

SciTalk

ISSN 1323-7667

Number 1 – February 2005

2005: Einstein International Year of Physics

It is not often that an entire year is devoted to science. The United Nations has declared 2005 the International Year of Physics. It marks the 100th anniversary of theoretical physicist Albert Einstein's 'miraculous year' in which he wrote three of his most famous scientific papers that have since influenced all of modern physics – on Brownian motion, the photoelectric effect and special relativity. Australians are joining the celebration and calling our one the 'Einstein International Year of Physics'.

Einstein (1879–1955) changed the 20th century. The first paper provided an explanation for how the temperature of objects is caused



by the vibrations of atoms. His second introduced the idea of light as both particle and wave. The third and most famous paper outlined his theory of relativity that led to $E = mc^2$ and all that followed.

Before 1905, physicists understood how objects behaved when moving at slow speeds. Einstein showed that objects moving very close to the speed of light, about 300 000 kilometres per second, behave in strange ways. He showed that as you get closer and closer to the speed of light, time slows down and your mass increases.

... continued on page 2

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

PRIZES TO WIN!

See pages 1, 3, 8 & 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.

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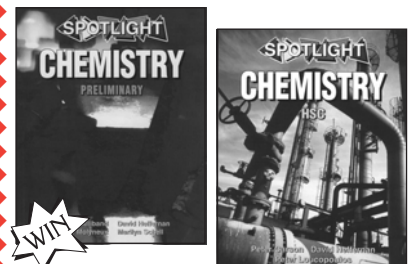
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Book Giveaway

You could WIN these books & CD ...

Spotlight Chemistry Preliminary • HSC

HSC: Carson, Heffernan, Loucopoulos
Prelim: Alliband, Heffernan, Molyneux, Schell



RRP: Prelim \$42.95, HSC \$47.95.
Teachers' Resource CD: \$79.95

These NEW texts & CD published by Science Press closely follow the current Stage 6 Chemistry Syllabus and cover all the required core theory and first hand investigations, and the 3 most popular HSC Options. They will provide your students with a broad and contemporary understanding of chemistry and prepare them well for their HSC Chemistry examination.

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

by 11 April 2005 to

Book Giveaway, PO Box 442, Harbord 2096

★★★

Winner for SciTalk 4/04

Congratulations to Anne Mason, Young High, who won the Physics in Context (2nd ed) Preliminary and HSC books & CDs by Wiecek et al, donated by Oxford Uni Press (rrp \$44.95ea).

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



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



Enquiries/bookings: (02) 9939 6107. See p6.

Why not focus on physics by coming to Sydney Observatory for International Year of Physics?

Teacher's Champagne Viewing & Preview: 3 March 6–9pm

View 3D Space Theatre show, *After Stars: Blackholes, Pulsars and Aliens*, latest about science education, a planetarium show in improved Starlab Fibre-Arc planetarium & telescope viewing (weather permitting). Free to teachers (max 5/school). RSVP: 1/3/05.

"Einstein for beginners": 6 April, 6–9pm.

Special Einstein night for Year 11/12 Physics students/teachers: with multimedia animations & demonstrations of Einstein's concepts. Includes viewing stars, Saturn & Jupiter (if weather permits), plus refreshment. Cost: \$15.

Einstein Extravaganza Weekend: 9–10 July 10 am–4 pm. Cost: \$6 adults, \$4 child

This weekend of science activities will include telescope viewing, rocket launching, and the 3D Space Theatre program.



SYDNEY OBSERVATORY
PART OF THE POWERHOUSE MUSEUM

www.sydneyobservatory.com.au/education
Bookings essential: (02) 9217 0485

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Diary Dates 2005

Einstein International Year of Physics

FEBRUARY 2005

26 Powerhouse Museum Teachers' Family Open Day: 10 am–3 pm, free entry to regular exhibitions, 20% discount to Lord of the Rings exhibition, free sausage sizzle 11–1 pm

MARCH 2005

various dates Shell Questacon Science Circus: Armidale, Casino, Glen Innes, Gunnedah, Inverell, Moree, Narrabri, Tamworth, Tenterfield, Walgett. www.questacon.edu.au/html/on_the_road.html
 4 Schools' Clean Up Australia Day. Ph: 1800 282 329. Details. www.cleanup.com.au
 6–13 Seaweed 2005. Details, Resources, Competitions at: www.mesa.edu.au/seaweed2005/ "Marine Pests & Threats" at: www.ausmepa.org.au AND www.marineteachers.org.au/news.asp?id=151
 13 Faraday Lecture: 'SoundFX—making music with technology', SBSTV, 10.30 am ... see p12
 14, 18 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
 20 International Earth Day. <http://www.earthday.net/> & www.earthsite.org/

APRIL 2005

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

MAY 2005

2, 6 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
 4–6 Science at the Shine Dome. Australian Academy of Science awards for teachers to attend this symposium – application in by 11/3/05. Enquiries: www.science.org.au/sats2005/ta.htm

JUNE 2005

3, 6 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
 various RACI Nyholm Youth Lectures. Yrs 10–12. Two lectures: 'What Gas Am I?' & 'Green chemistry: not different, just smarter.' Details: www.chem.unsw.edu.au/raci/ny2003.htm

JULY 2005

4–7 CONASTA 54: *Science Education Unplugged*. VIC. www.conferences.unimelb.edu.au/conasta54
 13–16 International Science School: Yr 11 & 12 students, Uni of Syd. Details on page 4
 23–30 National Chemistry Week. <http://www.raci.org.au/national/events/chemistryweek.html>
 28 National Chemistry Quiz. Enquiries: A/P Charles Fogliani, cfogliani@csu.edu.au

AUGUST 2005

5 Jeans for Genes Day. Enquiries: CMRI, 1800 677 260, at <http://www.jeans4genes.com.au/>
 13–21 National Science Week: Theme is *Energy–Future Challenges*. <http://scienceweek.info.au/>
 19, 22 National Science Week: Physics is Fun at Luna Park. <http://homepage.mac.com/robertgarner>
 13–21 Australian Science Festival, ACT. School Activities: 17/8–19/8. www.sciencefestival.com.au
 24 Physics Olympiad National Qualifying Exam. Closing date: 29 July. (02) 6125 9645
 31 Biology Olympiad National Qualifying Exam. Closing date: 29 July. (02) 6125 9645

SEPTEMBER 2005

7 National Threatened Species Day. www.deh.gov.au/biodiversity/threatened/information/
 7 Chemistry Olympiad National Qualifying Exam. Closing date: 29 July. (02) 6125 9645
 13, 19 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

OCTOBER 2005

9–15 Earth Science Week 2005. <http://www.earthsciweek.org/>
 21, 24, 25 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
 26, 31 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

NOVEMBER 2005

1, 4, 14, 15, 18 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
 22, 23, 25, 28, 30 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

DECEMBER 2005

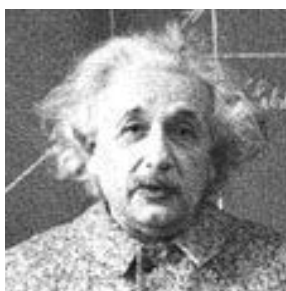
1, 2, 6, 7 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

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.

Einstein International Year of Physics 2005 (... continued from page 1)

In 1916 Einstein extended relativity to a General Theory that worked in places with a strong gravity. Successful predictions based on this theory made Einstein famous.

The name Einstein has become a word describing a person of very high intelligence. His face is also one of the most recognised the world over. This popularity has resulted in the use of Einstein in advertising, including registration of Albert



Einstein as a trademark. To honour Einstein a unit in photochemistry is the 'einstein', there is an element named 'einsteinium' (At. no. 99), and the asteroid '2001 Einstein'.

Imagine what physics will do for the world in the 21st century. Physics is helping us to understand and change the world today – from modelling climate change in an attempt to determine the fate of our planet, to creating new ways of



Update on BOS matters

REMINDER: Stage 6 Science Syllabuses Amendments are for 2005 (refer to BOS 34/04) All amended Stage 6 Science syllabuses are now on website.

REMINDER: New SC Science Syllabus implementation (refer to BOS 11/04) Yrs 7 & 9: 2005, and Yrs 8 & 10: 2006

HSC Assessment in a Standards-Referenced Framework - A Guide to Best Practice (Nov 2003) A 32-page booklet to assist in designing and implementing good policies and procedures for HSC Assessment Programs, and to evaluate the effectiveness of current practices. It builds on earlier documents: HSC Assessment Checklist (1998), HSC Assessment a Guide to Developing Procedures in Schools (1997), and The New HSC Assessment Support Document (1999).

Past HSC exams and SC Science Test papers are available on the internet to view/download.

2005 HSC Notes from the HSC Marking Centre (including **Marking Guidelines**) At the time of printing *SciTalk*, these had not yet appeared for the various HSC science subjects, but should be there soon.

BOS enquiries

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

Fun Park Excursions



SPECIAL PRICES FOR SCHOOLS through Physics is Fun!



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

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

Worksheets are available for:

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

NATIONAL SCIENCE WEEK DATES
 19 and 22 August 2005

Book your date now by ph (02) 9939 6107.

harnessing solar energy, to the nanotechnology revolution which is transforming our lives as machines get smaller and smaller.

During 2005, the Australian Institute of Physics (AIP) website will have a host of physics things to do. For information about events, to get AIP's online newsletter, links to organisations with ideas/activities, to register an event, go to: www.einstein2005.org.au □



The University of Sydney

“Waves of the future”

33rd Professor Harry Messel International Science School for year 11 & 12 Science students

3–16 July 2005 at The University of Sydney

Applications close Thursday 7 April 2005

Application forms will be available from mid-February 2005 at: www.scienceschool.usyd.edu.au

In July 2005, 140 students from across Australia and around the world will gather at the University of Sydney's School of Physics for 2 weeks of cutting-edge science. Waves of the Future will include daily lectures from world-leading scientists on topics ranging from the physics of beaches to psycho-acoustics, from the minute world revealed by electron microscopes, to the monsters lurking in the heart of galaxies!

ISS scholars will also participate in other activities — experiments, museums, lab tours, a harbour cruise — all designed to enthuse and excite their scientific curiosity.

All scholars are competitively selected at State level, and attendance is by scholarship only. Scholarships are valued at approximately \$2 000 and cover return travel within Australia, board and accommodation at Women's College for the duration of the School, all events and activities organised by the Science Foundation for Physics and a copy of the official ISS book of lectures.

For more information contact: Dr Chris Stewart
ph (02) 9351 3622, fax (02) 9351 7726,
email scifound@physics.usyd.edu.au
or visit www.scienceschool.usyd.edu.au

RACI NSW SCHOOLS TITRATION COMPETITION

DATES – Metro Sydney, Wollongong Uni, UNSW: 17/18 June 2005; Regional venues: tba



The NSW Schools Titration Competition is a quantitative analytical competition open to students in years 11 or 12. Organised by the Chemical Education Group of the Royal Australian Chemical Institute (RACI), it is run at several Sydney venues and various NSW regional centres. Entry costs \$21/team (GST exempt).

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.

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 will be invited to the National

Competition on 10 September 2005 at the UNSW. 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 could be used to satisfy 1.5 hours of practical experience and contribute to Chem. Syllabus outcomes: P2, P10, P12 & H12[12.2(a),(b),12.4(b)].

Go to www.nswtitration.com for more information/entry forms, or contact Alasdair Hey by email: ajhey@nswtitration.com, ph/fax (02) 9601 1021, or post: POB 282 Georges Hall 2198. **Closing date is 6 May 2005.**

2004 National Competition:

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

119 teams from across Australia took part in this **National Competition**. Of the top 29 scores, NSW achieved 13 places – with the top 9 results being achieved by Shore (3rd, 8th, 13th, 14th), Wilyama HS (5th), Christian Brothers HS Sydney (7th), Sydney Tech HS (18th), St Lukes' Grammar (21st), and Georges River College (22nd).

The **de Miklouho-Maclay Prize** for excellence in Chemistry went to Brian Hayne (Shore) who achieved a perfect score!

Congratulations to these competitors!

JOINT EXCURSION: IMAX + PHYSICS IS FUN AT LUNA PARK SYDNEY

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

These excursions are a great way to capture your students' interest and demonstrate science or D&T theory in practice.

● YOUR CHOICE OF IMAX FILM

Go to www.imax.com.au/schooltimetables to select the IMAX film you want to see before your visit to Luna Park Sydney. Student worksheets and teacher notes are available for many of the IMAX films.

● IMAX NASCAR 3D (Terms 1 & 2 only)

This film demonstrates how science, engineering, design & technology and team work play a major role in the motor sports industry. Student worksheets and teachers' notes are available for junior science and D&T.



● FUN PARK EXCURSION AT LUNA PARK

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: \$8.50* per student.

Luna Park: \$17* per student on scheduled dates, or \$18* per student on non-scheduled dates. Flat booking fee of \$16.50*.

Free Teachers: IMAX: 1:10 all student groups.

Luna Park: 1:15 secondary/1:8 primary students.

(*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 (any IMAX film)

11.00 am Bus to Luna Park Sydney

11.15 am Luna Park Sydney visit

Finish any time – Luna Park is open until 6 pm

* Excursions at Luna Park are available on selected dates. Additional dates are available upon request and incur a small surcharge.

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 17th June 2005. Biggest will not necessarily be the best! Details are at: www.chem.unsw.edu.au/raci/natchem.html#anchor66305

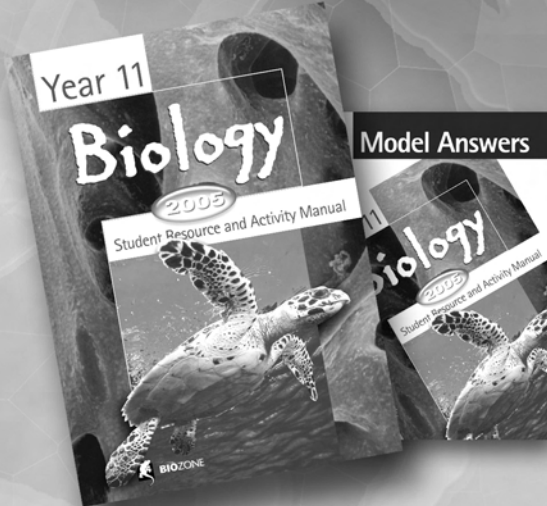
Australian sharks dying for their fins

Killing sharks for their fins is wasteful, as the carcasses often have little or no economic value. It is comparable to killing an elephant for its tusks or a rhinoceros for its horns – tragic, wasteful and inhumane. Yet the desire to eat shark fin soup continues in Asian culture. Shark fins, which constitute less than 2% of the animal, can fetch more than \$100/kg and so it is understandable that fishermen want to target sharks. However, this unsustainable practice is threatening the future of sharks across northern Australia. Sharks are extremely important ecologically as they are apex predators. A threat to the survival of sharks also threatens the functioning of marine ecosystems.

[From: Waves Vol 10 No 3 2004]

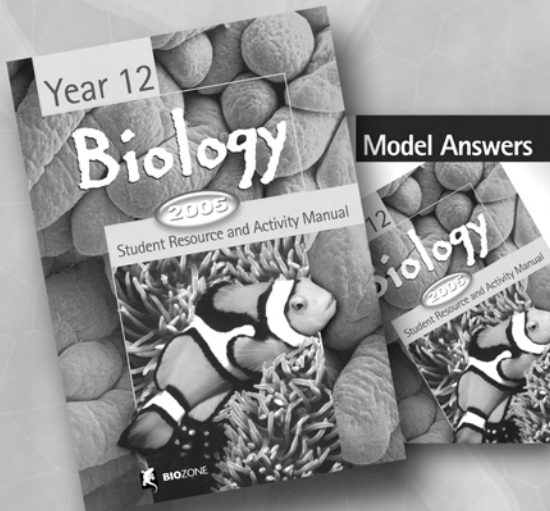
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www.biozone.com.au



Year 11 Biology
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Model Answers
ISBN: 1-877329-33-9



Year 12 Biology
ISBN: 1-877329-32-0

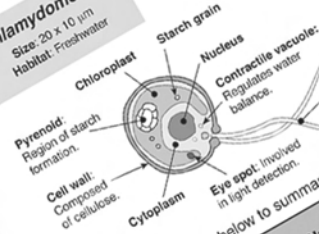
Model Answers
ISBN: 1-877329-34-7



Teacher Resource Handbook
ISBN: 1-877329-35-5

Pellicle: A flexible structure lying within the plasma membrane. It allows the cell to change its shape.

Chlamydomonas
Size: 20 x 10 µm
Habitat: Freshwater



Oral groove: Lies to the base of the oral groove where food vacuoles form.

Food: C of bac smar

1. Fill in the table below to summarise differences in some of the features of the organisms shown above.

Organism	Nutrition	Movement
Amoeba	Heterotrophic. Food ingested by phagocytosis & digested in vacuoles.	By pseudo (cytoplasmic) movement.
Paramecium	Heterotrophic. Food taken into food groove and digested in vacuoles.	By cilia.
Euglena	Autotrophic; heterotrophic when light deprived.	By flagella.
Chlamydomonas	Autotrophic	By flagella.

2. List the four organisms shown above in order of increasing complexity: Amoeba, Paramecium, Euglena, Chlamydomonas.

3. Suggest why an autotroph would be more difficult to grow in a laboratory than a heterotroph.

Biology

STUDENT WORKBOOKS

Year 11 and Year 12 Biology:

Recommended Retail Price: **\$38.50**
Student Discount Price*: **\$22.95**

Model Answers: \$7.70

Teacher Resource Handbook: \$59.95
(on CD-ROM)

* The *student discount price* (40% off the school purchase price) is only available for a minimum purchase quantity of 5 or more manuals. Please contact us and we will fax or mail you our order form. **First time customers must use our order form.**

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School Certificate Science Tests

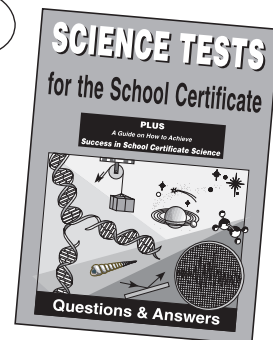
★ IT'S TIME TO GET YOUR CLASS SETS NOW ★

★ Science Tests for the School Certificate

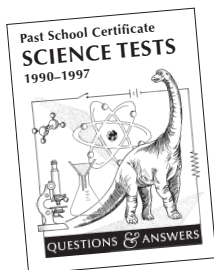
... by Catherine Odium, Robert Garner, Mitch O'Toole, Rob Mahon

ESPECIALLY WRITTEN FOR THE
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Price: \$29.95

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- **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**.

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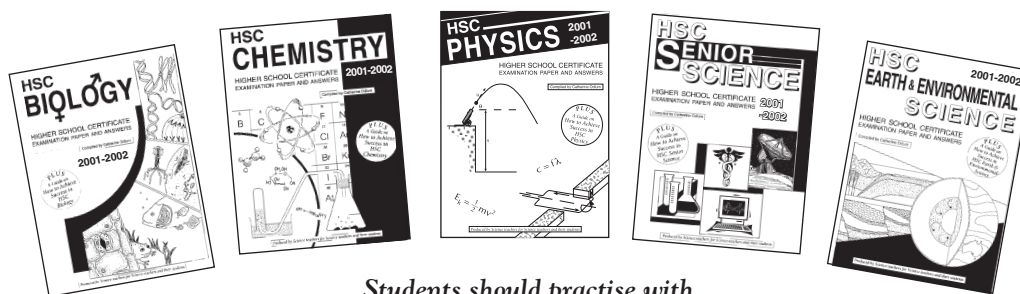


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- complete **WORKED ANSWERS** that would gain full marks (i.e. Band 6) to **all the Core & ALL Option questions** ... with **EXPLANATIONS for all multiple choice answers**. Includes all diagrams, graphs as in the actual HSC, etc.
- Periodic Table, 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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- Senior Science & EES ... \$24.95 ea
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POSTAGE: Sydney/Wollongong/Central Coast: 1-14 books...\$6.50, 15-28...\$12, 29+...\$17. ACT/NSW country: 1-2 books...\$6.50, 3-10...\$10, 11-20...\$15, 21-30...\$22

★ ALSO AVAILABLE FROM BOOKSHOPS ★

FUN PARK EXCURSION

2005 DATES*

Mar 14, 18. April 4. May 2, 6.
June 3, 6. Aug 19, 22. Sept 13,
19. Oct 21, 24, 25, 26, 31. Nov
1, 4, 14, 15, 18, 22, 23, 25, 28,
30. Dec 1, 2, 6, 7.

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

TIME 11 am–6 pm

**COST SPECIAL EDUCATION PRICES
THROUGH PHYSICS IS FUN**

2005: \$15.50* / student
plus \$17* booking fee / school
Teachers **FREE:**
1/15 secondary students
1/8 primary students
Entry to Luna Park is free. If you
want extra teacher ride tickets,
these are \$19.00* each.

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

JOINT EXCURSION WITH IMAX

Save \$\$\$ – see an IMAX film of
your choice, 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 booked through Physics is Fun.
It is an offence under Copyright Laws to use them on
any other occasion without written permission from

A fun-filled day.

Hands-on learning is great fun!

★ Book NOW – don't miss out! ★

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for this is available on our website**

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**ANY faculty can book a FUN DAY OR an
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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 learning is 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; Art; Peer
Support; or Business Studies.

Primary: Science & Technology, English, &
Mathematics; Art; or Peer Support.

ENQUIRIES/BOOKINGS

Book now by ph/fax/email, then send a deposit
of \$100 (+ 10% GST) to confirm your booking
and receive your worksheets.

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**BOOKING FORMS & 2005 DATES are at:
<http://homepage.mac.com/robertgarner>**



BHP BILLITON

SCIENCE AWARDS

**What are your students entering in the
2005 BHP Billiton Science Awards?**

**Have YOU thought of entering the
2005 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 innovative research
projects using thorough scientific procedure.

These prestigious awards, sponsored and
managed by BHP Billiton since 1981, are run
in conjunction with CSIRO.

There are three separate competitions: BHP
Science Student Awards, BHP Science Teacher
Awards, and BHP School of the Year Award.

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

Entry is free. **Closing date** is Friday 1 July
2005.

★ ◆ ★ ◆ ★

ENQUIRIES:

<http://scienceawards.bhpbilliton.com>



BHP Billiton Science Awards
GPO Box 86A,
Melbourne 3001



bhpbilliton

2004 Science Award Winners

STUDENT AWARDS

The 2004 winners were all from NSW:

- **Biology and Microbiology**
Marcus Cannon and Simeon Cannon
(Redeemer Baptist, NSW) for their work on
Deep Vein Thrombosis (DVT).
- **Chemistry and Biochemistry**
Derrick Roberts (Newington, NSW) for his
investigation of the effectiveness of Dietary
supplements.
- **Environmental and Earth Science**
Andrew Stewart, Karabar Dist Ed Ctre, NSW,
for his further investigation of how a common
wetland plant consumes nutrients from water
that could otherwise lead to algal blooms.
- **Physics, Engineering and Technology**
Robert Stewart, Karabar Dist Ed Ctre, NSW
for devising a fire-detection system using
ordinary PET bottles (as used for soft drinks).

TEACHER AWARDS

2004 Teacher Winners from NSW/ACT

Secondary: Jeanette Rothapfel (Maitland
HS) for her programs, including 'Science in
Space', which teaches many areas of science
using space-based activities.

Highly Commended – Kerry Ayre, St
Joseph's Catholic High. **Merit** – Raimund
Pohl, Cheltenham Girls High.

SCHOOL AWARD

The 2004 BHP School of the Year Award
went to Marshall Rd State School, Qld. □

ABC TV SCIENCE PROGRAMS FOR SCHOOLS



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

Program details, schedule dates and times are
at www.abc.net.au/schoolstv/titlelist.htm and
there are teachers' resources for some shows
at www.abc.net.au/schoolstv/tresources.htm

Programs in 2005, their starting & repeat dates:

- **Hazards Disasters & Survival:** 14/02 & 17/2/05
- **Science Bank:** 16/02/05 (last run)
Demonstrations of science experiments that
are often difficult to do in the classroom.
- **Scientific Eye:** 17/02/05 & 28/4/05 (last run)
8 episodes show science as an investigative
discipline & link 'real' science to class work.
- **Atoms Alive:** 17/02/05 & 23/6/05
Biomolecules, DNA (functioning, repli-
cation, mutations, technology) and genetic
issues, and how only four types of building
blocks create many different organisms.
- **World Environmental Changes:**
22/3/05 & 10/5/05 (last run)
Case studies (on Wetlands, The Sea,
Cities, Forests, Drylands) that look at the
impact of humans on the environment, its
consequences and possible solutions.
- **Salinity:** 30/03/05 & 25/5/05
- **Pathways to Australian Science:** 30/03/05
(last run)
- **Our Earth:** 01/06/05
- **Vital Systems:** 23/06/05

A 6-part series on the human body's major
systems and how they work together. □

Photo Spot

Phase transition in structure of olivine

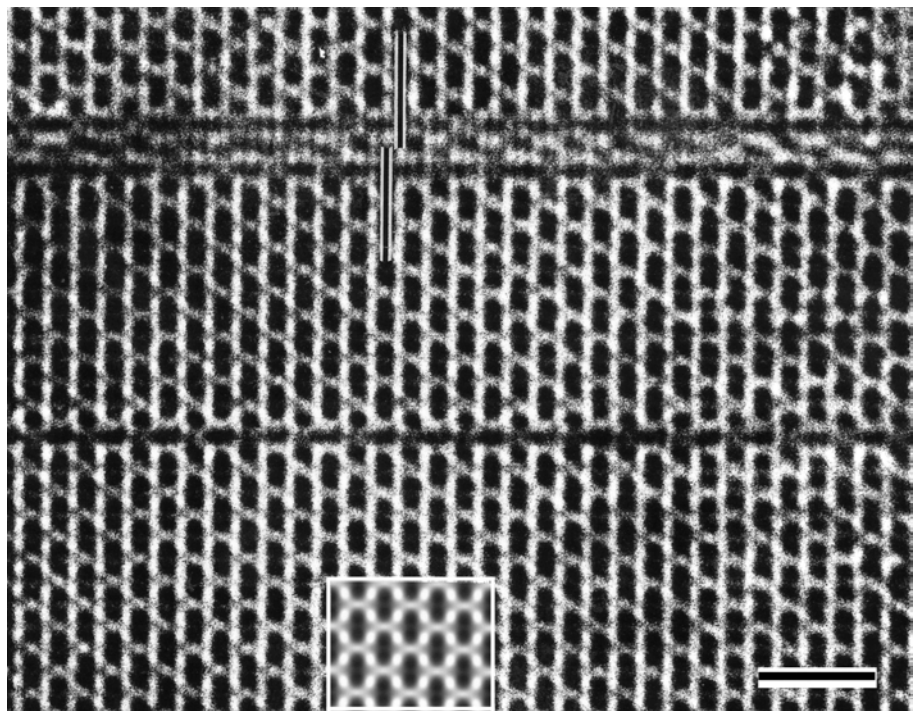
Olivine is a rock-forming mineral found in basic igneous rocks such as basalt, gabbro and peridotite. Sometimes it forms dunite, a rock composed solely of olivine.

Olivines are magnesium iron silicates ($(Mg, Fe)_2SiO_4$) in which the proportion of Mg and Fe varies. Sometimes the silicon (Si) is replaced with germanium (Ge), and/or the Mg or Fe are replaced with manganese (Mn).

Geoscientists study minerals such as olivine to gain an understanding of the behaviour of minerals in the mantle of the Earth. Olivine undergoes a phase change when subjected to conditions of both high temperature and pressure. It changes from its normal orthorhombic structure to a cubic structure. Scientists are interested in this phase transformation because of its importance in understanding the Earth's mantle dynamics and the origin of deep-focus earthquakes.

This photomicrograph shows an olivine, Mg_2GeO_4 that was synthesised in the laboratory. This was used to ensure that the exact chemical composition was known. This olivine was subjected to a pressure of 6 Gpa at 600°C to produce a phase change. The photomicrograph was taken in an HRTEM (high resolution transmission electron microscope). The image you see here has been magnified approximately 14 million times! This puts into perspective just how small atomic structure is!

Each dark spot (which are elongated) represent two Ge atoms. We can almost see two separate Ge atoms in some parts of the image. Most of the photomicrograph shows olivine's normal orthorhombic structure. The two dark horizontal bands near the top and across the



Phase changes in the structure of olivine when subjected to high pressure and temperature. Taken by Dr Zongwen Liu, Electron Microscope Unit, The University of Sydney

middle show olivine which has undergone a phase change to a cubic structure.

The white box inserted at the bottom centre of the photomicrograph is a simulation of how the orthorhombic olivine structure should appear. Such computer generated images require lengthy calculations. If the computer generated image and the 'real' image match,

then, and only then, can scientists be sure how to interpret what is actually being seen in an HRTEM. This HRTEM image matches very closely to the simulation which confirms that the photomicrograph is in fact showing mainly orthorhombic olivine and that under conditions of high temperature and pressure some of the crystal structure has been altered. □

WIN a book ...

Irresistible Forces

Australian Women in Science

by Claire Hooker

Claire Hooker brings to life stories of women scientists' experiences, from colonial times to today. She shows how women have played a significant role in Australian science over the years.



rrp \$34.95 each

This inspiring book also shows how women have left their mark on the development of science as well as the advancement of women in Australia. It describes how women have created careers in diverse fields in a predominantly male domain and become leaders in their field.

★ ★ ★

TO WIN: Send in your name, address, ph. no. & school on an envelope by 11 April 2005 to: **Win a Book, PO Box 442, Harbord 2096**

New geological period

A new geological period, the Ediacaran Period (beginning 610–635 million years ago and ending 543 million years ago) now exists. This period was formally adopted in March 2004 by the International Union of Geological Sciences.

It directly precedes the Cambrian and is the first stratigraphically defined new period of any sort to be added since 1891 when Williams divided the Carboniferous Period into two (Mississippian and Pennsylvanian).

The reference point on which a new period is based, the Global Stratotype and Point (GSSP), is an event recorded in a single section of rock outcropping. For the Ediacaran Period, the GSSP lies at the base of a texturally and chemically distinctive carbonate layer that overlies glaciogenic rocks in an exposure along Enorama Creek in the Ediacara Hills in the Flinders Ranges (near Brachina Gorge), South Australia. The period's end coincides with the beginning of the Cambrian Period, which is defined by its own GSSP found in Newfoundland, Canada. The name Ediacara is of Australian Aboriginal origin and refers to a place where water is present. Geologists were able to use carbon isotope trends and palaeomagnetic evidence to help define the beginning and end of this new period.

Up until the Ediacaran Period, only microbial fossils have been found. The term 'Ediacaran' refers to an assemblage of fossils of the first soft-bodied marine organisms. These marine invertebrate fossils were first discovered in 1946 by South Australian geologist, Reg Sprigg. They are unique and differentiate this time from younger time periods. □

21 senses & communication

A range of senses are involved in detecting a range of stimuli from our external environment, some of which are useful for communication. It was once thought that there were five senses, but new ways of probing the brain are changing this view. There are now thought to be at least 21 senses – the boundaries between them are blurred, e.g. if you stretch out your arms while your eyes are shut, you know where they are, and can wiggle your fingers. One of your senses enable this and it is not sight, hearing, touch, smell or taste! Should vision be considered as one sense (light), two (light+colour) or even four senses (light, red, green, blue). How do blind people 'see' and do realistic colour paintings?

This is from a set of articles in *NewScientist* 29/1/05 (pp 29–43). If you are teaching the HSC Biology Option: 'Communication' then these articles are a 'must read'. □

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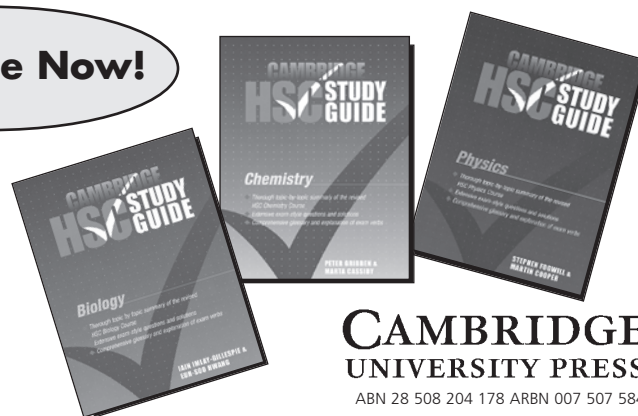
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HSC statistics: Entries for science courses and options at the 2004 HSC

The total number of entries for the HSC Science courses* in 2004 was 38 669 and the total number of HSC entries for the 2004 HSC was 66 279. So science entries were 58.3% of the total entries.

In 2003, there were 36 569 Science entries, 56.5% of the total. In 2002, the 36 178 HSC Science entries were 55.8% of the total entries. In 2001, the 36 372 HSC Science entries were 58% of the total HSC entries. The numbers in Science courses were 40 010 in 2000, 41 249 in 1999, and 40 462 in 1998.

The percentage of science entries has not varied greatly since 1998, but is still much lower than the peak of 54 414 in 1992 which was 90.8% of the total candidature that year[#].

The pattern of options presented at the 2004 HSC for each Science course is given as a percentage in the following tables.

Biology		
Total 2004 candidature	12 980 (♂ 4 673 ♀ 8 307)	
Q28. Communication		55.3%
Q29. Biotechnology		6.6%
Q30. Genetics: The Code Broken?		21.3%
Q31. The Human Story		16.1%
Q32. Biochemistry		0.7%
		100.0%

Physics		
Total 2004 candidature	10 114 (♂ 7 471 ♀ 2 643)	
Q28. Geophysics		1.2%
Q29. Medical Physics		23.9%
Q30. Astrophysics		27.1%
Q31. From Quanta to Quarks		44.9%
Q32. The Age of Silicon		2.9%
		100.0%

* 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 2004 candidature	10 146 (♂ 5 399 ♀ 4 747)
Q28. Industrial Chemistry	33.9%
Q29. Shipwrecks, Corrosion and Conservation	50.7%
Q30. The Biochemistry of Movement	1.7%
Q31. The Chemistry of Art	2.9%
Q32. Forensic Chemistry	10.8%
	100.0%

Earth & Environmental Science	
Total 2004 candidature	1 106 (♂ 597 ♀ 509)
Q28. Introduced Species & the Australian Environment	76.3%
Q29. Organic Geology – A Non-renewable Resource	11.1%
Q30. Mining and the Australian Environment	4.4%
Q31. Oceanography	8.3%
	100.1%

Senior Science	
Total 2004 candidature	3 992 (♂ 2 294 ♀ 1 698)
Q28. Polymers	5.1%
Q29. Preservatives and Additives	5.1%
Q30. Pharmaceuticals	17.2%
Q31. Disasters	64.9%
Q32. Space Science	7.6%
	99.9%

Distinction Cosmology: Total 2004 Candidature was 19 (14 males, 5 females).
Science Life: Total 2004 Candidature was 312 (176 males, 136 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 2004.

Never ruin an apology with an excuse.
 ... Kimberly Johnson

It is better to know some of the questions than all of the answers.
 ... James Thurber



One eye can see much more than two

Last *SciTalk* we looked at choosing binoculars. This time, we are looking at astronomical telescopes. A telescope is 'an instrument for seeing faraway things as though nearby' ... according to the patent application of October 1608. This article gives some sound advice on choosing a telescope to use.

A brief history of the telescope

The first telescope was invented by the Dutch spectacle maker, Hans Lippershey, in 1608. This was a tube with a convex lens at the front end and a concave lens in the rear end where you would look through. It magnified objects about 3x. The refractor telescope was born.

However, it was first brought to the attention of scientific world at large by a Genoan named Galileo in 1609 when he turned it to the stars and planets. Galileo observed that Jupiter was not a star, but a planet with four satellites orbiting it.

So why use a telescope?

The human eye, even when fully dilated to 7 mm and under dark skies can see to a limiting magnitude of 6.5. A 20 cm telescope can see a star down to 14 magnitude or 380 000 times fainter than the human eye can. Each magnitude is 2.5x fainter than the previous magnitude.

A telescope even of modest size will enable us to see craters on the Moon, Saturn's rings and the four Galilean moons of Jupiter.

What should I look for when buying a telescope?

There are many things to consider. The following lists these in order of importance.

- **Aperture**

A telescope's main function is to gather light. The amount of detail that can be resolved in a telescope is dependant on the size of its aperture. All telescopes have either a primary lens or mirror (called the objective). The light gathering power is proportional to the objective's surface area, and not its diameter, e.g. a mirror with 20 cm diameter has 4x the light gathering capacity to a 10 cm diameter one.

- **Telescope Types**

Refracting telescopes – these are what most people think of when the mind's eye seeks a telescope. They are so called because they refract light, that is, as the light passes through the glass lens it is refracted (bends) toward the foci (where the light rays meet). Such telescopes are expensive.

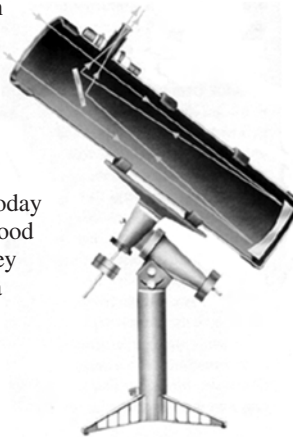


Reflecting telescopes – the concept of a reflecting telescope was suggested by Scottish mathematician James Gregory in his book *Optica Promota* in 1663. Isaac Newton created

a working model of a reflecting telescope in 1668. It was 2.5 cm in diameter and had a focal length of 15 cm.

Today, this type of telescope is known as a Newtonian reflector. It contains two mirrors — a large primary mirror (normally a parabola) at the bottom of the tube and a small, flat elliptical secondary mirror near the top of the tube. Light enters the tube, is reflected by the primary mirror to the secondary mirror, and then is reflected again 90° into the eyepiece which is at the side of the tube. Originally the mirrors were made of speculum (an alloy of ~80% copper and ~20% tin) that was polished, however this tarnished very quickly.

Today, modern mirrors with silvered glass are used. Reflecting telescopes are very popular today as they offer good value for money (as they have a larger aperture than refracting telescopes for a much lower cost).



Catadioptric telescopes – these use a combination of refracting and reflecting of the light path, and also known as compound telescopes. The first was made by German astronomer Bernhard Schmidt in 1930. The Schmidt telescope was a precursor of the Schmidt-Cassegrainian telescopes that are so popular today.

This design was followed by a second type of compound telescope that was invented by Russian astronomer Dmitri Maksutov in 1944, and is also very popular.

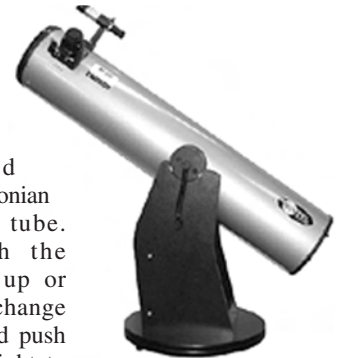


- **Telescope Mounts**

The mount is what aims and controls the telescope as it looks to the stars.

Alt-Azimuth mount – this is the simplest mount. It moves in altitude (up-down) and azimuth (left-right). In the early 1960's this design was picked up and worked on by amateur astronomer John Dobson. His alt-azimuth mount has revolutionised amateur astronomy. It is a simple dual-pivot mount

almost always combined with a Newtonian telescope tube. Just push the telescope up or down to change altitude and push it left or right to change azimuth. It is a terrific design and easy to build and use.



Equatorial mounts – because Earth moves, the stars we see appear to move, and so ideally if we could track them it would make sense. Because the Earth is basically a sphere the stars appear to move in an arc around a point known as the celestial pole. The Equatorial mount has its major axis pointed directly at the celestial pole and by moving the scope on this axis it can track the stars. This can be done manually with a small control cable or it can be motorised to run at sidereal speed. If motorised it can be used for simple photography of the stars. These mounts are good for smaller telescopes as once they get larger the mount becomes too heavy to move around and is better suited to an observatory.



Computerised GoTo Mounts – basically these are alt-azimuth mounts with a computer driving it in both axes. They require you to align the telescope with

at least two stars and then they are able to point to any object in the sky by using triangulation. They can have GPS systems in them so they are easier to set up. Computerised scopes have really come into their own with the invention of



digital photography and these days by using a simple web type camera it is possible to take photographs that were once only in the realm of major observatories. These come at a price but do offer the most expansion. The computers can be updated with new software which means that these scopes can stay up with the latest technologies.



You will notice that I have not mentioned **power**. This is the biggest mistake people make when looking for telescopes!

Avoid buying a telescope in a box that offers a magnification of 500x. Rarely do these telescopes offer good images at these powers. The useable magnification will be decided by the sky conditions on the night. No amount of power can see through clouds. It is the light collecting ability of your telescope's aperture (i.e. diameter of the primary lens or mirror) that determines what you can see, not its magnification. A larger aperture, not greater magnification, allows you to see fainter objects and determines how much colour you can see. Magnification will only make an object that you can see bigger and NOT brighter. An object will not be visible if the aperture has not been large enough in the first place to enable the object's detection.

Most amateur astronomers usually use a magnification between 50–150x.

Always seek out a reputable dealer – you wouldn't take your car to a beautician for a tune up, so a department store or internet catalogue

is not the best place to buy a telescope. There are telescope shops that specialise in these instruments – a good telescope dealer will ask you questions to determine your level of expertise and your interests, and will not try to sell you more telescope or accessories than you need. A good dealer will be very familiar with his telescopes as well as the sky – because more often than not, he will be a practising astronomer!

So in conclusion ... when choosing a telescope, first decide what you want to do with it. Then decide how much money you are prepared to spend. Choose a dealer who knows what they are talking about and can offer service and backup support when you need it.



What coming up in our skies

Don't forget the Earth's autumnal equinox is on 20 March – the Sun will rise due east and set due west and day and night will be equal.

During February–May you can easily observe the two largest planets in our solar system. So get out your sky charts and you can follow these planets. **Jupiter** will be very close to the Moon on 26 March and 22 April. It will be at opposition on 4 April and very noticeable in the east just after sunset. It will be visible until sunrise. **Saturn** will be in the northern sky in the evening and on 16 April it will be just above the Moon.

A **Penumbra Lunar Eclipse** will be visible on 24 April from the east coast of

Australia. This is where the full Moon will travel through the penumbral shadow of Earth. Low power will be the best way to observe this event.

The **eta Aquarids meteor shower** should be visible from 19 April–18 May, peaking on 5 May. This is associated with Comet Halley and is one of the better southern hemisphere meteor showers with its bright yellow colours and persistent trains.

As Autumn approaches, a different part of the Milky Way will become visible. **Orion** will be low in the west at sunset and **Scorpius** will be rising earlier each week. By winter the Milky Way's spectacular dust lanes and bright star clouds can be seen before midnight.

Enjoy the skies.
Don Whiteman

★ CONGRATULATIONS ★

The two winners for the *SciTalk No. 4-2004* "Astronomy Giveaway" were Peter Laffan, Barraba Central and Zane van den Berg, Brewarrina Central. Both winners have received a copy of:

ASTRONOMY 2005 A PRACTICAL GUIDE TO THE NIGHT SKY

by Glenn Dawes, Peter Northfield, Ken Wallace

(available from Quasar Publishing
<http://www.quasarastronomy.com.au/>
OR The Binocular & Telescope Shop)

DNA fingerprinting & testing is not infallible

Students studying DNA fingerprinting for the Biology Option 'Biotechnology' and the Chemistry Option 'Forensic Chemistry' need to be aware that DNA evidence is often touted as irrefutable, but problems exist. Even the tools can let down the scientists.

Problems can arise in the DNA analysis which involves feeding raw data into a computer which then creates a coloured graphic model for comparison. The computer software reads certain DNA characteristics as wave forms. Problems can include:

- mixtures – the DNA being used is actually a mixture of more than one person's sample
- degradation – DNA samples can degrade when aged or exposed to harsh conditions
- stutter peaks, peak height imbalance – DNA is read on an electropherogram output. Peaks indicate a certain characteristic, so irregular peaks indicate errors or mixed samples
- blobs & noise – these show as spikes on the output graph. Clumped dye blobs can mask a reading; noise shows air or other contamination is present and can cause mistaken readings
- pull-up – the analysis sometimes fails to

discriminate between dye colours, giving a mistaken reading.

Jurors in court cases generally lack enough knowledge of science to realise that DNA evidence is not infallible. Lay people do not understand the results, and so have to rely on experts to tell them what the results mean. A jury cannot tell if these 'experts' have made a mistake. So DNA evidence in a trial can go a long way towards convincing juries to return a guilty verdict – this is known as the 'white coat' syndrome.

Until recently, DNA evidence was never disputed. It is now realised though that the testing is carried out by humans, and humans err. There have already been several cases where wrong convictions have been overturned after discovering the DNA evidence was incorrect.

There are strict protocols for testing DNA, as in all forensic science. But it has been proven that things can go wrong in the extraction, handling and testing of DNA samples, especially with the contamination of samples with other DNA.

[From: The Bulletin, 1/2/05]

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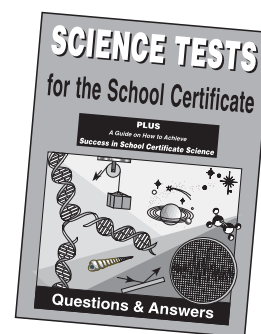
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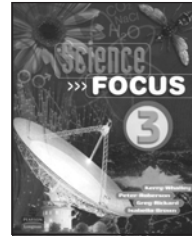
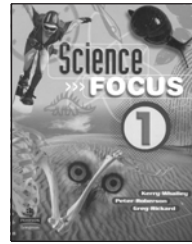
by Kerry Whalley, et al. Published & donated by Pearson Education Australia

Science Focus 1 and 3 are out now, 2 & 4 are due soon. These clear, easy-to-follow books are for NSW Science, stages 4 & 5. They address all the learning outcomes in knowledge, understanding and skills. Each chapter covers at least one prescribed focus area in detail. Many different contexts are used to show the link between science and our everyday lives. This great series includes a Coursebook (\$44 ea/\$49.95 with CD containing the book+website), Homework Book (\$12.95 ea), Companion Website, and Teachers Resource Pack (\$120 ea) at each level. There are questions, tests, revision activities, practical activities, and much, much more!

QUIZ QUESTION: What colour are copper carbonate crystals?

HOW TO ENTER: Send an answer to the Quiz Question, your name, school, address, & home ph. no. on the back of an envelope to: Competition Corner, PO Box 442 Harbord NSW 2096 – by 11 April 2005.

Winners for SciTalk 4/04: *Biology in Context: Option booklets* (\$19.95 ea), from Oxford Uni Press, were won by: Margaret St Hill (All Saints Catholic Boys), Michael Robson (Keira HS), Andrew Burn (Miller HS), Bernadette Neilson (Melville HS), & Margaret Kilham (Copland College).



Answer for SciTalk 4/04: Prion

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SciTalk

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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.

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

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From this same web page you can also download a great Pupil Information Booklet (in 5 parts) to accompany this lecture. □

CONTRIBUTIONS

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

CLOSING DATES

- *SciTalk* No. 2–June 2005 ... April 16
- *SciTalk* No. 3–August 2005 ... July 2
- *SciTalk* No. 4–November 2005 ... Sept 24
- *SciTalk* No. 1–February 2006 ... Jan 27

ADVERTISING & INSERTS

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