

SciTalk

ISSN 1323-7667

Number 3 – August 2004

Science on the Web

Past issues of *SciTalk* for the current year are now available on our website at:
<http://homepage.mac.com/robertgarner>

Brochures and full details for the Fun Park Excursions to Luna Park Sydney conducted by Physics is Fun are also available there.

Joint IMAX + Luna Park Sydney Fun Park Excursions

We all know that Physics is Fun ... but did we know it could be this much fun?!

A combined IMAX + Luna Park Sydney excursion is a great way to capture your students' attention and demonstrate how scientific principles are applied in practice.

You can take your students to IMAX to see either *NASCAR 3D* where they will learn about the roles that science and technology and team work play in the motor sports industry, or to *Adrenaline Rush: The Science of Risk* where they will learn about the psychological and physiological forces at play in extreme risk-taking and the physics involved in sky-diving, basejumping and parachuting. Then afterwards, you can visit Luna Park for a Fun Park Excursion.

Both excursions have comprehensive curriculum-based worksheets. More details are on page 4 of this



★ ◇ ★ ◇ ★

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

Secondary: Junior Science, Physics, Biology, Senior Science, Design & Technology
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NEW EXCURSIONS now available: Peer Support & Business Studies

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

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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 ...

Core Science 1-4 2nd Edition

Haire, Kennedy, Lofts & Evergreen



rrp \$49.95 each



The revised *Core Science 1-4* (2nd ed) textbooks, published by Jacaranda, feature the entire text, syllabus grids, learning objects to support concept development, interactive *e-tivities* for self-testing, skills spreads on data logging and databases, updated data, news articles and other stimulus material, updated information on current issues and technologies, and an interactive CD-ROM. Books 1 & 2 are out now. Books 3 & 4 should be out later this year. There will be fully editable Testmaker files in the Teacher Support Kits.

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

by 8 October 2004 to

Book Giveaway, PO Box 442, Harbord 2096

★★★

Winner for *SciTalk* 2/04

Congratulations to Fiona Hall, Pacific Hills Christian School, who won *Heinemann Biology 2nd edition* by Mudie & Brotherton, donated by Heinemann (rrp \$63.80).

Diary Dates 2004

AUGUST

- 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

- 10–16 Earth Science Week 2004. www.deh.gov.au/biodiversity/threatened/information/
- 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>
- 29 Closing date for Sustainable Living Competition 2004: national competition with more than \$30,000 prizes for environmental projects undertaken in the classroom or individually. Details: Faculty of Built Environment, UNSW, <http://www.sustainableliving.com.au/>

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 School Certificate

Monday 8 November

- *English-Literacy*: 9.20–11.30 am (includes 10 mins reading time)
- *Science*: 12.50–2.30 pm (includes 10 mins reading time)

Tuesday 9 November

- *Mathematics*: 9.25–11.30 am (includes 5 mins preparation time)
- *Australian History, Geography, Civics & Citizenship*: 12.50–3 pm (includes 10 mins reading time)

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

Past HSC Exam Questions & Answers by Odlum & Garner

Help your students do well in their HSC. The Past HSC books are available for **Biology, Chemistry, Physics, Senior Science, and Earth & Environmental Science**. These books contain the actual exams PLUS a complete set of **Blank Answer Booklets** and a guide on *How to Achieve Success in the HSC*. Make sure your students practise past HSC questions and check their answers. The Odlum & Garner books contain **CORRECT answers** (Band 6 level) for ALL questions.



Update on BOS matters

2004 SC Tests – Modifications to Layout and Instructions (BOS 39/04)

The 2004 SC will contain minor modifications to the layout and instructions. The 2003 SC tests on the website have been modified to show these changes (www.boardofstudies.nsw.edu.au/schoolcertificate/index.html)

HSC Standards Packages (BOS 11/04)

The BOS will no longer be producing these every year for each course, unless certain needs arise. Schools should have the 2001 and 2002 packages for each of the science subjects.

Stage 6 Science Syllabus Amendments will take effect in 2005 (BOS 34/04)

Reminder – the amendments to sections 12.5 and 12.7, Assessment Components, Weightings and Tasks for all Stage 6 Science syllabuses will be effective for 2005 HSC (BOS 59/03), and are at www.boardofstudies.nsw.edu.au/syllabus_hsc

All Stage 6 Science syllabuses on the BOS website will be updated in Term 4, 2004 to incorporate these amendments.

Implementation of new SC Science Syllabus (BOS 11/04)

Years 7 & 9 in 2005, and Years 8 & 10 in 2006.

Approved calculators for HSC (BOS 11/04)

These are listed on the BOS website.

Science things on the BOS website

- 2003 HSC Notes from the Marking Centre (including Marking Guidelines)
- List of Approved Scientific Calculators for use in 2004 HSC
- Science Years 7–10 Nov 2003 Syllabus with Tracked Changes to the outcomes and content of the 1998 Syllabus
- Science Years 7–10 Syllabus Mapping Grids Draft
- Equipment checklist for HSC and SC

BOS enquiries

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

Fun Park Excursions at



Luna Park Sydney is now open SO BOOK YOUR DAY NOW



These days are a great way to learn SCIENCE and have FUN at the same time (see page 7).

Worksheets are available for:

- Primary Science & Technology
- Junior Science 7–10 • Physics, Senior Science, Biology • Design & Technology
- Peer Support • Business Studies

Book your date now by ph (02) 9939 6107 or fax (02) 9939 6105 with Physics is Fun.

Year 10 Ultimate Survival Kit

- *Success in School Certificate English* ... by B & S Pattinson (\$10.95)
- *New School Certificate Mathematics* (2nd ed) ... by Sami El Hosri (\$35.95)
- *Science Tests for the School Certificate* ... by Catherine Odlum et al (\$32.95)
- *Success in School Certificate Australian History, Geography, Civics & Citizenship* ... by B & S Pattinson (\$14.95)



AVAILABLE FROM ODLUM & GARNER
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IMAX + Luna Park Sydney Joint Excursion

Come to a combined IMAX + Luna Park Sydney excursion for a great action-packed, fun time of interactive learning.

This excursions are a great way to capture your students' interest.

● IMAX NASCAR 3D

There is no doubt that science, engineering, design & technology and team work play a major role in the motor sports industry. Seeing real world applications of these subject areas in such a dynamic setting will help to capture students' attention and encourage them to want to learn more. Student worksheets and teacher notes for *NASCAR 3D* have been prepared by Science teachers from 'Physics is Fun' for Primary & Secondary Science and Design & Technology 7–10.



● IMAX ADRENALINE RUSH: THE SCIENCE OF RISK

A thrilling visual experience, this explores the psychological and physiological forces at play in extreme risk-taking and the physics involved in sky-diving, basejumping and parachuting. The film also puts to the ultimate test the 15th century specifications of Leonardo da Vinci's first ever parachute, using modern science.

● FUN PARK EXCURSIONS AT LUNA PARK SYDNEY

Interactive, hands-on learning is a great way to put fun into your lessons. See page 7 of this *SciTalk* for more details and how to book.

COST BREAKDOWN

IMAX: \$7.50* per student.

Luna Park: \$13.50* per student on scheduled dates, or \$15.00* per student on non-scheduled dates. Flat booking fee of \$16.50*.

Free Teachers: IMAX: 1:10 all student groups.
Luna Park: 1:20 secondary / 1:10 primary.

(All prices include GST which can be claimed back as these are curriculum-based excursions.)

BOOK & PAY SEPARATELY AT EACH VENUE



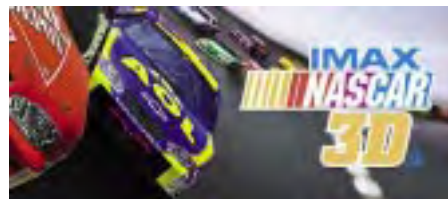
PLANNING YOUR DAY

10.00 am IMAX screening
(choose one of the two films listed)

11.00 am Bus to Luna Park

11.15 am Luna Park Visit
Finish any time ... open until 6.30 pm (or later)

Excursions at Luna Park are available on selected dates. Additional dates are available upon request and incur a small extra charge per student.



★ Success in School Certificate Science ★

Science Tests for the School Certificate

by Catherine Odlum, Robert Garner, Mitch O'Toole, Rob Mahon

This book is **ESSENTIAL** practice for Year 10 students who want **SUCCESS** in their School Certificate Science Test.

Many schools have already bought class sets, or a copy for each student in Year 10. Get it onto your Book List now!

Students who have done these questions and answers claim that they did better in the real Science Test as a result.

A complete set of answers (= Band 6) that would score full marks are included for all questions, along with clear explanations for all answers to the multiple choice questions.

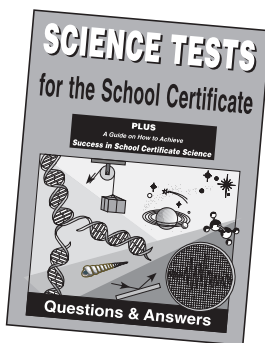
A **BONUS SECTION** with longer questions is also included.

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Price: \$32.95

For more details about this book,
or to order it ... see page 6.

ERRATA ... apologies to all!

The *Heinemann Biology 2nd Edition Student Pack* will be available by the end of Term 3 [and NOT Term 2 as in the last edition of *SciTalk*].

The correct titles of the Biology Options on the *Heinemann Biology Student CD* are: (1) Genetics: The Core Broken, (2) The Human Story, (3) Communication, and (4) Biochemistry [and NOT Biotechnology as in the last edition of *SciTalk*].

Not everyone can be famous, but everyone can be great!

... Anon

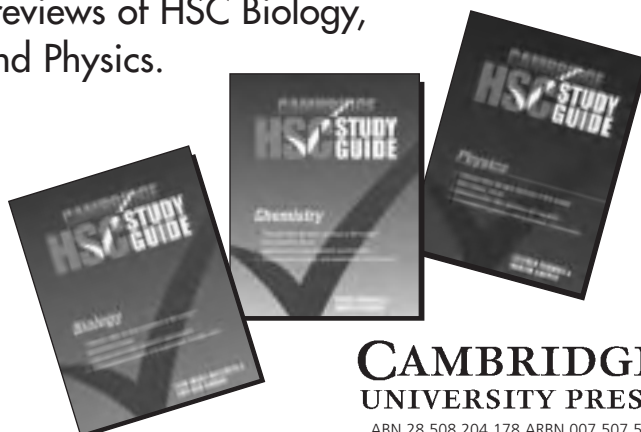
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Cambridge HSC Physics Study Guide <i>Fogwill, Cooper</i> - available Term 4	0521 545358



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Photo Spot

Nanotechnology produces beautiful 'nanosculptures'

Nano is all the rage these days, and much of that craze has been directed at zinc oxide.

Nanoscientists have found that different production techniques impart different characteristics to nanoparticles such as zinc oxide (ZnO). For example, crystalline ZnO, depending on how it is grown, can acquire a vast array of bizarre and curious shapes of many different sizes ... 'nanorods', 'nanobelts', 'nanosprings' ... in fact, ZnO is so versatile we may well be seeing 'nanoclockworks' soon.

ZnO has recently been the subject of much industrial attention, yet these photomicrographs here show how crystals of ZnO can acquire distinctly different structures of non-industrial beauty. The crystal in Figure 1 has a beauty all of its own that hovers somewhere between coral and lettuce, and Figure 2 shows a number of nanorods that have joined together to form a flower-like structure.

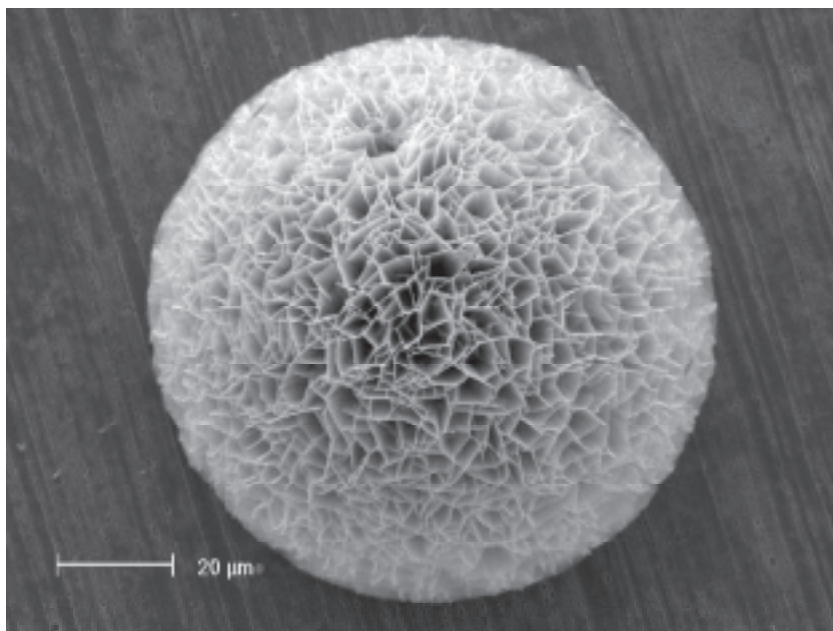


FIGURE 1 (above): ZnO crystal prepared using hydrothermal synthesis.

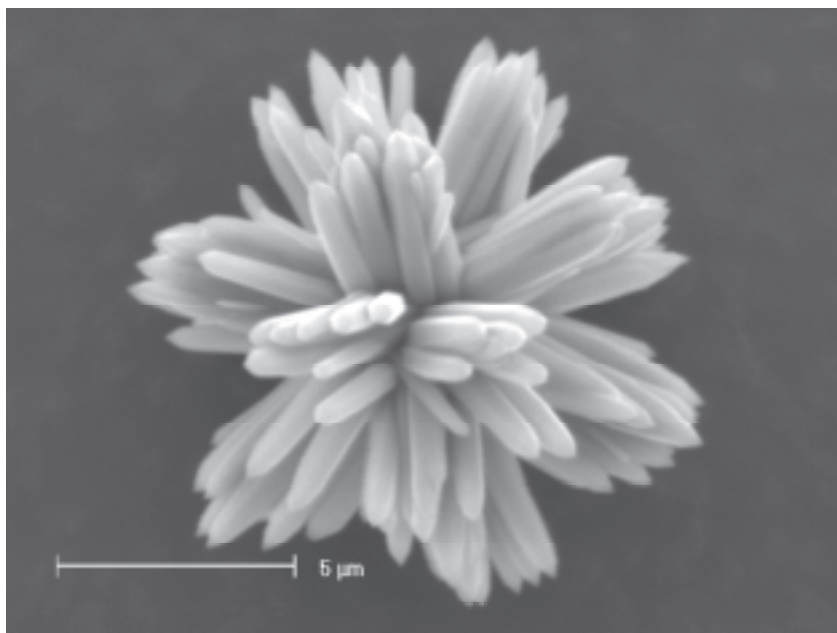


FIGURE 2 (left): ZnO crystal prepared using alkali precipitation.

These photomicrographs and article were done at the Electron Microscope Unit by Ben Fulcher, Dalibor Frtunik and Barry Tang, who are in the Talented Student Program at The University of Sydney.

Currently little is understood as to why crystal structures are so different, except that different substrates, times in an oven, concentrations, temperatures, etc all have different effects. The hydrothermal method used to produce the crystal seen in Figure 1 resulted in similar crystals which ranged from 20–200 μm in diameter, and exhibited an array of curious optical properties. The crystal in Figure 2 was produced using alkali precipitation, and ranged from 4–10 μm in size.

Both methods were wet chemical type techniques. The hydrothermal method involved using a metallic substrate and 'growing' crystals from an HMT (hexamethylenetetramine) solution onto the substrate in an oven at $\approx 100^\circ\text{C}$, while the alkali precipitation method included preparation of ZnO powder solutions at different concentrations that were heated in an 'oven' at $\approx 100^\circ\text{C}$ and precipitated. □

... BF, DF & BT

Zinc oxide nanoparticles and their uses

Zinc oxide (ZnO) can be produced as a nanoparticle. Nanoparticles, which are $<100\text{ nm}$ in size, have many different applications that depend on their properties.

ZnO nanoparticles have the ability to absorb ultraviolet light and so one use has been to incorporate them into surface coatings to provide long-term protection against UV radiation without significantly affecting optical clarity, gloss, colour or physical properties. Whether the substrate is metal (automotive clear-coats), glass (windows and architectural glazing) or polymeric (plastic sheets and building products), UV attenuation helps to prevent the degradation of the substrate or items that the substrate protects.

ZnO nanoparticles are also used in cosmetics, sunscreens and sunblocks where UV protection is required combined with a very high degree of transparency. In the past, the use of zinc oxide by the cosmetic industry has been limited due to the cosmetically unacceptable whitening that was imparted to the skin. This whitening, which is a direct function of scattered light, has been significantly reduced by using an oxide that consists of nanoparticles which have a much smaller particle size, narrow size distribution and are free of agglomerates.

ZnO nanoparticles have many other uses, e.g. in electronics, personal care, ceramic glazes, paint pigments, rubber products, paper coatings, adhesives, and anti-bacterial additives. □

... CO

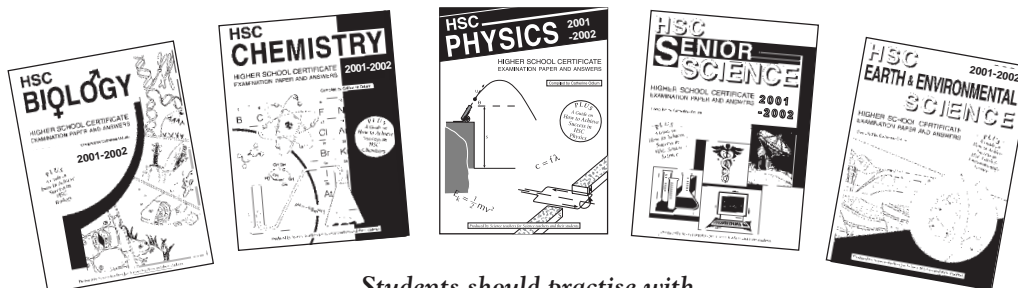


Past HSC Questions & Answers

These books include the actual exam papers and blank answer spaces/booklets!

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Top HSC students and science teachers have always used and recommended Odlum & Garner books for Past HSC Questions & Answers



Students should practise with
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Each title contains:

- a complete copy of the 2001–2002 HSC Exams **PLUS blank answer spaces for ALL questions** (incl. all MC & Options)
- complete **WORKED ANSWERS** that would gain full marks (i.e. Band 6) to **all the Core & ALL Option questions** ... with **EXPLANATIONS** for all multiple choice answers. Includes all diagrams, graphs as in the actual HSC, etc.
- Periodic Table, Data Sheet (Phys/Chem), Formulae Sheet (Phys), Geological Time Scale (E&ES).
- a comprehensive guide on **HOW TO ACHIEVE SUCCESS IN THE HSC** for each science subject This includes essential exam techniques and how to study effectively to help students maximise their marks in the HSC.
- a GLOSSARY OF EXAMINATION TERMS.

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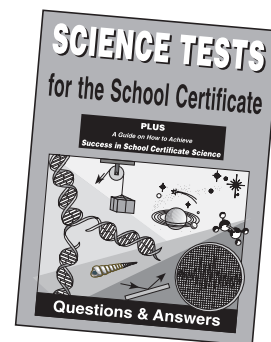
School Certificate Science Tests

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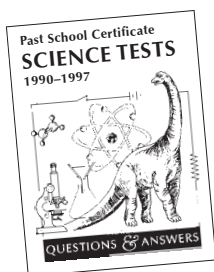
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... by Catherine Odlum, Robert Garner, Mitch O'Toole, Rob Mahon

- Includes a guide on **How to Achieve Success in School Certificate Science**.
- Six comprehensive Science Tests ... the questions cover the content and outcomes of the new 7–10 Science Syllabus.
- BONUS section of free response questions & answers.
- **Complete worked answers**, and **explanations to all MC answers**.
- Students will **improve their exam technique** by **answering questions in a given time and writing in the space allowed**.
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Produced by Science teachers for Science teachers and their students

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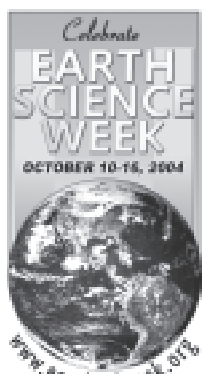
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Earth Science Week 2004: 'Living on a Restless Earth' 10–16 October, 2004

This year Earth Science Week will celebrate the theme 'Living on a Restless Earth'. This was selected to reflect how the dynamic processes of our planet affect the global community every day. For example, earthquakes rattle the islands of Japan. Volcanic activity closes resorts in Italy, and the fishing industry in Peru struggles to survive changes in ocean temperature caused by El Niño. In Florida, a sinkhole in the karst terrain causes the sudden collapse of a building. Earth scientists study dramatic phenomena such as these in order to understand their causes and minimise their impact on society. You can share your knowledge and enthusiasm about studying our dynamic Earth with others by getting involved in Earth Science Week 2004.

Earth Science Week is an international event that was begun in 1998 by the American Geological Institute (<http://www.earthsciweek.org/>) and has been organised in Australia since 1999 by Geoscience Australia* (<http://www.ga.gov.au/about/event/esw2004.jsp>). You will find some



great ideas on their websites, as well as useful material for your lessons.

There are many ways to get involved in Earth Science Week 2004 – for example, with a geoscience activity day, family activities, scientific demonstrations, photographic displays, library 'geoscience' book displays, children's earth science artwork display, science projects displays, teacher workshops, public lectures, have a guest speaker, design an Earth Science Week web page or promotional material, or go to the IMAX film, 'Forces of Nature'.

As international interest in Earth Science Week broadens, the phrase 'Think globally, act locally' is a fitting guide to shape its growth. Just as parents must nurture a growing child, geoscientists and teachers around the world must individually nurture Earth Science Week's long-term success. They must invest their energies and resources to raise public awareness and understanding of the Earth Sciences in their communities.

Earth Science Week is an opportunity for you to give students new opportunities to discover the Earth sciences, to remind people that Earth science is all around us, to encourage Earth stewardship through an understanding of Earth's processes, to highlight the contributions that the Earth sciences make to society, and to have fun!

* * * * *

* Geoscience Australia's Education Centre, in Symonston, ACT, offers curriculum linked activities for students (K–12) as well as organising and running teacher work-shops. Students will explore many aspects of geoscience through hands-on experiments and activities using scientific equipment, computers and first-class teaching materials. The Education Centre is staffed by trained educators and geoscientists who provide a unique level of professional geoscience education. Their programs can be adapted to meet special needs by arrangement. Bookings for the Earth Science Education Centre are essential, and admission is free. Enquiries: (02) 6249 9571.

Geoscience Australia was previously known as the Bureau of Mineral Resources, Geology & Geophysics, then it became Australian Geological Survey Organisation (AGSO) in 1992, and AGSO–Geoscience Australia in August 2001, and finally, Geoscience Australia in November 2001. □

FUN PARK EXCURSION

2004 DATES*

May 4, 7. June 2, 4.
August 16, 20. Sept 14, 17, 20.
Oct 22, 25, 26, 27.
Nov 1, 2, 3, 15, 16, 19, 23,
24, 26, 30. Dec 1, 2, 3, 6, 7.

*Note: Other school days
are available by arrangement.
A surcharge will apply.

OPERATING HOURS

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COST SPECIAL EDUCATION PRICES

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\$12.70*/primary student
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Teachers FREE:

1/20 secondary students
1/10 primary students
Extra teachers: \$19.00* each

* plus 10% GST (schools can
claim this back as this is a
curriculum-specific excursion).

JOINT EXCURSION WITH IMAX

Save \$\$\$ – see *IMAX Adrenaline
Rush: The Science of Risk* OR
IMAX Nascar 3D, then visit Luna
Park afterwards ... details on p4.



PHYSICS IS FUN

Fun Park Excursions

The original and best

Physics is Fun was co-authored in 1983 by Robert Garner and Sylvia Jennings and based on their earlier science excursions at Luna Park. Robert has conducted Physics is Fun since its inception ... both at Luna Park (1983–1987 and 1995) and at Wonderland Sydney (1990–2004). With the closure of Wonderland Sydney in early 2004, these Fun Park Excursions returned to Luna Park Sydney in April 2004.

Please note: Our excursion notes are only for use when on a Physics is Fun day. It is an offence under Copyright Laws to use them on any other occasion without written permission from Physics is Fun.

*A fun-filled educational day.
Hands-on learning is great fun!*

★ Book NOW – don't miss out! ★

Save \$\$\$... special DISCOUNT SCHOOL PRICES

ANY faculty can book a FUN DAY at Luna Park through Physics is Fun and save \$\$\$.

Book now, as numbers are limited to ensure that queues are minimal.

Come and join us for a fun-filled day at LUNA PARK Sydney. Curriculum-based worksheets are available. Interactive learning is a great way for your students to discover that forces, energy and motion are not so dull after all!

These excursions are presented by experienced Science teachers, to support and promote excellence in Science.

WORKSHEETS ... secondary / primary

Secondary: Junior Science, Physics, Biology, Senior Science, Design & Technology, Peer Support, Business Studies.

Primary: Science & Technology, English, & Mathematics.

ENQUIRIES/BOOKINGS

Book now by ph/fax/email, then send a deposit of \$117 (+ 10% GST) to confirm your booking and receive your worksheets.

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Physics is Fun – The original and best
ABN 54 942 891 924

Booking forms are available at:
<http://homepage.mac.com/robertgarner>

Download FREE sample pages from our web site:

www.biozone.com.au

The write-on format allows students to write their answers to questions directly on the page

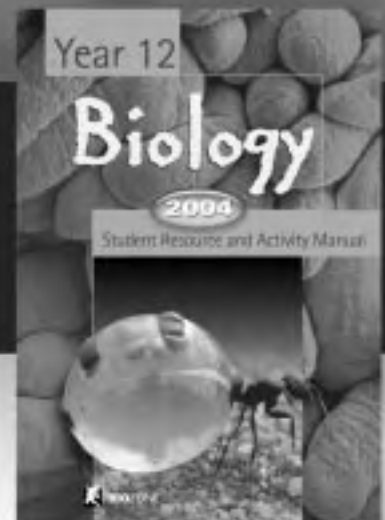


Biology

Student Resource & Activity Manuals

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GOLD FOR AUSTRALIA'S SCIENCE OLYMPIANS

The Australian Physics and Chemistry Olympiad teams have returned victorious from competing with up to 73 other nations in Pohang, South Korea and Kiel, Germany respectively in July this year. Combining their results with those of the Biology Team who competed on 'home turf' in Brisbane in July, Australia's 2004 Science medal tally was 3 Gold, 4 Silver and 5 Bronze – one of the best ever results from these Olympic Games for Science Students.

As Executive Director of the Rio Tinto Australian Science Olympiads (RTASO), Dr Colin Taylor said: "At a time when the world is focused on the Olympic Games in Athens, these Science Olympiads show that our young Australians are competitive with the world's best in mind as well as body."

Selection for the teams started last year when nearly 3 500 Year 11 students across

Australia were nominated by their teachers to sit the RTASO National Qualifying Examinations in Physics, Chemistry and Biology. 67 of these students went on to be RTASO Scholars and attended a residential training school in Canberra. The teams were selected after completing a final exam in March.

Congratulations to all the students who gained an award – their results were:

● **Physics:** 12th/73 countries **35th International Physics Olympiad**

2 Gold Medals – Matthew Pinson (Cowra HS, NSW) & David Wang (James Ruse Ag HS, NSW); 1 Bronze Medal – Tom Grujic (Lilydale HS, VIC) & Simon Kheifets (Narrabundah College, ACT); 1 Hon Mention – Marc Schubert (Daramalan College, ACT).

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● **Chemistry:** 15th/62 countries **36th International Chemistry Olympiad**

1 Gold Medal – David Allen (Trinity College, WA); 1 Silver Medal – Ying Xiao (St Peters College, SA); 2 Bronze Medals – Harry Yan (James Ruse Ag HS, NSW), & Nithin Iyer (Sydney Grammar School, NSW).

● **Biology:** 9th/43 countries **15th International Biology Olympiad**

3 Silver Medals – Patricia Illing (Carey Baptist Grammar, VIC), Anna Wang (Sydney GHS NSW), Alisa Sedghifar (University HS, VIC); 1 Bronze Medal – Gabrielle Josling (MacRobertson GHS, VIC).

For more information about the Science Olympiads, go to: www.rtaso.org.au/
Enquiries: ph (02) 6125 9645

Biology meets industry – genomics, proteomics, phenomics

The entry of information technology and robotics into the biology laboratory is opening the door to new ways of studying cell biology – the 'omics'.

The Australian Academy of Science's 'Nova: Science in the News' website (<http://www.science.org.au/nova>) has the latest information on the 'omics in their new topic: 'Biology meets industry – genomics, proteomics, phenomics'.

In biology, the suffix -omics generally refers to the study of a complete group or system of biomolecules.

Genomics is the study of a genome (the total genetic material of an individual or species), rather than the study of an individual gene. For most of the last decade, genomics, especially the Human Genome Project, have never been far from the headlines. However, even before the announcement in February 2001 that the sequencing of the human genome had been completed, the principles and technologies which had enabled this

impressive achievement were being turned to the study of other areas of cell biology.

Just as genomics is the study of an organism's genome, **proteomics** is the study of an organism's entire complement of proteins. While the genome may be the blueprint for an organism, proteins are the structural and functional molecules required by virtually all life processes. Therefore, to truly understand how an organism functions we need to understand more than just its genome – we need to understand its proteome.

Phenomics is the name given to the science which attempts to integrate the information provided by all these areas of study into a holistic picture of the complete organism – its phenotype. As researchers focus on more and different groups of molecules, more 'omics will become part of the biological language.

* * * * *

As well as the many potential benefits from this research, there are also some serious

social issues that will emerge as a result of this new technology.

For example, the ability to accurately predict a person's individual risk of disease with an easy genetic test raises the prospect of health insurance companies insisting on such tests before issuing a policy – and even refusing to cover those who have a heightened genetic risk for say, heart disease or breast cancer.

Another problem is that personalised medicine and targeted drug treatments are currently very expensive. Many patients will be unable to afford such treatments on their own, and governments are already faced with difficult choices about which life-saving or life-improving drugs they can afford to subsidise.

More information about this topic is on the 'Nova: Science in the News' website and includes a glossary; student activities; further reading; and annotated links to relevant websites.

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Rings and things

The planet Saturn has been in the news quite a bit lately and will be again over the coming months with the spacecraft that is orbiting the ringed planet. Cassini-Huygens is the name of the mission to Saturn. But who or what is Cassini-Huygens?

Gian Domenico Cassini

8 June 1625–14 Sept 1712

An Italian by birth, Cassini became a French citizen in 1673. Cassini was an astronomer who studied the Sun at first, then turned his attentions to the planets when he obtained a larger telescope. He is well known because he discovered the dark gap between the A and B Rings of Saturn (1675), later named the Cassini Division. During his lifetime he observed many different comets.

In 1665–66, he determined the rotation periods of Jupiter and Mars with remarkable accuracy, observed the phases of Venus, and discovered the oblateness of Jupiter. He joined the Académie Royale des Sciences in 1669 and became director of the Paris Observatory in 1671. He collaborated with Christiaan Huygens in many astronomical projects. He discovered four of Saturn's moons: Iapetus (1671), Rhea (1672), Tethys (1684), and Dione (1684). In 1672, he measured the distance of Mars by triangulation with the help of observations by Jean Richer. This enabled him to refine the dimensions of the Solar System, i.e. determine the value of the astronomical unit (AU). His value was just 7% short.

In 1683 he determined that zodiacal light was cosmic in origin, not meteorological as previously thought, and correctly assumed that it was an effect of a cloud or aura of small particles surrounding the Sun. In 1693 he formulated 3 laws about lunar orbits, the first of which explains why we only see the same face of the Moon from Earth. Cassini was also considered an expert in hydraulics and engineering and did many experiments in these areas.



Figure 1 – Gian Cassini

Christiaan Huygens

14 April 1629–8 July 1695

Huygens was a Dutch physicist, mathematician, astronomer, and inventor. In 1654, Huygens, with his brother, devised a new and

better way of grinding and polishing lenses, and was thus able to improve the telescope. He discovered how to construct lenses with a large focal length and invented the achromatic eye piece for telescopes. As a result, he resolved numerous astronomical questions, discovered Titan and was the first to correctly identify the presence of Saturn's rings. He also discovered the stellar components of the Great Orion Nebula.

Huygens developed the balance wheel and spring assembly used in wrist watches and which kept them in time, and invented the pendulum as a regulator of clocks. The southern constellation Horologium (meaning 'clock') was named after his invention of the pendulum.

Huygens deduced the laws of reflection and refraction, and was the leading proponent of the wave theory of light. He said that all points of a wave front of light in a vacuum or transparent medium may be regarded as new sources of wavelets that expand in every direction at a rate depending on their velocities. He made important contributions to mechanics, stating that in a collision between bodies, neither loses nor gains 'motion' (his term for momentum).

As a mathematician he wrote many papers and was held in high regard by many mathematicians of the day such as Gottfried Leibniz and Blaise Pascal. He also met with Isaac Newton despite having his own theory on gravity.



Figure 2 – Christiaan Huygens

Cassini-Huygens mission to Saturn

With the history of Cassini's and Huygens' involvement with Saturn, it was only fitting that the current mission to study Saturn, its ring system and Titan should be named in honour of these two brilliant scientists

The Cassini-Huygens spacecraft was launched from Kennedy Space Centre on 15 October 1997 to begin its seven year journey to Saturn. The spacecraft locked into orbit around Saturn on 1 July 2004 to begin observations of the planet, its rings, and a



Figure 3 – Image of Saturn taken by the Hubble Space telescope [Source: NASA/JPL]

number of its 31 icy moons such as Phoebe, Enceladus, Hyperion, Dione, Rhea and Iapetus. Scientists hope to measure Saturn's huge magnetosphere, and study the gas giant's composition and atmosphere.

The Cassini orbiter will orbit Saturn and its moons for four years, while the Huygens probe will detach from it in December 2004 and begin its 21 day journey down to Titan, the largest of Saturn's moons and the second-largest moon in the Solar System. It will perform a study of the clouds and atmosphere of Titan, and will study the surface if it survives landing on Titan. Both Cassini and Huygens will send data and images back to Earth's scientists to study. Scientists are intrigued by Titan as it is the only other body in the Solar System, other than Earth, that has a nitrogen-based atmosphere.

The Cassini-Huygens mission to Saturn is a joint project of NASA, ESA and the Italian Space Agency and 17 nations contributed to building it. There was much concern when this mission was being launched as the spacecraft uses nuclear batteries to ensure they last the lifetime of the mission. It then travelled for years without anything in the press, however as it got closer



Figure 4 – Cassini-Huygens spacecraft before launching [Source: NASA/JPL]

to Saturn it began sending back images of unbelievable resolution of the ringed planet and as it approached its orbital distance from the planet the rings and cloud bands themselves revealed more details.

Members of the public were invited via a NASA website to register their name that would be on a DVD that would be sent with the mission. This author has his name currently orbiting the ringed planet approximately 1.4 billion km from Earth.

You can get more information, images and mission updates from NASA's website:

<http://saturn.jpl.nasa.gov/home/index.cfm>

* * * * *

What's coming up in the night sky

Saturn will return to our pre-dawn skies in October and rises before midnight for most of November. In December it will rise during twilight. So as we keep up-to-date on the Cassini-Huygens mission on the internet, we can also see the Saturn itself through our telescopes. This will be the major event for the remainder of the year.

The Orionids meteor shower will peak on 21 October. This is a reasonably favourable time as it falls on the first quarter Moon phase and the Moon will be out of the way by the time that the shower begins. The Orionids are typically fast, short meteors, however a



Figure 5 – DVD with over 616 000 signatures

[Source: NASA/JPL]

good percentage of them display long persistent trains. The Orionids are associated with Comet Halley. Earth passes through the tail of Comet Halley twice a year and so both the Orionids and the Eta Aquarids six months earlier usually are good showers.

The Geminids meteor shower will peak on 13 December. This year that is the day after new moon and we should get a very good shower. This has been in the past one of the most reliable displays for southern observers.

... Don Whiteman

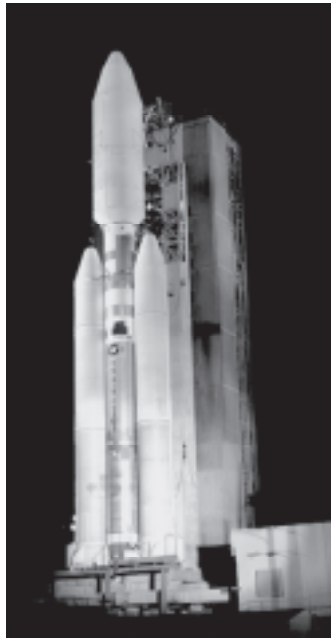


Figure 5 – The Titan IV-B/Centaur vehicle carrying the Cassini-Huygens spacecraft - waiting on the launch pad [Source: NASA/JPL]

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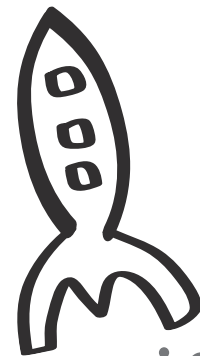
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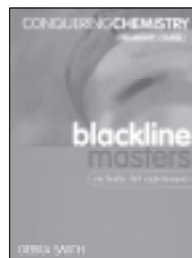
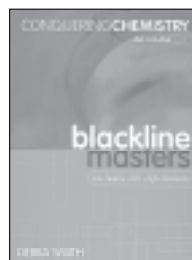
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Please pass *SciTalk* on to all Science teachers at your school so they can benefit from it – or put it up on your notice board for reference.

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- *SciTalk* No. 3–August 2004 ... July 2
- *SciTalk* No. 4–November 2004 ... Sept 24

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There were 268 teams of three entered from schools across NSW at 14 venues. Venues were located across the State from Lismore to Wollongong and from Broken Hill to Newcastle.

The results this year were again strong, with 53 teams achieving an excellent performance (i.e. scores of less than 100). In this competition, like golf, the lower the score the better the result.

Congratulations to the following competitors whose scores were all below 10:

- *Equal 1st place:* Newcastle Grammar, and Shore;
- *3rd place:* Shore;
- *4th place:* Shore;
- *5th place:* Fort St HS;
- *Equal*

6th place: St Luke's Grammar, Sydney Technical HS, Georges River College (Oatley campus).

28 teams have been selected to compete in the National Competition in September. Some of these teams will compete at the Sydney finals held at the UNSW on 11 September, 2004.

Alasdair Hey, the competition organiser, was very pleased with this year's results, saying "Students continue to excel in this competition, demonstrating valuable chemistry skills, while having a great time."

For further information about the Titration Competition, contact Alasdair Hey by email: ajhey@ozonline.com.au, ph/fax (02) 9601 1021, or post: POB 282 Georges Hall 2198. □

