs.

Contact Land's Edge on: ph (02) 4234 3278, fax (02) 4234 3815, e-mail info@landsedge.com.au or visit www.landsedge.com.au

SCIENCE CENTRE & PLANETARIUM

University of Wollongong
Squires Way, Fairymeadow
Only 45 mins from southern Sydney

★ Special viewing for Transit of Venus on 8 June 2004 (see page 9).

★ Extensive range of shows & exhibits in 2004, including:
- **Stellar Evolution** – planetarium program for HSC Physics
- **Superconductors & Liquid Nitrogen** – live science show
- **Zap! Understanding Electricity**
- **Energy and Motion**

★ School entry includes two floors on hands-on exhibits, a science show, plus a planetarium / laser show.

★ Also available: environmental field trips, science shop, kiosk, science fun bags, membership programs. Live shows can be presented at your school – ask us about our Outreach Program.

★ Book now for 2004.
For information and bookings, phone (02) 4286 5000.
www.uow.edu.au/science_centre

WIN A FREE FAMILY PASS TO IMAX

Sydney's IMAX Theatre, at Darling Harbour, is open every day. More than 8 storeys high, IMAX has the world's biggest cinema screen designed to give audiences the ultimate film experience. IMAX films are both entertaining and educational. Films are constantly changing and cover a wide range of themes. High quality resource materials & teacher guides which link individual films directly to school programs are provided for school visits.

★ ✧ ★ ✧ ★ ✧ ★

TO WIN A FREE FAMILY PASS* TO IMAX: (for 2 adults and 2 children) worth $44 (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 2 July 2004** 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: Tracey Warzecha, Riverside GHS won the IMAX Sydney family pass for *SciTalk No. 1–2004*.

IMAX THEATRE SYDNEY

UNSW Medical Sciences Schools Programs

Hall of Health Museum

Fascinating curriculum-based programs for Biology, Senior & Junior Science, and PDHPE. **Book now for 2004**.

Museum of Human Disease & Hall of Health:
Discover how disease can ravage the human body in our interactive 2 hour programs, with real specimens of lung cancer, tuberculosis, HIV/AIDS and more. Use an electro-larynx, examine X-rays and visit the Hall of Health to learn about genetic disorders in the 'Faded Genes' Exhibition.

Anatomy Programs:
Visit a TEM, peep inside your eye & ear or meet the ancestors in our new and revised 2 hour programs: Cellular & Tissue Biology, Sensory Systems & Communication and The Human Story.

Cost: Single program $7 pp. Double program $14 pp.

Enquiries: Phone: (02) 9385 1522. Fax/phone: (02) 9385 1747
Email: j.horder@unsw.edu.au http://hallofhealth.med.unsw.edu.au

SCIENCE IN FOCUS AT IMAX

Darling Harbour, Sydney 2000

IMAX THEATRE SYDNEY

★ ★ ***THINK BIG AT IMAX*** ★ ★

★ **Roar: Lions of the Kalahari**
Starts May. Available for school bookings now. Filmed entirely in the wild, *Roar* captures the most amazing lion behaviour ever seen on the giant screen and brings students face-to-face with the other natural inhabitants of the African desert who play a role in this life & death drama. Balancing suspense and action with insightful information, a strong story line and breakthrough cinematography, this film will thrill and enlighten science students of all ages.

★ **Coming soon to IMAX**
Hear Dr Karl at IMAX! As part of *Science in the City*, students have an opportunity to hear a presentation by Dr Karl Kruszelnicki before a screening of *Adrenaline Rush: The Science of Risk*. **One date only**: Wed 4 August at 9.45 am–11 am.

★ **Booking & enquiries**
Contact the IMAX Education Office on ph: (02) 9213 1600, fax: (02) 9281 3833, email: sydgroups@imax.com.au

Visit our website for the **latest information** about films, packages and session times for schools: ***www.imax.com.au***

For Sale

nerringillah ecology centre

An ideal business opportunity for 1 or 2 science teachers offering:

- a great lifestyle; coastal, outdoor education
- good annual turnover, with 42 separate school visits last year, mostly 3 day visits, and with potential for growth
- solid infrastructure; guesthouse/staff residence, 2 dormitories, hall, amenities block and cook shed
- 56 ha (140 acres) property, 4 BR residence, 4 km from Bendalong beaches, nestled within Conjola National Park.

Nerringillah has grown over the last 15 years into what we believe is the best field study facility in NSW. We would love someone with new enthusiasm to take our beginnings to greater heights. Anybody interested?

Contact us at: nerringillah@yahoo.com
or (02) 4456 4397 or visit www.nerringillah.com.au

IEE Faraday Lectures

The Faraday Lectures were founded in 1924 to commemorate the life and work of Michael Faraday whose work laid the foundation for many of today's advances in technology. From his experiments came devices which led directly to the modern electric motor, generator and transformer. Faraday's discoveries are described on the opposite page.

Faraday was also the greatest scientific lecturer of his day, who did much to publicise the great advances of nineteenth-century science and technology through his articles, correspondence and the Friday evening discourses which he established at the Royal Institution in London.

The IEE Faraday Lectures are aimed at 14–16 year-old students. They present cutting edge technology in exciting and interactive presentations. Each lecture has explored a different aspect of electrical engineering, and highlighted the challenges and excitement of a career in this high-technology profession.

Students and teachers in Australia can experience these great lectures by downloading them from the IEE website. To obtain a copy of the recent lectures from 2000–2004, as well as a range of extras such as Key concepts, Teacher Notes, student information booklets, pre-lesson and/or post-lesson worksheets you will need to go to two different addresses on the IEE website:

• *http://www.ieee.org/organizations/eab/precollege/faraday/index.htm*

• *http://www.iee.org/Events/Lectrs/Faraday/PrevLect.cfm*

★ The **2004 IEE Faraday Lecture:** ***Sound FX – Making Music with Technology*** explores the use of technology in music making, both live and when recording. It provides a fly-on-the-wall look at what happens in the recording studio when singers and instrumentalists are recorded, paying particular attention to techniques that are employed to make modern recordings sound particularly effective. In addition, new ways of playing electronic musical instruments will be explained and explored on stage by members of the audience. The importance of making music live will not be lost though, as the lecture ends with an extravagant musical grand finale. It covers things such as: sound waves; electromagnetic induction; mixing desk functions and FX; as well as synthesised sound and FX.

★ The **2003 IEE Faraday Lecture**: ***Fighting Crime with Science*** interactively simulates a police investigation using optics and computers to construct a crime scene and demonstrate the growing role for technology and forensics in creating a safe society. It explores the role of science and technology in the arena of crime detection and prevention. It covers things such as: DNA profiling; polymerase chain reaction; gel electrophoresis; infra-red spectroscopy; and sensing smells.

★ The **2002 IEE Faraday Lecture:** ***Smart Living @ home with technology*** explores technologies which will deliver radical changes to the way we live, both now and in the future. Integrated command, control and communication systems will enable us to exploit technology to make our homes truly interactive environments. It shows how we can control our homes to make them safer and more efficient; provide new services in and to the home; link the home to outside networks; and improve residents' quality of life. It covers things such as: electrical currents; electrical energy; experiments with infra-red remote control; and fingerprint recognition; as well as design problem; load levelling; micro-generation; and remote control codes.

★ The **2001 IEE Faraday Lecture:** ***Beyond the Square Window*** covers a range of new television entertainment and offers an exhilarating explanation of how digital technology is rapidly revolutionizing communications. It covers things such as: bandwidth; analogue and digital images; Morse code; communications; manipulation of images; resolution and coding; transmission time.

★ The **2000 IEE Faraday Lecture:** ***Time and Place in the Communications Age*** covers how the ability to measure time with exact precision is taken for granted. Modern electronic technology has given us the ability to not only measure time accurately - wherever we are - but to measure distance, position, speed, and many other things. It covers things such as: satellites; global positioning satellites (GPS); seeing inside the human body; CD-ROMs; mobile phones; and the internet. Multi-media and 'live' demonstration show how these technologies are extending human capability. □

SCIENCE EVENTS 2004 AT SYDNEY UNIVERSITY

June: Olympiad Training Begins*
June: Careers Advisors' & Science Teachers' Breakfast*
July 14, 15, 16: Gifted & Talented Discovery Program 2*.
Aug 3–5: Science in the City–High Schools§
Aug 10–12: Science in the City–Primary Schools§
August 15: Science in the City – Open Day§
Aug: Sleek Geek Week (Sydney & Orange)*
Aug: Annual Physics Competition. Ph 9351 3201
Aug 28: Courses & Careers Day#
Sept 15: Sydney Science Forum 4*
Oct 12: Postgraduate Information Sessions*
Oct: Sydney Science Forum 6*

* Enquiries: ph 9351 5268
# Enquiries: ph 1300 36 2006
§ Enquiries: ph 9320 6233

Michael Faraday – one of the greatest experimentalists who ever lived

Michael Faraday, the son of an English blacksmith, is remembered for his pioneering experiments in electricity and magnetism. Many of his discoveries have become common ideas in modern physics.

At 14 years of age, after only a primary school education, Faraday was apprenticed to a bookbinder. There he became interested in physics and chemistry. After hearing a lecture by the famous chemist Humphry Davy, he sent Davy the notes he had made at his lectures. As a result Davy appointed the 21 year old Faraday as his assistant.

Faraday's research into electricity and electrolysis led him into the field of electromagnetism. In 1785, Charles Coulomb had been the first to demonstrate how electric charges repel one another, but it was not until 1820 that Hans Christian Oersted and Andre Marie Ampere discovered that an electric current produces a magnetic field (i.e. electro-magnetism). This led Faraday to undertake a series of experiments in 1821 that culminated in his discovery of electromagnetic rotation – the principle behind the electric motor – and to his describing the dynamo principle.

In 1823, Faraday discovered two new chlorides of carbon, and liquefied chlorine and other gases. He isolated benzene in 1825, and was appointed director of the laboratory.

Faraday's ideas about conservation of energy led him to believe that since an electric current could cause a magnetic field, a magnetic field should be able to produce an electric current. He demonstrated the principle of electro-magnetic induction in 1831 in his famous experiment, where a galvanometer showed the existence of current in a coil wrapped around a current-carrying metal ring – the principle underlying the transformer. Later in the same year he hypothesised that a moving magnet could produce an electric current. In proving his hypothesis he created the first dynamo (or generator). Faraday expressed the electric current induced in the wire in terms of the number of lines of force that are cut by the wire. The principle of induction also made possible

Michael Faraday (1791–1867)

the electric transformer. This discovery allowed electricity to change from being a scientific curiosity into a powerful technology.

During the 1830s Faraday did further work with electricity, and along with William Whewell, coined many of the words now so familiar to us – electrode, electrolyte, anode, cathode and ion to name but five. In the latter half of the 1830s Faraday worked on a new theory of static electricity and electrical induction. This work led him to reject the traditional theory that electricity was 'an imponderable fluid or fluids'. Instead he proposed that electricity was a form of force that passed from particle to particle of matter.

Davy, who greatly influenced Faraday's thinking, had shown in 1807 that sodium and potassium metals can be precipitated from their compounds by an electric current (a process known as electrolysis). Faraday's further work on this in 1834 led to what became known as Faraday's laws of electrolysis and he coined the term 'ion' for the particles believed to be carrying current. He formulated the second law of electrolysis: 'the amounts of bodies which are equivalent to each other in their ordinary chemical action have equal quantities of electricity naturally associated with them.'

Faraday had demonstrated the phenomenon of electro-magnetism in a series of experiments, however, his introduction of the concept of lines of force was rejected by most of the mathematical physicists of Europe. Faraday's work in electromagnetism however was taken up and mathematised by Thomson and James Clerk Maxwell who accepted the concept of lines of force, thus giving birth to modern field theory.

In the 1840s Faraday invented a chimney for oil burning lamps that allowed more of the products of combustion to be taken away from the lamp. It was installed in all lighthouses, Buckingham Palace and many other places.

Faraday spent a considerable amount of time, especially in the early 1860s, working on various systems of electric light that were proposed. These systems were tested in the Tynemouth and South Foreland lighthouses.

In 1845, Faraday observed the rotation of polarised light by magnetism, and found that light propagation in a material can be influenced by external magnetic fields – the magneto-optical effect, now known as the Faraday Effect.

Faraday also experimented with dielectrics in a capacitor. After further experimentation, he abandoned the concept of electrotonic forces in favour of 'lines of force'. He maintained that these lines could be made visible in a magnet using iron filings. Faraday was an advocate of the law of conservation of energy, believing that possibility of 'the production of any one [power] from another, or the conversion of into another'.

Faraday devised the laws of chemical electrodeposition of metals in 1857.

The unit of capacitance, the 'farad' (F) was named after Faraday.

Faraday's experiments in electricity and electromagnetism are in three volumes entitled *Experimental Researches in Electricity* (1839, 1844, 1855); his chemical work was chronicled in *Experimental Researches in Chemistry and Physics* (1858). A series of six children's lectures published in 1860 as *The Chemical History of a Candle*, is now a classic of science literature. □

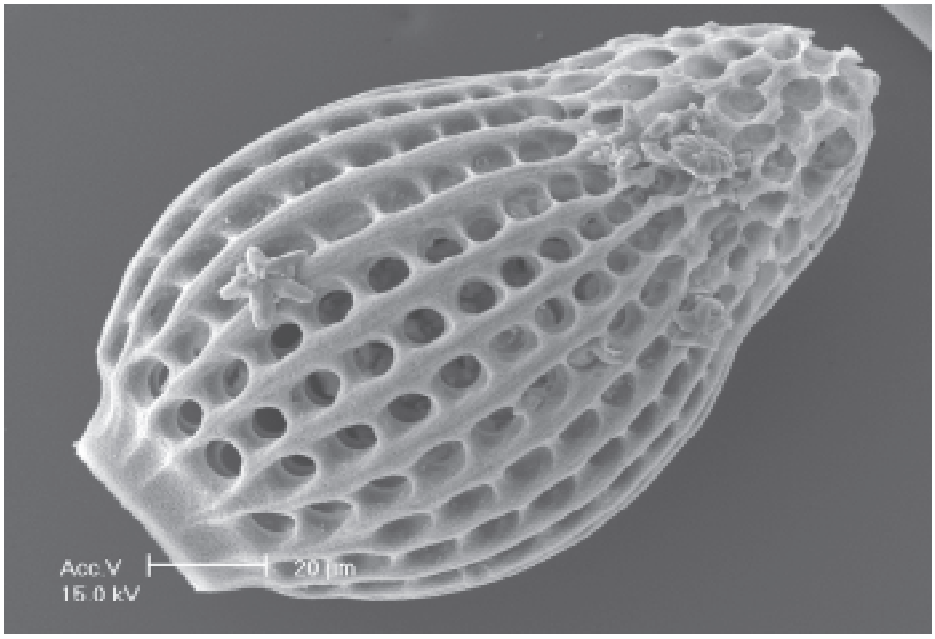
PhoTo Spot Skeleton from the Ocean Depths

This image is of a radiolarian, the skeleton of a tiny sea creature that was found in deep ocean sediment from the Eocene era (40–60 million years ago). It is approximately 100 µm in length, the diameter of a normal human hair.

Radiolarians are symmetrically shaped and their skeletons are made of silica rather than calcite. Radiolarians are a group of unicellular marine protists that have existed since the Cambrian era and are common in sedimentary rocks of marine origin. They belong to the Class Sarcodina. Radiolaria are characterised by the symmetry and diverse morphology of their skeleton and range in size from about 30 µm to 2 mm in diameter. When the organism dies, the cell disintegrates and leaves a skeleton such as that shown in the photomicrograph.

The morphological diversity of radiolarians over time makes them useful microfossils for geologists to use in the correlation of and age dating of rock strata in the search for petroleum.

The round, segmented object towards the tip of the radiolarian, is a fossilised coccolith. It consists of calcite crystals enlarged with overgrowth and is 40 million years old. A coccolith is a minute plate, which is only a few microns wide. Such plates covered unicellular, planktonic algae known as *coccolithophoroids*. Some organisms thought to be similar to *coccolithophoroids* had star shaped plates and became extinct at the end of the Pliocene (~1.8 million years ago). The star-like plates are called discoasters and were calcite crystals. A discoaster can be seen to the left of the centre of this photo. □



Photomicrograph of a radiolarian and article are by Dr Ian Kaplin.
This was taken with an XL30 SEM in the Electron Microscope Unit, at The University of Sydney.

Evaluating in science

The Stage 6 syllabuses for the various science syllabuses have the H1 Course Outcome: *'evaluates how major advances in scientific understanding and technology have changed the direction or nature of scientific thinking'*.

The term 'evaluate' means to 'determine or estimate the value or worth of an argument, data, information, a conclusion, a procedure, etc.'[1].

It is important to make sure that your students know the meanings of any terms that you have used, e.g. 'evaluate', BEFORE they are required to do an assessment task or an exercise in class.

The term 'evaluate' is one term that often causes difficulty. This not only causes problems with students however, but also with teachers who sometimes think that the student has not done their evaluation correctly, when in fact the student has, e.g. the student has given many positive outcomes of an advance having judged that these aspects were worthwhile.

Teachers need to be mindful that not all scientific developments have disadvantages – in fact many have no disadvantages at all, or only a few. Many advances in scientific understanding and technology only have advantages and have resulted in many useful discoveries and/or technologies. Any new discovery or technology is in fact the direct outcome of a change in the direction or nature of scientific thinking, and evidence therefore of such a change.

To say that an advance has had advantages or resulted in positive outcomes, or that it has had disadvantages or resulted in negative outcomes is to give an opinion, and that is what judging or evaluating is all about.

An advantage that has resulted from an advance in scientific understanding and technology, indicates that the change was an improvement, and that the advance changed scientific understanding and thinking for the better. This is referred to as 'positive evaluation' and is making a positive judgement about the worth of the advance. A student who does this, has placed a value on this advance and judged it as worthwhile, even if they have not made a specific statement that it 'was worthwhile'.

Evidence of 'changes in the direction or nature of scientific thinking' is indicated, for example, by statements which state that:

- peoples' views of the world around them changed
- arguments and speculations occurred as a result of something
- resolutions of arguments occurred
- new discoveries were made possible
- new knowledge, beliefs or realisations were acquired
- new disciplines in science were established as a result, etc. etc.

Similarly, if an 'advance' resulted in any disadvantages or caused scientific thinking to 'go backwards' in any way, then this should be clearly stated. This is referred to as 'negative evaluation' as not all outcomes were positive. Again, a person should not have to say specifically that an outcome was 'not worthwhile', if they have clearly stated that the advance resulted in or led to a problem and/or drawback, etc. Such a statement on its own is a judgement or evaluation of the 'advance' as not being totally worthwhile. □

1. Odlum, C. (1982). 'Glossary of Examination Terms'.

BHP BILLITON SCIENCE AWARDS

What are your students entering in the 2004 BHP Billiton Science Awards?

Have YOU thought of entering the 2004 BHP Billiton Teachers' Awards?

These awards are designed to encourage and reward excellence and participation in teaching science, and to reward young people who have undertaken research projects which demonstrate innovative approaches and thorough scientific procedure.

These awards have been sponsored and managed by BHP Billiton since 1981, and are run in conjunction with CSIRO. There are 3 separate competitions: BHP Science Student Awards, BHP Science Teacher Awards, and the BHP School of the Year Award.

It's time to start thinking and planning your entries. There are fantastic prizes to be won. Entry is FREE. There are **4 research categories** for students: • Biology and Microbiology • Chemistry and Biochemistry • Physics, Engineering and Technology • Environmental and Earth Science.

Entry is free and the **closing date** is Friday 2 July 2004.

★ ✧ ★ ✧ ★

ENQUIRIES: ***http://scienceawards.bhpbilliton.com***

BHP Billiton Science Awards
GPO Box 86A, Melbourne 3001
ph (03) 9609 3341
fax (03) 9609 4420

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Astronomy

Transit of Venus: the scientific event that led Cook to Australia

On 8 June 2004, Australians will be able to witness one of the rarest and most important events in the astronomical calendar – the Transit of Venus – when Venus will cross in front of the Sun. Sydney Observatory* has provided the following information about the Transit and how to view it.

WARNING: It is dangerous to look directly at the Sun, especially through binoculars or telescopes. SERIOUS EYE DAMAGE MAY RESULT. You should view the Transit safely at an observatory using the correct type of solar filter to ensure safe viewing of this magnificent spectacular.

A transit occurs when, as seen from Earth, a planet appears to move *across* the disc of the Sun. Only the two inner planets, Mercury and Venus, can ever be found between the Sun and the Earth and therefore only they can ever be seen in transit. A transit does not occur each time Mercury and Venus are in the same direction as the Sun because usually they pass either above or below the Sun in the sky.

Transits of Mercury occur 13 or 14 times per century but transits of Venus are quite rare events. Transits of Venus occur in a repeating cycle separated by 8, 122, 8 and 105 years in turn. No person now alive on Earth has seen a transit of Venus. This year's transit of Venus will be the first since 1882. The next will be June 6 2012 and then not until 11 December 2117 then 2125, 2247 and 2255. In Australia we will see the start of this transit, but throughout Australia, the Sun will set before the transit ends. Seen from Sydney, Venus will appear to touch the Sun's disc at 3:07 pm and be completely immersed 19 minutes later. Venus will still be moving across the Sun at sunset at 4:53 pm.

Scientists in past centuries were keen to study transits of Venus as they provided a way of measuring the distance from Earth to the Sun, and they believed it would help them to draw up more accurate navigation charts. This technique was pointed out by Edmond Halley, of Halley's Comet fame in 1716. He realised that, due to parallax, observers at different locations would see slight shifts in Venus' track across the Sun.

To measure this slight shift Halley suggested that each separate observer should time the instants that Venus appears to touch the Sun. With such timings astronomers could compare the path of Venus across the Sun as seen from different locations and then use geometry to obtain the Sun's distance. Measurements made in 1769, 1874 and 1882 gave the Sun's distance to within 3% accuracy, however, this method subsequently became obsolete as more accurate results can now be obtained using radar.

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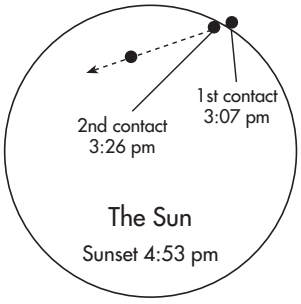

The path of Venus across the Sun as seen from Australia. 1st contact refers to the time Venus just touches the edge of the Sun's disc. 2nd contact is when Venus is completely inside the disc, but still touching the edge.

This astronomical event has particular significance for Australians as it was the transit of Venus in 1769 that led to Captain James Cook's discovering Australia.

Cook, along with astronomer Charles Green, was sent out in the HM Bark *Endeavour* to observe the transit in Tahiti and to search for the southern continent. From Tahiti, Cook sailed to the east coast of Australia which he called New South Wales and claimed for the British Crown in 1770.

James Cook

To celebrate the first transit for over a century, Sydney Observatory will be holding a special event to view the transit as well as presenting a series of school and public programs and exhibition.

The exhibition ***Transit of Venus: the scientific event that led Captain Cook to Australia*** will explore Cook's 1769 observations as well as the transit of 1874, which was observed by the then Government astronomer Henry Chamberlain Russell from Sydney Observatory.

On display will be equipment used during viewing of both transits, original handwritten illustrations and manuscripts by Cook and Russell, and the Shelton Clock – an astronomical regulator built by John Shelton for the Royal Society which was used by Cook during the 1769 transit.

This exhibition will be open at Sydney Observatory from 5 June–20 December 2004.

An associated publication, written by Dr Nick Lomb, curator of Astronomy at Sydney Observatory, can be purchased for $5.95 from Sydney Observatory or from their website *www.sydneyobservatory.com.au*

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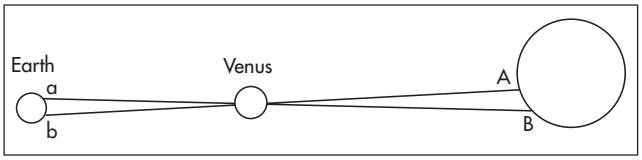

The shift in the track as seen from two points a & b on Earth leads to a larger separation A & B on the Sun. Not to scale.

Special Schools' Programs

- **Exhibition: Transit of Venus: the scientific event that led Captain Cook to Australia**

School excursions to attend this include telescope viewing and a 3D theatre program. Cost: $6 per student, teachers/ supervisors FOC. *Bookings essential. Ph: (02) 9217 0485.*

- **The Transit of Venus – its meaning to Australia Friday 4 June, 5–8 pm**

Especially for year 9–12 history students and teachers. The night includes a special 3D Space Theatre show, telescope viewing, lectures and information on when, where and how to safely view the Transit.
Cost: $10 students, accompanying teachers FOC (Powerhouse Member schools $8 students). *Bookings essential. Ph: (02) 9217 0485.*

Public Programs

- **Science meets history: the Transit of Venus Sunday 6 June, 4 pm**

The meeting of science and history will be the focus of this discussion between Dr Nick Lomb, curator of astronomy at Sydney Observatory, and Paul Brunton, senior curator Mitchell Library. Cost: $15 adult, $12 concession, $10 child, $40 family (includes exhibition tours and telescope viewing).
Bookings and pre-payment essential. Ph: (02) 9217 0485.

- **Transit of Venus viewing* Tuesday 8 June, 2:30 pm**

Dr Nick Lomb, curator of astronomy will provide an introduction and briefing followed by a viewing of the Transit from 3.07 pm to sunset at 4.53 pm through telescopes with solar filters and other safe devices in the grounds of Sydney Observatory.
Cost: $22 adult, $18 concession, $12 children, $56 family (includes access to the site for transit viewing, webcasts, talks and night viewing).
Bookings essential, numbers are limited. Ph: (02) 9217 0485.

* The actual Transit viewing will be followed by live webcasts from various parts of the globe, including Whitby, the birthplace of Cook, where the Endeavour replica will be marking Transit celebrations. The Transit is complete at 9:25 pm (EST). Gates will be open until 10 pm.

Acknowledgments: • James Cook – *Picturesque Atlas of Australasia (1886).* • Endeavour: The National Library of Australia.

[* Assisted by the Science Museum, London & State Library NSW. Supported by the Bruce & Joy Reid Foundation.]

Winter 2004: Birds and Sparks

Winter is always a great time to view the central bulge of the Milky Way as it traverses overhead and the 'Emu' is easy to distinguish. What is the Emu?

According to the Australian Museum website, an adult Emu is Australia's tallest native bird, reaching 1.6–1.9 m when standing erect. It weighs 30–45 kg, and is covered with shaggy grey-brown feathers except for its neck and head, which are largely naked and bluish-black. The wings are greatly reduced, but the legs are long and powerful. Each foot has three forward-facing toes and no hind toe.

To astronomers in Australia, the 'Emu', which is overhead in the night sky in the winter months, is a sight that once seen will never be forgotten. Many people are familiar with the Greek and Roman stories about the major constellations, but very few Australians know about the 'Emu' which is one of the largest shapes in our sky.

The 'Emu' has been important to Aboriginals for thousands of years. It has influenced their rock art, the design of ceremonial sites, when ceremonies should be held. The male emu's role in producing young emus by sitting on the eggs was seen by Aboriginal elders as being similar to their role in initiating boys into manhood.

First you should find Crux Australis (the Southern Cross). Just below alpha Crucis (the brightest star in the Southern Cross) lies a dark patch called the Coalsack, which is one of the most famous dark nebulae in the entire sky. This represents the Emu's head with the eye just visible. The Emu's long neck runs down through beta and alpha Centauri (the two Pointers to the Southern Cross) and into the Norma constellation. The body starts to form about here and continues across the Scorpius constellation and down into Sagittarius. Here the body ends and the legs come out from beneath the body and extend into the faint constellation of Scutum.

The 'Emu' is best seen away from city lights, but rug up well as it will get cold before the Emu disappears into the dawn sky. The best time to see it is from 9 pm onwards in June, moving to earlier in July and August. Whilst out observing the Emu, you are very likely to see some good meteors with Southern delta and iota Aquarids in July and the Northern delta and iota Aquarids in August. Delta Aquarids display yellow to blue colours and about 10% of them have persistent trains. Iota Aquarids are normally very swift. Alpha Capricornids in early August are exciting to observe, with long trails and some fireballs.

Enjoy winter while it lasts, as spring will soon be here and there will be plenty of galaxies to look for.

… Don Whiteman

ABOVE: The 'Emu' as seen in our night sky, its head on the right. It appears to be 'flying' as its orientation is the same as in the picture below.

LEFT: This picture is from 'The Emu in the Sky' (by Peter D'Arcy & illustrated by Scott Towney) which is a great collection of Aboriginal astronomy stories from around Australia. This book, and its sequel, 'The Hunter in the Sky', can be bought from the Questacon Shop (www.questacon.edu.au).

Special Program for the Transit of Venus
at the
Science Centre & Planetarium
University of Wollongong

- Explanatory Planetarium presentation at 2.20 pm – runs 33 mins. Tickets: $2/child, $3/adult (max 65 seats).
- Interactive computer transit info presentation in Foyer (free) from 2.20 pm.
- Telescopes outside (free) – from 3 pm, including feed from the Science Centre's solar telescope and telescopes provided by the Illawarra Astronomical Society.
- Transit begins at 3.07 pm.
- Explanatory planetarium presentation repeat: 3.40 pm–4.20 pm (while transit is underway).
- Sun sets at 4.53 pm.
- Science Centre closes at 5 pm.

Information & bookings: ph (02) 4286 5000
www.uow.edu.au/science_centre

COMPETITION CORNER

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Winner for *SciTalk 1/04*: *Science Tests for the School Certificate* ($32.95), donated by Odlum & Garner, was won by Ian Judd, Dorrigo High School.

Answer for *SciTalk 1/04: Transit of Venus.*

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 (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. It is produced quarterly and 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* around to all Science teachers at your school so that they can benefit from it … and/or put it up on your notice board for further reference.

Contributions and advertising for *SciTalk* are welcome … see below.

CONTRIBUTIONS

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

CLOSING DATES

- *SciTalk* No. 1–February 2004 … Jan 23
- *SciTalk* No. 2–June 2004 … April 16
- *SciTalk* No. 3–August 2004 … July 2
- *SciTalk* No. 4–November 2004 … Sept 24

ADVERTISING & INSERTS

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