

# SciTalk

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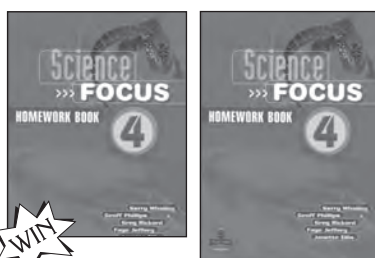
Number 1 – February 2006

## Book Giveaway

You could WIN these books & CDs ...

**NEW: Science Focus – Bks 2 & 4**

Kerry Whalley, et al



RRP: Student texts \$44 ea  
or \$49.95 ea with CD (= book & website)  
Homework Books \$12.95 ea

Science Focus Books 1–4 were written specifically for the NSW Science Syllabus, Stages 4 & 5. Books 2 & 4 are now available. The theory is presented clearly & contextually to engage students in seeing the relationship between science and their everyday lives. This series is stimulating, and contains extensive illustrations and photos. There is a Companion Website, and Teachers' Resource (\$120 ea) at each level. Each text contains questions, tests, revision activities, practical activities, and much more!

**TO WIN:** Send in your name, address, ph. no. & school on the back of an envelope

by 13 April 2006 to

Book Giveaway, PO Box 442, Harbord 2096

★ ★ ★

Winner for SciTalk 4/05

Congratulations to Jody Harris, Sefton HS who won the 8 books in the Spotlight Surfing series for Preliminary & HSC Biology (\$16.95 ea) by Kerri Humphreys, donated by Science Press.

### ★★ ATTENTION ★★

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

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

Please return to file or noticeboard.

### PRIZES TO WIN!

See pages 1, 3, 4, & 12  
Send in your entries now

(ALL IN THE ONE ENVELOPE if you prefer!)

This SciTalk & past issues are available at  
<http://homepage.mac.com/robertgarner>

## Is water running out and our planet becoming parched?

Australia is the driest continent in the world, apart from Antarctica. Yet many Australians do not appreciate how little water Australia really has and the stress that an increasing population is placing on our water supplies and environment. No more water falls than when Europeans first settled here. In fact probably less falls now with all the land clearing!

About 35% of the continent receives so little rain, it is effectively desert. In total, 70% of the mainland receives less than 500 mm of rain annually, which classes it as arid, or semi-arid. Australia's deserts (Great Victoria, Great Sandy, Tanami, Simpson, Gibson, Little Sandy, Strzelecki, Sturt Stony, Tirari, Pedirka) are distributed throughout the western plateau and interior lowlands. The total desert area equates to 18% of the total mainland area.

With so little rain and so much of Australia being a desert, and with 2006 being the International Year of Deserts and Desertification, Australians should take time

to learn about and become more involved in desert ecosystems and desertification issues.

Despite being one of the driest continents, Australians are placing an unsustainable demand on water supplies with the highest per capita consumption of water in the world. Some 70% of this consumption is used to support agriculture. Only 12% of our rainfall runs off to collect in rivers. River flow is highly variable and these factors are exacerbated by a high degree of variability in climate.

Very few of Australia's soils are naturally suited to agriculture, with most being shallow, high in salt stores and low in nutrients. Only 6% of the land is arable without irrigation and large areas are naturally affected by salt, waterlogging or acidity.

The problems of water demand are not unique to Australia, but are throughout the world. The demand by humans for water is exceeding the available supply and rivers are

... continued on page 7

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★ 2006 Australian Museum Eureka Schools Prizes ... see page 9 ★

## EDUCATIONAL EXCURSIONS & FUN DAYS AT LUNA PARK for primary & secondary students through Physics is Fun

**Secondary:** Science 7–10, Physics, Biology, Senior Science, Maths, Technology

**Primary:** Science & Technology, English, Mathematics, Art & Peer Support

★ **OTHER SECONDARY EXCURSIONS:** Visual Arts, Peer Support, Commerce, Business Studies, Tourism ★

Save \$\$\$ ... special DISCOUNT PRICES FOR SCHOOLS: see page 7

PLAN NOW  
to celebrate  
2006 National  
Science Week  
by doing a  
Physics is Fun  
excursion at  
Luna Park Sydney



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

Any school faculty can save \$\$\$.

Why pay more?

SPECIAL SCHOOL PRICES  
for Fun Park Excursions  
booked through Physics is Fun  
to Luna Park Sydney. See p7.



# Diary Dates 2006



## 2006 – International Year of Deserts & Desertification

### MARCH 2006

- various dates Shell Questacon Science Circus: Armidale, Casino, Coonabarabran, Glen Innes, Gunnedah, Inverell, Moree, Narrabri, Tamworth, Walgett, Wee Waa. [www.questacon.edu.au/html/on\\_the\\_road.html](http://www.questacon.edu.au/html/on_the_road.html)
- 5–12 Seaweed 2006: Footprints for our future. Resources: [www.ausmepa.org.au](http://www.ausmepa.org.au)  
<http://www.mesa.edu.au/seaweed2006/> & News at: [www.marineteachers.org.au/](http://www.marineteachers.org.au/)
- 6–12 Blood, bugs & bodies: The mystery of pathology. Powerhouse Museum. [www.phm.gov.au](http://www.phm.gov.au)
- 17, 20 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 20 International Earth Day. [www.earthsite.org/](http://www.earthsite.org/)  
[Note: This day is celebrated on 22 April in some places: <http://www.earthday.net/> ]

### APRIL 2006

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

### MAY 2006

- 3–5 Science at the Shine Dome. Australian Academy of Science. Award applications for teachers to attend this symposium in by: 10/03/06. Details at: [www.science.org.au/sats2006/](http://www.science.org.au/sats2006/)  
Closing date: RACI Titration Competition. [www.nswtitration.com](http://www.nswtitration.com)
- 9, 10 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

### JUNE 2006

- 2, 5, 7, 9 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 16 Closing date Crystal Growing Comp. [www.chem.unsw.edu.au/raci/crystal\\_grow/index](http://www.chem.unsw.edu.au/raci/crystal_grow/index)
- tba RACI Nyholm Lectures. Details soon at: [www.chem.unsw.edu.au/raci](http://www.chem.unsw.edu.au/raci)

### JULY 2006

- 9–13 CONASTA 55: Science + Education: Inventing the Future. SA. [www.sapmea.asn.au/conasta55/](http://www.sapmea.asn.au/conasta55/)
- 13–16 International Science School: Yr 11 & 12 students, Uni of Syd. Details on page 4
- 23–29 National Chemistry Week. [www.raci.org.au/national/events/chemistryweek.html](http://www.raci.org.au/national/events/chemistryweek.html)
- 27 National Chemistry Quiz. [www.raci.org.au/national/events/nationalchemistryquiz.html](http://www.raci.org.au/national/events/nationalchemistryquiz.html)

### AUGUST 2006

- 4 Jeans for Genes Day. Enquiries: CMRI, 1800 677 260, [www.jeans4genes.com.au/](http://www.jeans4genes.com.au/)
- 12–20 National Science Week: Theme – Our Dry Continent. <http://scienceweek.info.au/>
- 18, 21 Science Week events: Physics is Fun at Luna Park. <http://homepage.mac.com/robertgarner>
- 12–20 Australian Science Festival, ACT. School Activities 16/8–18/8. [www.sciencefestival.com.au](http://www.sciencefestival.com.au)
- 23 Physics Olympiad National Qualifying Exam. [www.aso.edu.au](http://www.aso.edu.au) Closing date: 28 July
- 30 Biology Olympiad National Qualifying Exam. [www.aso.edu.au](http://www.aso.edu.au) Closing date: 28 July

### SEPTEMBER 2006

- 6 Chemistry Olympiad National Qualifying Exam. [www.aso.edu.au](http://www.aso.edu.au) Closing date: 28 July
- 7 National Threatened Species Day. [www.deh.gov.au/biodiversity/threatened/ts-day/](http://www.deh.gov.au/biodiversity/threatened/ts-day/)  
& [www.deh.gov.au/biodiversity/threatened/information/](http://www.deh.gov.au/biodiversity/threatened/information/)
- 13, 14 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

### OCTOBER 2006

- 8–14 Earth Science Week 2006. [www.earthsciweek.org/](http://www.earthsciweek.org/)
- 20, 23, 24 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 25, 30, 31 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

### NOVEMBER 2006

- 3, 13, 14, 17, 21 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 22, 24, 27, 29, 30 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

### DECEMBER 2006

- 1, 5, 6, 8 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

### JANUARY 2007

- National Youth Science Forum. Forms to local Rotary club by 15/5/06, interviews in July.

Only for Yr 11 in 2006. Enquiries: 6125 2777, fax 6125 8015, email: [nsss@anu.au](mailto:nsss@anu.au), [www.nysf.edu.au/](http://www.nysf.edu.au/)

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



The United Nations have proclaimed 2006 as the International Year of Deserts and Desertification. This will provide valuable opportunities for Australian communities to learn about and become more involved in desert ecosystems and desertification issues.

All countries are invited to support public awareness activities related to desertification

and land degradation. The year will highlight the growing threat that desertification represents for humans, and celebrate the unique ecosystem and cultural diversity of deserts. It will make a clear difference between the need to fight against desertification as a threat to sustainable development and to protect deserts as unique natural habitat.

Internationally, the UN are coordinating activities. Nationally, the Department of the Environment and Heritage is the Australian focal point. For information, activities and website links, go to: [www.deh.gov.au/events/iydd/](http://www.deh.gov.au/events/iydd/) □



## Update on BOS matters

Check the BOS website regularly to ensure you have the latest information. This website contains all syllabuses (K–12), past exam papers, Board Announcements, Official Notices, Board Bulletins, a statistics archive and more.

### Reminder: Amendments for Stage 6

Remember Stage 6 Syllabuses were amended for Assessment Components, Weightings and Tasks and this was effective for the 2005 HSC onwards. All syllabuses on BOS website have been amended. (see *BOS 59/03*, *BOS 34/04*)

### SC Science Syllabus implementation 2006

Don't forget: all Years 7–10 should be using the revised Science 7–10 Syllabus in 2006.

### Health and safety issues related to student projects, etc (*BOS 17/05*)

Check these guidelines to ensure your safety with respect student projects.

### On BOS website:

- HSC Notes from HSC Marking Centre (including Marking Guidelines)
- Past HSC exams and SC Science Tests
- Amended Periodic Table (*BOS 22/05*)

### BOS enquiries

Ph (02) 9367 8111, fax (02) 9367 8484  
Website [www.boardofstudies.nsw.edu.au](http://www.boardofstudies.nsw.edu.au)

A teacher affects eternity;  
he can never tell where  
his influence stops.

... Hans Hofman

## Fun Park Excursions



**SPECIAL SCHOOL PRICES  
through Physics is Fun!**

**WHY PAY MORE? SAVE \$\$\$  
ANY FACULTY CAN COME**

★ ◆ ★ ◆ ★

• Come for a **FUN DAY** or **EDUCATIONAL DAY!**

• These days are held throughout the year and are a great way to have FUN learning (see p 7).

Worksheets are available for:

- Primary Science & Technology, English, Maths
  - Science 7–10 • Technology • Maths
  - Physics • Senior Science • Biology • Art
- Peer Support • Commerce/Bus. Studies/Tourism

### NATIONAL SCIENCE WEEK DATES

18 and 21 August 2006

• Book your date now by ph (02) 9939 6107.  
• \*\* Includes complete Risk Assessment package! \*\*







## The University of Sydney

The Science Foundation for Physics & The School of Physics

*New to teaching physics? Been at it since Newton was a kiddie?*

*Don't know a quark from a quasar? Or a PFA\* from a TLA\*\*?*

*Can't recall the last time you were so excited about physics that you climbed up onto the desk?*

### Reignite your excitement for Physics: Science Teachers' Workshop 2006

*Sydney: Thursday 15 & Friday 16 June 2006*

*School of Physics, The University of Sydney*

*Regional NSW: venues & dates TBA*

The two-day *Science Teachers' Workshop* will focus on the NSW Physics syllabus, giving you a chance to improve your understanding of physics, share classroom tips and tricks and learn new ways to get your students excited. The *STW 2006* includes a lecture series covering physics concepts and ideas, including sessions for new physics teachers, while hands-on sessions will provide practical ideas and classroom resources. *STW2006* will run at the School of Physics, University of Sydney, 15–16 June 2006, and in two regional centres (dates and locations TBA).

Check [www.physics.usyd.edu.au/foundation](http://www.physics.usyd.edu.au/foundation) for details in early 2006.

**For more information:**

Dr Chris Stewart, Executive Officer  
Science Foundation for Physics  
School of Physics A28  
The University of Sydney NSW 2006

**Phone:** 02 9351 3622  
**Fax:** 02 9351 7726  
**Email:** [c.stewart@physics.usyd.edu.au](mailto:c.stewart@physics.usyd.edu.au)  
**Web:** [www.physics.usyd.edu.au/foundation/](http://www.physics.usyd.edu.au/foundation/)

\* Primary Focus Area      \*\* Three Letter Acronym

## RACI NSW SCHOOLS TITRATION COMPETITION 2006



**DATES:** 17 June (most Sydney Metro, Wollongong Uni), 16 June (UNSW, St John Bosco College); Most regional venues: tba

Encourage your Year 11/12 chemistry students to test their quantitative analytical skills in the 2006 NSW Schools Titration Competition. Organised by the Chemical Education Group of the Royal Australian Chemical Institute (RACI), it is run at a number of school and uni venues across NSW.

Students compete in teams of 3 and, in 90 minutes, must complete a set of acid-base titrations to determine the unknown concentration of a weak acid. Entry costs \$24/team (GST exempt).

A team's score depends on the accuracy of each members' work. At each venue, each member of the winning team wins a trophy. Winning teams may then be invited to the

National Competition in September 2006. All students receive a Certificate of Excellence or Merit or Participation. The **de Miklouho-Maclay Prize for Practical Chemistry** (a certificate and \$100) will be awarded to the student with the best overall results.

Competition entry can be used to satisfy 1.5 hours of practical experience and contribute to the Chemistry Syllabus outcomes: P2, P10, P12 & H12 [12.2(a),(b),12.4(b)].

For further details about the competition, entry forms, hints and tips, please go to: [www.nswtitration.com](http://www.nswtitration.com) or contact Alasdair Hey by email: [ajhey@nswtitration.com](mailto:ajhey@nswtitration.com), ph/fax (02) 9601 1021, or mail: POB 282 Georges Hall 2198. **Closing date is 5 May 2006.**

**2005 National Competition results:**

Approx 850 students entered the 2005 NSW competition. 28 teams went on to compete in the National Competition in September at UNSW.

117 teams across Australia took part in the **National Competition**. Of the top 26 scores, 4 were by NSW teams: 9<sup>th</sup> place (De La Salle College), 13<sup>th</sup> place (Mount St Benedict College), 16<sup>th</sup> place (SHORE) and 20<sup>th</sup> place (Willoughby GHS). 1<sup>st</sup> place in Australia was Annesley College from South Australia. Congratulations to all who participated.

The **de Miklouho-Maclay Prize** for excellence in Chemistry went to Benjamin Dalglish (Shore) with a near perfect score! Congratulations to these competitors! □

### JOINT EXCURSIONS: PHYSICS IS FUN AT LUNA PARK SYDNEY WITH IMAX / SYDNEY AQUARIUM

Combine a PHYSICS IS FUN at Luna Park Sydney excursion with a visit (before or afterwards) to either IMAX or SYDNEY AQUARIUM for a great action-packed, fun time of interactive learning. These excursions are a great way to capture students' interest and demonstrate learning in action.

● **COSTS, BOOKING DETAILS & WORKSHEETS ARE AVAILABLE AT:**

IMAX: [www.imax.com.au/schooltimetables](http://www.imax.com.au/schooltimetables)  
SYDNEY AQUARIUM: [www.sydneyaquarium.com.au](http://www.sydneyaquarium.com.au)  
PHYSICS IS FUN: <http://homepage.mac.com/robertgarner>

● **PLANNING YOUR DAY**

**Before / after Luna Park:**

Allow 1 hr for IMAX (any film);  
or 2 hrs for a Sydney Aquarium excursion.

**11 am–6 pm:** Allow 2–3+ hours for Luna Park Sydney.

**BOOK & PAY SEPARATELY FOR EACH EXCURSION**



### WIN A FREE 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 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 are provided for school visits.



**TO WIN A FREE FAMILY PASS\* TO IMAX:** (for 2 adults and 2 children) worth \$46 ... send in your full name, school, home address & ph no. on an envelope **by 13 April 2006** to:

IMAX Give Away, PO Box 442, Harbord NSW 2096

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

**WINNER:** Stella O'Rourke, McCarthy Cath. College, won the IMAX Sydney family pass for *SciTalk* No. 4–2005.



## HSC statistics: Entries for science courses and options at the 2005 HSC

The total number of entries for the HSC Science courses\* in 2005 was 38 063 and the total number of HSC entries for the 2005 HSC was 65 189. So Science entries were 58.4% of the total entries.

The number of HSC Science entries as a percentage of the total HSC entries from 1992–2005 is shown in the table below. This percentage has decreased significantly from the peak of 90.8% of the total candidature in 1992<sup>#</sup> with 54 414 students doing a Science course to only 58.0% in 2001. Since 2001, the percentage of Science entries has not varied greatly from around 57% but this is much lower than in past years.

Entries for HSC Science courses 1992–2005 as a percentage of the total number of HSC entries <sup>#</sup>														
YR	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
%	90.8	87.7	80.1	72.0	73.8	72.3	70.2	69.9	64.1	58.0	55.8	56.5	58.3	58.4

The pattern of options presented at the 2005 HSC for each Science course is given as a percentage in the following tables.

Biology	
Total 2005 candidature 13 217 (♂ 4 844 ♀ 8 373)	
Q28. Communication	57.7%
Q29. Biotechnology	6.7%
Q30. Genetics: The Code Broken?	20.0%
Q31. The Human Story	14.6%
Q32. Biochemistry	0.5%
	99.5% <sup>§</sup>

Physics	
Total 2005 candidature 9 315 (♂ 6 815 ♀ 2 500)	
Q28. Geophysics	1.4%
Q29. Medical Physics	25.5%
Q30. Astrophysics	26.6%
Q31. From Quanta to Quarks	43.8%
Q32. The Age of Silicon	2.6%
	99.9% <sup>§</sup>

Excellence is never an accident ... Anon

It is never too late to become what you might have been. ... George Eliot

\* These are the total number of entries in Science courses, and not the actual number of students who study a Science course, since a fair percentage actually study 2 courses in the same year, and some students since Pathways do 3 science courses.

# The total number of entries prior to 1996 was based on the total English candidature. Since then, due to Pathways, the total figure each year is still based on English entries, but is slightly affected by acceleration students, Pathways students, etc.

§ The total number of students below reflects the actual number of students who received a result for each subject. It differs from the figures given in the media as their figures are the number of HSC entries for each subject as of September 2004. There is usually a difference between these two sets of figures because some students have illness/misadventure and so do not sit for the examination.

[Note: Individual option percentages are rounded to the nearest 0.1%, thus totals are not exactly 100.0% for some courses.]

Chemistry	
Total 2005 candidature 10 120 (♂ 5 394 ♀ 4 726)	
Q28. Industrial Chemistry	36.1%
Q29. Shipwrecks, Corrosion and Conservation	46.7%
Q30. The Biochemistry of Movement	1.5%
Q31. The Chemistry of Art	2.8%
Q32. Forensic Chemistry	12.6%
	99.7% <sup>§</sup>

Earth & Environmental Science	
Total 2005 candidature 1 127 (♂ 619 ♀ 508)	
Q28. Introduced Species & the Australian Environment	75.8%
Q29. Organic Geology – A Non-renewable Resource	6.9%
Q30. Mining and the Australian Environment	7.5%
Q31. Oceanography	9.7%
	99.9% <sup>§</sup>

Senior Science	
Total 2005 candidature 3 924 (♂ 2 296 ♀ 1 628)	
Q28. Polymers	4.0%
Q29. Preservatives and Additives	5.7%
Q30. Pharmaceuticals	13.0%
Q31. Disasters	67.2%
Q32. Space Science	9.9%
	99.8% <sup>§</sup>


**Distinction Cosmology:** Total 2005 Candidature was 28 (20 males, 8 females).  
**Science Life:** Total 2005 Candidature was 332 (195 males, 137 females).  
 (These courses are part of the total science entries.)

These tables were prepared by Robert Garner using data provided by Board of Studies, Feb 2006.

### RACI's Crystal Growing Competition

Students in K–8 are invited to grow either crystals of potash alum (potassium aluminium sulfate) or your own choice for five weeks and submit them to the RACI for judging by Friday 16 June 2006. Biggest will not necessarily be the best! All details and rules will soon be at: [www.chem.unsw.edu.au/raci/](http://www.chem.unsw.edu.au/raci/)

### ABC TV: SCIENCE PROGRAMS FOR SCHOOLS

These 15–20 minute programs are broadcast weekdays from 10.15–11.30 am. 

Science program details, dates & times are at: [www.abc.net.au/schoolstv/titlelist.htm](http://www.abc.net.au/schoolstv/titlelist.htm) and teachers' resources are at: [www.abc.net.au/schoolstv/tresources.htm](http://www.abc.net.au/schoolstv/tresources.htm)

### IEE Faraday Lecture 2006

#### *Emission Impossible – Can Technology Save the Planet*

on SBS TV in Science Week (August 2006)

CLIMATE CHANGE is the most important issue humans face. The need to address our impact on the global environment is urgent.

'Emission Impossible - Can Technology Save the Planet?' takes a fascinating look at technology that is helping us tackle climate change and make better use of Earth's precious resources.

Using a mixture of live demonstrations, video and graphics, this one-hour presentation examines how Earth regulates itself, how we

affect this equilibrium and how alternative sources of energy and efficiency improvements can redress the balance.

The Faraday lecture began in 1924 to commemorate Michael Faraday and is aimed at 14–16 year-olds. It is more than just an educational event; it provides a realistic context for the work of engineers and the fascinating world of science and technology, both now and in the future.

This lecture can be seen on SBS in August this year, or you can view it Online now at: [www.iee.org/Events/Lectrs/Faraday/2006/index.cfm](http://www.iee.org/Events/Lectrs/Faraday/2006/index.cfm) – just click on it in the 'Links' box. Click on 'Background Notes' for some great notes, classroom activities and websites to accompany the lecture.



**Past HSC Exam Questions & Answers**  
 by Odum & Garner

**Past HSC Exam Questions & Answers**  
 Biology, Chemistry, Physics, Senior Science, Earth & Environmental Science  
 All books include: *How to Achieve Success in the HSC*  
 \*\* NEW Editions will be available in 2006 \*\*

# For Success in School Certificate Science

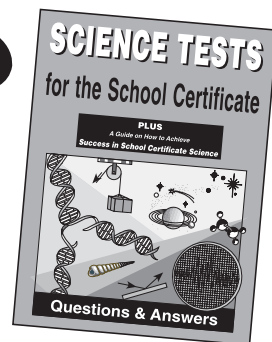
★ GET A COPY & YOUR CLASS SETS NOW ★

## ★ Science Tests for the School Certificate ★

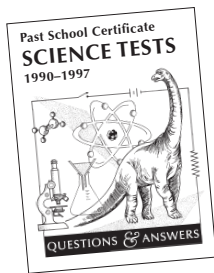
... by Catherine Odium, Robert Garner, Mitch O'Toole, Rob Mahon

- Includes a guide on **How to Achieve Success in School Certificate Science**.
- Six **comprehensive** Science Tests ... in the **correct layout** and **format** for the School Certificate Science Test
- 322 pages ... the questions cover the content and outcomes of the new 7–10 Science Syllabus
- **BONUS** section of free response questions & answers. Appendices correlate Q's to syllabus
- **Complete worked answers**, and **explanations to all MC answers**.
- Includes Glossary of Terms, and Appendices on use of the verbs from the syllabus in Science Tests.
- Students will **improve their exam technique** by **answering questions in a given time** and **writing in the space allowed**.
- These tests will provide students with excellent preparation for the actual test. This practice will develop their knowledge and assist them to accept the challenge of the Science Test with confidence and success.

ESPECIALLY WRITTEN FOR THE NEW 7–10 SYLLABUS



Price: rrp \$32.95



Price: rrp \$32.95

## ★ Past School Certificate Science Tests 1990–1997

... a great resource for practising process science questions

- Science process questions are still used ... so practise with these MC & free response questions.
- **Complete worked answers**, and **explanations to all MC answers**.
- Students can **improve exam technique** and **practise answering questions in a given time**.
- Helps your students to **learn to solve problems** logically, using scientific reasoning.
- **Process questions are still used in the current Science Tests**. This will book help your students to **learn how to answer process questions**.

BUY DIRECT from Odium & Garner & SAVE up to 20%

## Past HSC Questions & Answers

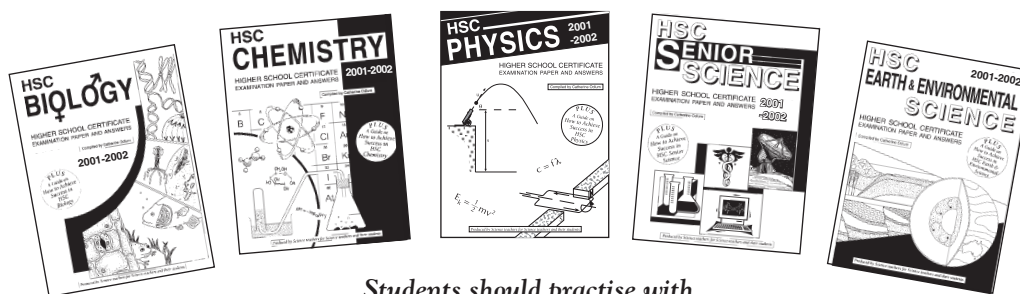


ODLUM & GARNER

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## Is water running out and our planet becoming parched?

... continued from page 1

running dry all over the world. Measures need to be put into place rapidly to prevent mass global drought and starvation.

In most places, irrigation means building dams, emptying rivers into irrigation canals, or using underground reserves. The latter method is causing great concern as it will not be quickly replaced and water tables are rapidly dropping or drying up in many places.

Proper water management practices and rain harvesting are needed as they can transform environments and provide water in a more sustainable way. Adequate rain harvesting has been shown to make water tables rise again, and dried-up streams to flow again.

Australia's natural environment reflects the effects of over 50 000 years of human management. Since the arrival of the Aborigines, their hunter-gatherer activities and use of fire have changed the environment and its flora and fauna. European settlement over the last 200 years has led to further, often very rapid, changes.

Much of Australia's agricultural land is under pressure from either loss of natural vegetation cover, over-use of irrigation water, overgrazing by introduced and native herbivores, or other impacts of introduced invasive species. Problems such as soil erosion, soil degradation, soil salinity, altered stream flow regimes, poor water quality, acidification, rising groundwater and loss of biodiversity all appear to be on the increase. Soil fertility has

declined to 33% of all agricultural land, more than offsetting the 10% improvement in fertility of the land through the use of fertilisers.

Our continent's erosion prone soils and climatic extremes have necessitated finding ways to sustainably manage our natural resources. While agricultural and pastoral activity are critical parts of our national economy, Australian landscapes are generally not well suited to many of the land use and management practices imported from other continents over the last 200 years.

Some steps being taken in Australia to reverse these problems are: comprehensive and integrated regulatory frameworks; processes to manage the use of surface and ground waters; measures to improve water quality and vegetation management, retention and protection; diversifying the commercial use of agricultural land; measures to encourage conservation and remediation; improved decision making at all levels through better access to information; and a range of community based, voluntary programs targeted at reducing land degradation.

The world will never have more water than was originally available. However, the proper management of water worldwide so that water is used more efficiently and sustainably will hopefully save us from a global disaster. □

Note: There is a fascinating article "The Parched Planet" in *NewScientist* 25 February 2006 about the problems caused by the human demand for water. It is well worth reading.

# Photo Spot **A closer look at a traffic light**

**W**hat are the white stripes in this image? Well, this is how it looks when you have a close look at an LED (light-emitting diode).

LEDs are the small lights you see all around you: the red television stand-by light, the green 'on' light of your computer or display, and in many other places where just a small indicator light is needed. However, in the last few years LEDs have become much more than just small indicator lights. A much better control of the fabrication process, new materials, and layered structures have greatly improved the efficiency of LEDs, so that they are now taking over the place of old-fashioned light bulbs.

Have a close look at traffic lights next time you stand in front of them. They are no longer just a light bulb behind coloured glass, but are now made from a hundred or so red, yellow or green LEDs. Look at the rear lights of modern cars. More and more car manufacturers are making them with LEDs because they use much less power and more importantly, they waste much less energy than heat-producing light bulbs.

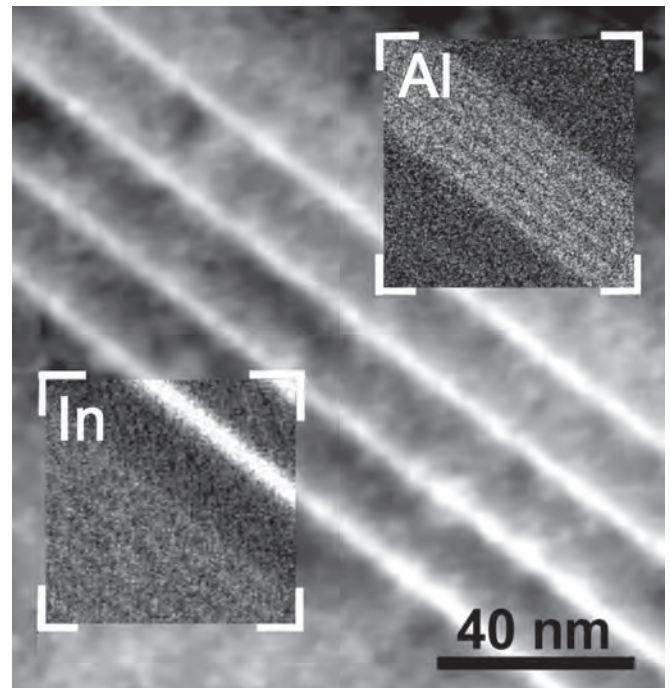
This image is a transmission electron microscope (TEM) view of a very bright, green LED, as in a traffic light. It was sliced very thinly, so it could be studied. The four bright stripes are cross-sections of four thin layers, which are less than 60 nm thick and are where all the LED light is produced. Just to indicate how small that is: a human hair is about a thousand times thicker.

This layered structure is an important reason why LEDs are so efficient. When an LED is switched on, a small current runs through it. In reality, this means that electrons are injected into it on one side, and drawn out on the other. When the electrons reach the four layers, they enter a region with much lower chemical energy. By dropping into one of these low-energy wells, their energy is released as light – in this case, as green light.

The four layers where light is produced are called 'quantum wells'. Their chemical composition determines the colour of light an LED emits. With a TEM, it is possible to study the chemistry of a specimen.

The two insets in the photo are examples of this. They map the intensity of X-rays produced in the TEM. The lower left inset shows the distribution of the element indium. It is present in high concentration (25%) in the quantum wells (which also consist of gallium and nitrogen). If the manufacturer had used less indium when making these quantum wells, the LED would emit blue light. It can be seen that a lower concentration of indium is present in a layered structure on the lower left side of the quantum wells. A similar, thinly-layered structure – but with aluminium instead of indium – is in the top right inset.

The sets of very thin layers are called 'superlattices'. There is a good reason why they are present next to the quantum wells. If the indium-rich superlattice were not there, it would not be possible to have such smooth quantum wells. This means that the lifetime of the LED is improved, since there is less chance it will fail due to a structural defect.



ABOVE: TEM view of a very bright, green LED (light-emitting diode). The insets are maps of the intensity of X-rays produced in the microscope: the lower left inset shows the distribution of indium, while the upper right shows the distribution of aluminium.

This photomicrograph & article are by Michael Bosman, Electron Microscope Unit, The University of Sydney.

The aluminium-rich superlattice is there for another reason: it slows down the electron flow. Some electrons flow through the quantum wells without releasing their energy as light. To prevent this waste of energy, a large number of electrons are blocked by the aluminium superlattice to keep them in the quantum well for a longer time. This improves the efficiency of the LED. Truly engineering on a small scale!

This great engineering on a small scale is great inspiration in the morning traffic! □

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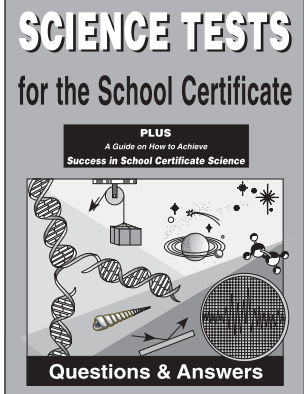
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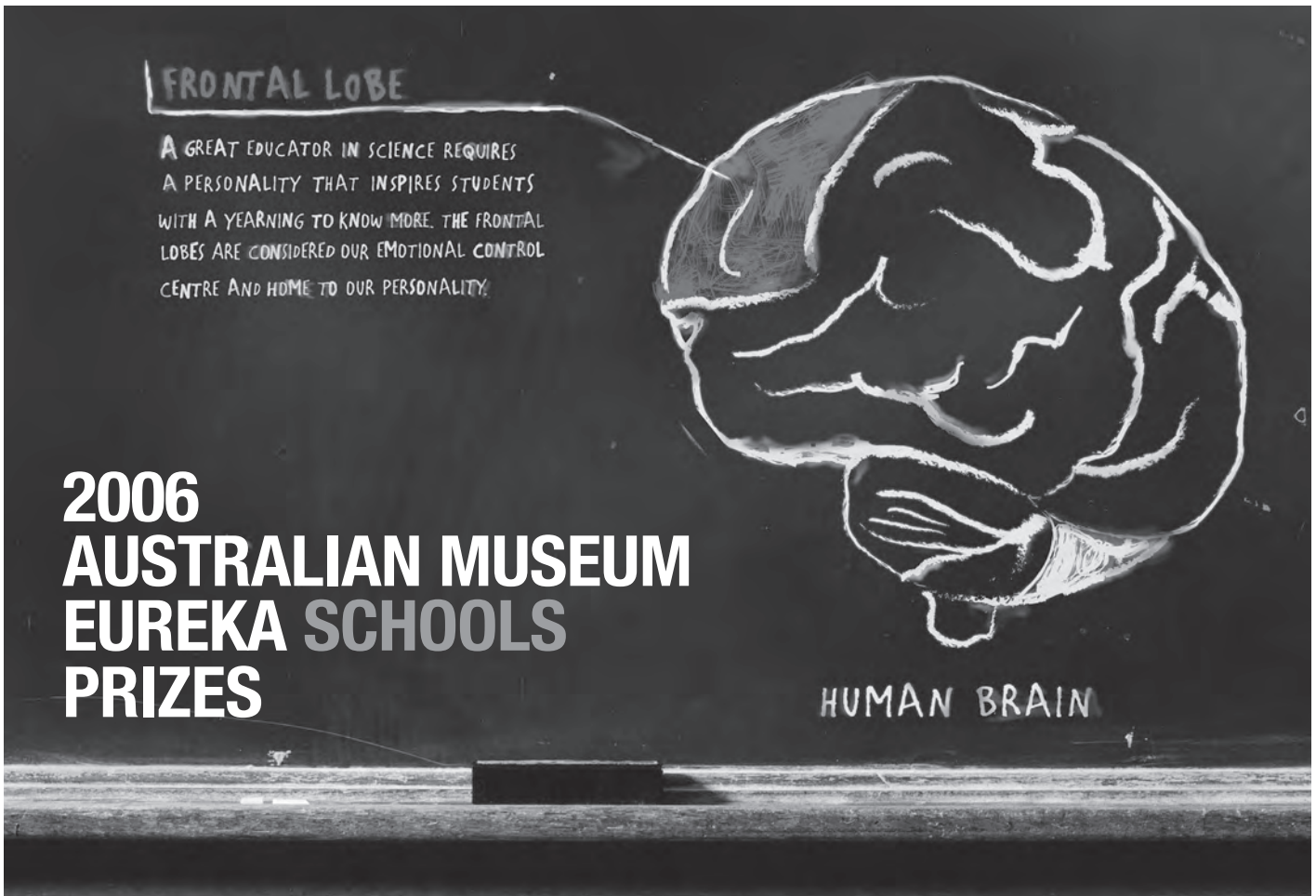
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## Back to the Moon – are we there yet?

... Don Whiteman

When NASA landed men on the Moon back in the late 60's and early 70's during the Apollo years, the world was captivated by the sheer magnificence of the event.

It was in July 1969 that humans from Earth set foot in the Sea of Tranquillity on the Moon's surface and returned safely to Earth. This was probably our greatest achievement and even now, almost 40 years later, it would be very hard to find something else to top it.

Only 12 men have walked on the Moon, as the space race was deemed to have been won. The USSR had not succeeded, as Luna-15 which was about to land and return surface samples at the same time as Apollo 11, crashed into the lunar surface. The USA flew a further six missions. Apollo 13 was the only one not to complete its mission, although it did return the astronauts safely to Earth. It has since featured in a great Hollywood film! The US congress decided there was nothing left to learn from lunar exploration and the final Apollo missions Apollo 18 and Apollo 19 were cancelled.

Times have finally changed and there are plans to return to the Moon. If humans are to explore further into the solar system, many things must first be achieved. So the plan is to first see if humans can survive living on the Moon.

The first lift off is due in October 2008 in a mission that is called Lunar Reconnaissance Orbiter (LRO). The LRO mission will orbit the Moon for at least one year at an altitude of 50 km making complete and detailed maps of the lunar surface, and measure the Moon's radiation levels. The critical part of extended stays on the Moon would be the amount of radiation to which the astronauts would be exposed.

High-resolution cameras will enable LRO to image the polar regions of the Moon for large water ice deposits that can be used as resources for future missions.

If successful, NASA hopes to be able to land humans on the Moon by 2018. NASA's preliminary plans are to send up to four astronauts in a vehicle similar to the old Apollo capsule, with a landed and command module. The command module, unlike Apollo, would remain in orbit unmanned, whilst the four crew would land and spend seven days on the surface. Instruments would be left behind and further missions would add to these instruments.

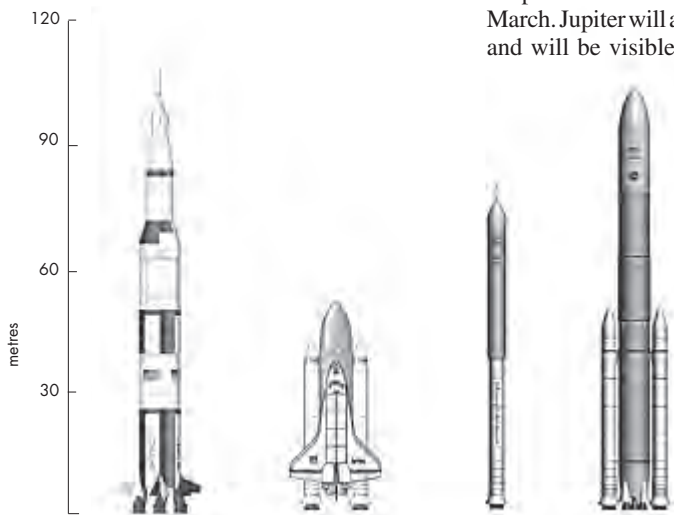


Figure 1 (from left to right): Apollo Saturn 5 Rocket, Shuttle, New Crew Vehicle, New Payload Vehicle

Thus a facility would slowly be built as the International Space Station has been.

The new lunar heavy cargo launch vehicle will use a pair of longer solid rocket boosters and five space shuttle main engines to put up to 125 metric tons in orbit. This versatile system will be used to carry cargo or put the components needed to go to the Moon and Mars into orbit. Eventually, the heavy-lift rocket could be modified to carry crew as well.

When this happens astronauts will launch on a different rocket made up of a single space shuttle solid rocket booster, with a second stage powered by a space shuttle main engine on top. This type of launch system is 10 times safer than a shuttle as there is an escape rocket on top of the capsule which could quickly blast the crew away from the rocket if a problem developed during launch. Using the single space shuttle solid rocket booster would also eliminate the problem of debris falling onto the launch vehicle during the actual launch.

The years ahead will certainly be exciting. Tomorrow's astronauts who fly these future missions are today's primary school students!

### What's coming up in the night sky?

#### Solar Eclipse

On 29 March there will be a Total Solar Eclipse beginning just near the east coast of Brazil. It will not be visible in Australia, but will probably be broadcast on the internet. Closer to the time, check at: [www.space.com/](http://www.space.com/)

#### Planets

Mercury crosses in front of the Sun during March and will become visible in the east just before sunrise from the end of March until early May when it disappears behind the Sun.

From March–May, Venus rises in the early morning and will be visible from around 3 am in the eastern sky.

Saturn, continues in retrograde motion until 5 April and will be overhead around 9 pm all March. Jupiter will also rise in the early evening and will be visible all night. If you stay out



Figure 2 (from left to right): New Payload Launch Vehicle, New Crew Launch Vehicle

until 11 pm, Jupiter will make great viewing all month. It will get earlier though as it gets closer to opposition. The bright blue star Spica (Alpha Virginis) will almost be occulted by the Moon in the early evening sky on 11 May.

In April, Mars is moving away from Earth. It will be in the Taurus constellation and will set around 9 pm most of the month.

#### Jupiter opposition, meteors and comets

Late April and May will be fun times. On 5 May, the eta Aquarids meteor shower will peak and Jupiter will be in opposition. There will be two spectacular comets bright enough for binocular viewing – Comet 73P/Schwassmann-Wachmann 3-B (set to brighten to 7th magnitude = hard binocular object) and Comet 73P/Schwassmann-Wachmann 3-C (will possibly brighten to 3rd magnitude = naked eye and great binocular object). These comets will head across the northern sky, past the bright star Arcturus in mid March, however they should brighten up as they cruise through the constellation Hercules in early May.

\*\*\*\*\*

Astronomy couldn't get much better than this.

*Enjoy the sky during autumn!*

★ **CONGRATULATIONS** ★

The two winners for the SciTalk No. 4–2005 "Astronomy Giveaway" were Lynne Henson, Keira HS and Dianne Hills, Endeavour HS. Both winners have received a copy of:

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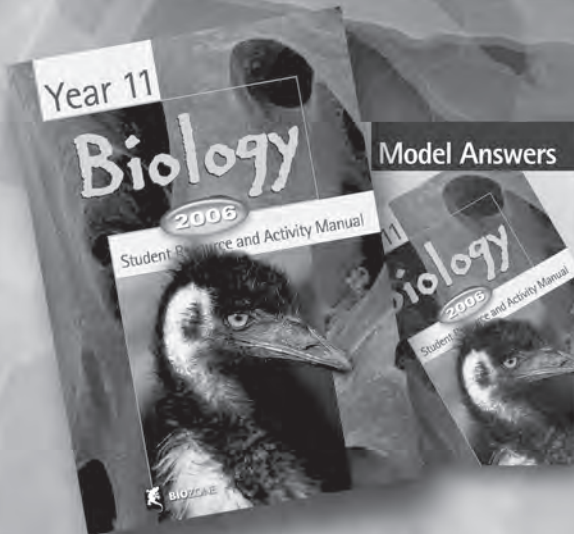
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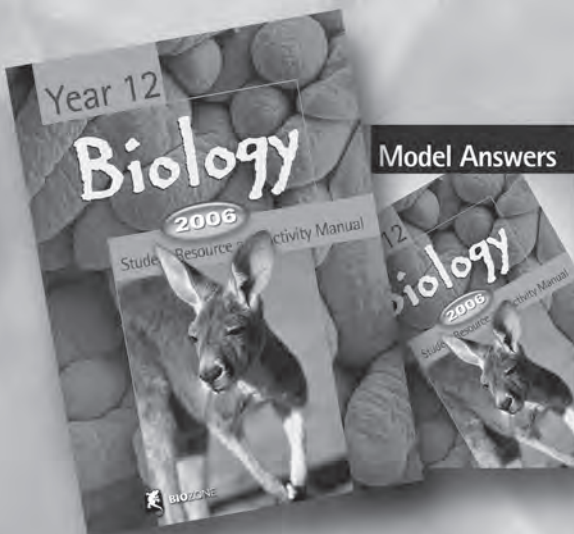
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They... membranes... colourless str... sites for photosyn... occur mainly in leaves.

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**Plasma membrane:** Located inside the cell wall in plants, 3 to 10 nm thick.

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Onion epidermal cells

Eukota cells

1. The two photographs are taken with a microscope. Identify the structures shown in each photograph.

A: Nucleus  
B: Cell wall  
C: Nucleolus  
D: Chloroplast

2. Cytoplasm

3. Describe three structures/organelles present in the Eukota cells.

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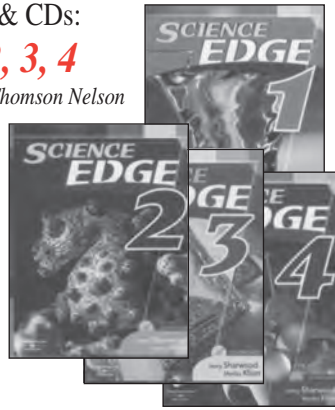


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*SciTalk 4/05 answer: Meniscus*

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#### CLOSING DATES

- *SciTalk* No. 1–February 2006 ... Jan 27
- *SciTalk* No. 2–June 2006 ... April 13
- *SciTalk* No. 3–August 2006 ... July 3
- *SciTalk* No. 4–November 2006 ... Sept 29

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