Providing support and promoting excellence in science education

SciTalk

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2010 – International Year of Biodiversity

Biodiversity refers to the variety of life on Earth. It is essential to sustaining the living networks and systems that provide us all with health, wealth, food, fuel and the vital services our lives depend on. Humans are part of nature's rich diversity and have the power to protect or destroy it.

Human activity is causing the diversity of life on Earth to be lost at a greatly accelerated rate. These losses are irreversible, impoverish us all and damage the life support systems we rely on every day. But we can prevent them.

2010 is the *International Year of Biodiversity*. It is a celebration of life on Earth and of the value of biodiversity for our lives. This year will be a time to reflect on our achievements to safeguard biodiversity and focus on the urgency of our challenge for the future. Now is the time to act to safeguard the variety of life on Earth. It is important that we raise our students' awareness of the need to conserve biodiversity and to generate pressure on the world's leaders to curb the unprecedented loss in biodiversity due to human activity.

This year's *Seaweek 2010* has the theme: 'Oceans of Life, Oceans to explore, ours to restore'. Australia is a marine nation. We have one of the largest ocean territories in the world and it drives our climate and weather, generates employment, provides food and resources and offers lifestyle and recreational opportunities. Australia's oceans also support a rich biodiversity. Encourage your students to explore this and ways to conserve our oceans and their biodiversity during *Seaweek 2010*.

... continued on page 11

INSIDE SCITALK ▶▶▶▶

National Curriculum progress

Details about the National Curriculum are at: *www.acara.edu.au/curriculum_development.html*. The draft Australian curriculum for Science should be available for consultation from mid-February to May 2010. It will be online and include content descriptions, achievement standards, content elaborations and some annotated work samples. Teachers will be able to provide feedback online and through state forums such as STANSW. ☐

★ NEW: 2001-2009 Past HSC Questions & Worked Solutions OUT NOW ... see p7 ★

★★ ATTENTION ★★

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

☐ 1. .....
☐ 2. .....
☐ 3. .....
☐ 4. .....
☐ 5. .....

Please return to file or noticeboard.

PRIZES TO WIN!

See pages 1, 11 & 12

Send in your entries now

(ALL IN THE ONE ENVELOPE if you prefer!)

This *SciTalk* & past issues are available at www.odlumgarner.com

Book Giveaway

WIN a copy of this book ...

WIN

Understanding Science for Years 7 & 8

Compiled by Catherine Odlum
Published by Odlum & Garner
ISBN 1 875918 08 9 RRP: $32.95

The ideal revision guide for Years 7 & 8 Science students, this book uses questions and answers to cover the essential content of the Stage 4 Science Syllabus Dot Points, skills and Prescribed Focus Areas for Years 7 & 8. It also includes a Stage 4 Science Test for students to practise their exam techniques in preparation for school-based Science tests and statewide Science Tests, such as the ESSA Test.

TO WIN: Send in your name, school & school address, on the back of an envelope **by 1 April 2010 to:** Book Giveaway, PO Box 442, Freshwater 2096

★ ★ ★

Winner for *SciTalk 4/09*

Congratulations to Chris Stevens, St Mary's Central, Wellington who won *Core Science Stage 4 and Stage 5* (rrp $72.95 ea) published by Jacaranda.

Diary Dates 2010

2010 – International Year of Biodiversity

For: Shell Questacon Science Circus 2010 program: www.questacon.edu.au/html/on_the_road.html
tba: Astronomy Open Nights & Lectures: Macquarie Uni, www.astronomy.mq.edu.au/

MARCH 2010

1–7	Seaweek 2010: Theme: 'Oceans of Life, Oceans to explore, ours to restore' www.mesa.edu.au/seaweek.asp Some resources will also be at: www.ausmepa.org.au
5	Schools' Clean Up Australia Day. Ph: 1800 282 329. Details. www.cleanup.com.au
22, 26, 29	Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
20	International Earth Day. www.earthsite.org/ [Note: 20 March is the original day, but it is celebrated on 22 April in some places: www.earthday.net/]
21	Autumn Equinox (3.32 am EST)

MAY 2010

5–7	Science at the Shine Dome conference, Australian Academy of Science: Details on Teacher Awards to attend soon at: www.science.org.au/events.sats
31	Science Teachers' Forum. Children's Medical Research Institute. www.cmri.com.au
7, 28	Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

JUNE 2010

7, 11	Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
tba	Closing date Crystal Growing Comp. www.chem.unsw.edu.au/RACI/ Ph: (02) 9663 4960
tba	NSW Schools Titration Competition. www.nswtitration.com/
21	Winter Solstice (9.28 pm EST)
23, 24	Hands-on Microscopy. Details: i.kaplin@usyd.edu.au

JULY 2010

4–7	CONASTA 59: *Celebrating Diversity – in Science, in Learning and in the Environment*. Venue: University of Technology Sydney. Details: www.conasta.edu.au/
19–24	National Chemistry Week. www.raci.org.au/national/events/chemistryweek.html
22	National Chemistry Quiz. www.raci.org.au/national/events/nationalchemistryquiz.html

AUGUST 2010

2–15	Australian Science Festival, ACT. For school Activities visit: www.sciencefestival.com.au
6	Jeans for Genes Day. www.jeansforgenes.org.au/
9, 13, 16, 20	Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
14–22	National Science Week. *Australian Biodiversity.*
13, 16, 20	National Science Week events: Physics is Fun at Luna Park. www.odlumgarner.com
23	Physics Olympiad Nat. Qualifying Exam. www.aso.edu.au/ Close date: tba. 6125 9645
26	Biology Olympiad Nat. Qualifying Exam. www.aso.edu.au/ Close date: tba. 6125 9645
31	Chemistry Olympiad Nat. Qualifying Exam. www.aso.edu.au/ Close date: tba. 6125 9645

SEPTEMBER 2010

2	Rio Tinto Big Science Competition: www.asi.edu.au
10, 13	Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
23	Spring Equinox

OCTOBER 2010

10–16	Earth Science Week. www.earthsciweek.org & www.ga.gov.au/education/events, 6249 9859
18, 22, 25, 29	Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

NOVEMBER 2010

tba	Science Teachers' Forum. Children's Medical Research Institute. www.cmri.com.au
1	Biol & Environ. Sciences Science Teachers' Workshop. Uni of Sydney. Details: tba
2 & 3	Chemistry Science Teachers' Workshop. Uni of Sydney. Details: tba
4 & 5	Physics Science Teachers' Workshop. Uni of Sydney School of Physics: www.physics.usyd.edu.au/schools_community/schools.shtml
1, 5, 15, 19	Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
22, 26, 29	Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

DECEMBER 2010

3, 10, 13	Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
22	Summer Solstice (9.38 am EST)

JANUARY 2011 National Youth Science Forum. Forms to local Rotary club by 29/5/10, interviews from July. Only for Yr 11 in 2010. Enquiries: 6125 2777, 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.

AUSTRALIAN SCIENCE FESTIVAL

The Australian Science Festival is back in 2010 celebrating the variety of life. It will be in Canberra from 2–15 August, linking its exciting program into the International year of Biodiversity. There will be over 50 Science events to learn about sustainability, climate change and the environment – details will soon be at: *http://sciencefestival.com.au*

The schools' programs (2–6, 9–13 August) will provide opportunities for your students to become captivated with the world of Science.

Update on BOS matters

Regularly check the BOS website to ensure you have the latest data – for syllabuses, past exam papers, news, Official Notices, Board Bulletins, the statistics archive & more.

Official Notices are now online ONLY

Official Notices will be effective from the date they are appear on the BOS website.

Minor amendments to 2010 Syllabuses for Senior Science, Earth & Environmental Science, Biology, Chemistry and Physics & updated Science Stage 6 Support Document

(BOS 31/09, 32/09, 33/09, 34/09, 35/09, 40/09)

A summary of the amendments, the amended Stage 6 Syllabuses and a Summary of the HSC exam specifications and assessment requirements from 2010 are in the HSC Syllabus section – as well as updated Support Documents of the BOS website.

BOS enquiries:

Ph: (02) 9367 8111, fax: (02) 9367 8484
Website: *www.boardofstudies.nsw.edu.au/*
BOS contacts for Science:
• Inspector Science, K–12 & Senior
• Assessment Officer – Science

"Most people are about as happy as they make up their minds to be."
... Abraham Lincoln

NOTE: Your purchase of the Odlum & Garner Past HSC Biology, Chemistry and Physics books helps to support the production of Past HSC books for Earth & Environmental Science and Senior Science. Thank you to all the teachers who support these projects.

OUT AND ABOUT

SHIPWRECKS, CORROSION & CONSERVATION

STAGE 6 CHEMISTRY

This program relates to the *Shipwrecks, Corrosion and Conservation* option. Students attend an AV presentation on conservation and restoration, including footage taken during the recovery of material from HMS *Bounty*. Students then participate in a hands-on workshop focusing on desalination of metal objects, metal and corrosion product identification, methods of protecting metals and rates of corrosion.

This is followed by a guided tour of shipwreck material in the museum. Students may also visit the destroyer HMAS *Vampire* and submarine HMAS *Onslow*.

The program is 4 hours, at a cost of $20.00 per student (teachers free).

Bookings & Information:

Phone: 9298 3655 Fax: 9298 3660
Email: bookings@anmm.gov.au
Location: 2 Murray Street, Darling Harbour

AUSTRALIAN NATIONAL MARITIME MUSEUM

MUSEUM OF HUMAN DISEASE

2010 EXCURSION OPTIONS

The Museum of Human Disease is a pathology museum at UNSW offering interactive programs with amazing insights into the nature and progression of disease in its many forms. We offer 2 hour curriculum-based programs in the following areas:

HSC Biology – *The Search for Better Health*

HSC Senior Science – *Bionics*

JuniorScience–*Infectious&Non-infectiousdiseases,microorganisms*

Further information and bookings:

T 02 9385 1522
E diseasemuseum@unsw.edu.au
W www.diseasemuseum.unsw.edu.au

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Our preview events will feature a special guest presentation by Ruben Meerman, also known as 'The Surfing Scientist'.

For more on the film, visit the official website:
www.ultimatewavetahiti.com

TEACHER PREVIEWS:

Sunday 21 February 10 am–12 noon

Tuesday 23 February 6 pm–8 pm

RSVP online only: *www.imax.com.au/schoolsrsvp*

Ph: (02) 9213 1600
Email: education@imax.com.au
Website: *www.imax.com.au*

SYDNEY WILDLIFE WORLD

Darling Harbour, Sydney

Sydney Wildlife World

NEW at Sydney Wildlife World, *The Last Living Dinosaur* exhibit is an expansive re-creation of a gorge in Kakadu National Park. It is the territory of the last living ruling reptile from the dinosaur era – a fearsome 5 metre crocodile, one of the largest in the world.

The brand new exhibit features:

- above and below the water viewing of the monster live croc in its mangrove habitat
- a crocodile entertainment area – watch regular interactive presentations
- a Crocodile interpretive area with a lifesize model of prehistoric crocodilian Deinosuchus and interactive displays.

Don't miss it!

Combine your visit to Sydney Wildlife World with the film *Dinosaurs Alive 3D* at IMAX theatre and SAVE!

Combine your visit to Sydney Wildlife World with Sydney Aquarium to study all of Australia's aquatic and terrestrial habitats – SAVE even more!

Phone 02 8251 7811 now to book. For more details go to *sydneywildlifeworld.myfun.com.au/* … go to *School/Education*

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University of Wollongong
Squires Way, Fairy Meadow
Only 45 mins from southern Sydney.

- ★ ***Taking bookings for 2010***
- ★ **Star Trails Outreach Program** – visiting schools with interactive Science Shows.
- ★ We have an extensive range of ***shows & exhibits***, including:
  - ***NEW EXHIBITION: The Machine***
  - **Stellar Evolution** – planetarium program for HSC Physics
  - **Superconductors & Liquid Nitrogen** – live science show
  - **Energy and Motion**
  - **The Machine and Parasites in Focus**
  - **Dinosaurs, Fossils & Coal**
- ★ School entry includes two floors of hands-on exhibits, a science show, plus a ***planetarium / laser show***.
- ★ ***Also available***: environmental field trips, science shop, kiosk, science fun bags, membership programs.
- ★ ***Book now*** for an excursion. Information/bookings: (02) 4286 5000. Website: http://sciencecentre.uow.edu.au

Science Teachers' Forum

CHILDREN'S MEDICAL RESEARCH INSTITUTE

To be held at the
Children's Medical Research Institute
Westmead, Sydney
Monday 31 May 2010
9.45 am–4.30 pm

This one-day forum will focus on the science of genetics and disease, concentrating on topics relevant to the HSC Biology syllabus.

It will include an introduction to the use of **Gene Technology** in medical research, followed by captivating presentations from two prominent CMRI scientists discussing leading edge research projects. The day will incorporate two workshops, one under the guidance of a research scientist, the other an interactive hands-on practical lab demonstration of simple DNA-based techniques. There will also be an informative session on the topic of **Genetics and Ethical Issues**.

Places will be limited, so please book by **Friday 21 May 2010**.

Contact: Debbie Brewer **(02) 9687 2800**
email: dbrewer@cmri.usyd.edu.au
Cost: $55 to cover cost of refreshments and lecture notes.

** An additional Forum will be held in November **

Science on the Web

- **Topics on NOVA: Science in the News**

www.science.org.au/nova

Maintained and updated regularly by the Australian Academy of Science, this site provides reliable and up-to-date information on many topical issues in Science. It is great for research, assignments, as well as for encouraging an interest in Science.

The following latest topics (any many more) are great for studying environmental issues, given that 2010 is the 'International Year of Biodiversity'.

- **Making our mark – ecological footprints**

Ecological footprints are being used to measure our impact on Earth and the results are not good. Humans have been changing our planet for thousands of years by clearing forests, building cities, etc. Our numbers have multiplied many times over. But we are destroying Earth's natural resources such as air, fresh water and fertile soil. In many regions of our planet, the strain is showing – water is getting scarce, forests are disappearing, deserts are spreading and fish stocks collapsing. Our pattern of life, particularly in developed countries like Australia, has become unsustainable.

- **Excuse me! The problem with methane gas**

When you ask people about greenhouse gases, chances are they will focus on carbon dioxide. But there's another, more potent gas contributing to global warming. Meet methane, the forgotten greenhouse gas.

- **Science for sustainable reefs**

Pollution, overfishing, coastal development and climate change are putting the world's coral reefs under increasing pressure. With millions of people relying on them, how can Science help make our reefs sustainable? □

- **Marsupial adaptation for living in deserts**

www.abc.net.au/science/articles/2009/11/17/2742311.htm

The fat-tailed dunnart, one of Australia's smallest and most widespread marsupials, basks in the Sun after a midday torpor – a short hibernation that some mammals can go into for a few hours each day. It is thought that combining basking with torpor can allow dunnarts to survive on a quarter of the food and water they would normally need. This helps it to survive in the desert – a strategy normally associated with 'cold-blooded' animals. □

HSC statistics: Science entries in the 2009 HSC

The total number of entries for the HSC Science courses* in 2009 was 41 020 and the total number of HSC entries for the 2009 HSC was 68 556. So Science entries were 59.8% of the total entries.

The number of HSC Science entries as a % of the total HSC entries from 1992–2009 is shown below. This % has decreased significantly from a peak of 90.8% of the total candidature in 1992# with 54 414 students doing a Science course to only 55.8% in 2002. Since then, it has hovered around 58.0%, which is much lower than in past years. The pattern of options in the various science courses for the 2009 HSC has not varied greatly, except that more Biology students are doing 'Communication' and less doing 'Human Story' than when these courses began in 2001.

Entries for HSC Science courses 1992–2009 as a percentage of the total number of HSC entries#

YR	1992	'93	'94	'95	'96	'97	'98	'99	2000	'01	'02	'03	'04	'05	'06	'07	'08	'09
%	90.8	87.7	80.1	72.0	73.8	72.3	70.2	69.9	64.1	58.0	55.8	56.5	58.3	58.4	59.4	57.9	60.5	59.8

The pattern of options presented at the 2009 HSC for each Science course is given as a percentage in the following tables.

Biology	
Total 2009 candidature 15 308 (♂ 5 810 ♀ 9 498)	
Q28. Communication	63.9%
Q29. Biotechnology	6.6%
Q30. Genetics: The Code Broken?	19.3%
Q31. The Human Story	9.3%
Q32. Biochemistry	0.3%
	99.4% §

Physics	
Total 2009 candidature 9 024 (♂ 6 759 ♀ 2 265)	
Q28. Geophysics	1.3%
Q29. Medical Physics	29.5%
Q30. Astrophysics	22.3%
Q31. From Quanta to Quarks	45.4%
Q32. The Age of Silicon	1.5%
	100.0% §

Chemistry	
Total 2009 candidature 10 041 (♂ 5 443 ♀ 4 598)	
Q28. Industrial Chemistry	43.8%
Q29. Shipwrecks, Corrosion and Conservation	37.2%
Q30. The Biochemistry of Movement	1.8%
Q31. The Chemistry of Art	4.0%
Q32. Forensic Chemistry	13.1%
	99.9% §

Earth & Environmental Science	
Total 2009 candidature 1 393 (♂ 732 ♀ 661)	
Q28. Introduced Species & the Australian Environment	81.3%
Q29. Organic Geology – A Non-renewable Resource	7.6%
Q30. Mining and the Australian Environment	2.1%
Q31. Oceanography	8.8%
	99.8% §

Senior Science	
Total 2009 candidature 4 802 (♂ 2 605 ♀ 2 197)	
Q28. Polymers	2.1%
Q29. Preservatives and Additives	6.4%
Q30. Pharmaceuticals	20.2%
Q31. Disasters	63.8%
Q32. Space Science	6.9%
	99.4% §

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

* 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 were the number of HSC entries for each subject as of October 2009. 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.

Distinction Cosmology: Total 2009 Candidature was 21 (13 males, 8 females).
Science Life: Total 2009 Candidature was 431 (256 males, 175 females).
(These courses are part of the total science entries.)

These tables were prepared by Robert Garner using data provided by Board of Studies, Jan 2010.

"Be civil to all, sociable to many, familiar with few, friend to one, enemy to none."

"Well done is better than well said."

… Benjamin Franklin

RACI NSW SCHOOLS TITRATION COMPETITION 2010

18 and 19 June … venues in Sydney and country area (tba)

The 2010 NSW Schools Titration Competition is on again. This competition is a great way for Year 11/12 chemistry students to test their quantitative analytical skills. It is organised by the NSW Chemical Education Group of the Royal Australian Chemical Institute (RACI). Students have 90 minutes to complete a set of acid-base titrations to determine the unknown concentration of a weak acid. Entry is $33/team of 3 students – with a maximum of 8 teams/school.

A team's score depends on the accuracy of each member. At each venue, each member of the winning team wins a trophy. Winning teams may then be invited to the National Competition on 18 September 2010. All students receive a Certificate of Excellence or Merit or Participation. The **de Miklouho-Maclay Prize** (certificate & $100) is awarded to the NSW student with the best overall results.

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

★ **2009 NSW Schools Titration Competition:** 36 schools achieved an Excellent award, 38 achieved a Merit award. Congratulations to:
1st: GRC Oatley Snr Campus, *2nd:* Bethlehem College Ashfield, *3rd:* All Saints Catholic Senior College

★ **2009 National Competition:** Of the top 24 scores, 8 were achieved by NSW teams: 1st (Shore), 4th place (Shore), 5th (Normanhurst BHS), 9th (OLMC, Parramatta), 11th (All Saints Catholic Senior College), 13th (St Vincent's College), 24th (Kincoppal).

★ **2009 de Miklouho-Maclay Prize** for excellence in Chemistry with the best overall result in the National Titration Competition went to Lewis Baird of Shore who achieved a near perfect score.

★ Congratulations to all these competitors!

★ **For details, entry forms, hints & tips:**
- *www.nswtitration.com*
- Email: *ajhey@nswtitration.com* • Ph: 4655 2961
- Post: PO Box 306 Camden 275 • Closing date: 7 May 2010 □

Photo Spot Perovskite crystals

Perovskite, is a calcium titanium oxide mineral species composed of calcium titanate, with the chemical formula $CaTiO_3$. This mineral was discovered in the Ural mountains of Russia by Gustav Rose in 1839 and is named after Russian mineralogist, L A von Perovski (1792-1856).

The mineral perovskite typically exhibits a crystal lattice that appears cubic, though it is actually orthorhombic in symmetry due to a slight distortion of the structure.

Perovskite is becoming increasingly important economically. It is sought after for its rare earth metal content. Often perovskite is enriched in cerium, niobium, thorium, lanthanum, neodymium and other rare earth metals. The titanium derived from perovskite is recovered as well.

Perovskite lends its name to the class of compounds that have the same type of crystal structure as $CaTiO_3$, known as the perovskite structure. Natural compounds with this structure are perovskite, loparite, and silicate perovskite.

Many ceramic perovskites exhibit a structure similar to the mineral perovskite. The characteristic chemical formula of a perovskite ceramic is ABO_3 – with the A atom exhibiting a +2 charge and the B atom exhibiting a +4 charge. The atoms of the unusual material are generally arranged so that 12 coordinated A atoms mark the corners of a cube, octahedral O ions are featured on the faces of the cube, and tetrahedral B ions are located in the centre of the structure.

Experimentation with minerals and pressure in the 1970s resulted in the discovery that many substances transform into a dense, perovskite structure when exposed to high levels of pressure. As Lin-gun Liu of the Australian National University demonstrated, for instance, the common mineral enstatite ($MgSiO_3$) can be used to synthesise a silicate perovskite. This same transformative capability is possessed by a great number of the minerals believed to comprise the Earth's interior. Thus, as Liu proposed, perovskites are possibly in large amounts within the lower mantle, where high pressure affects the lattice structures of other minerals. Based on this possibility, Liu also suggested that silicate perovskite is the most abundant mineral on Earth, estimating that it comprises about half of the planet's bulk. Hence perovskites have been of continuing interest to geologists for the clues that they may hold regarding the planet's history.

Because many perovskites may achieve impressive dielectric constants, they are well suited for use in capacitors, which are components in electric circuits that temporarily store energy. The capacity of these devices can be greatly increased through the inclusion of a solid dielectric material. Due to the fact that some ceramics are readily transformed into extremely effective dielectrics, it is estimated than more than 90% of all capacitors produced contain ceramics, such as perovskites.

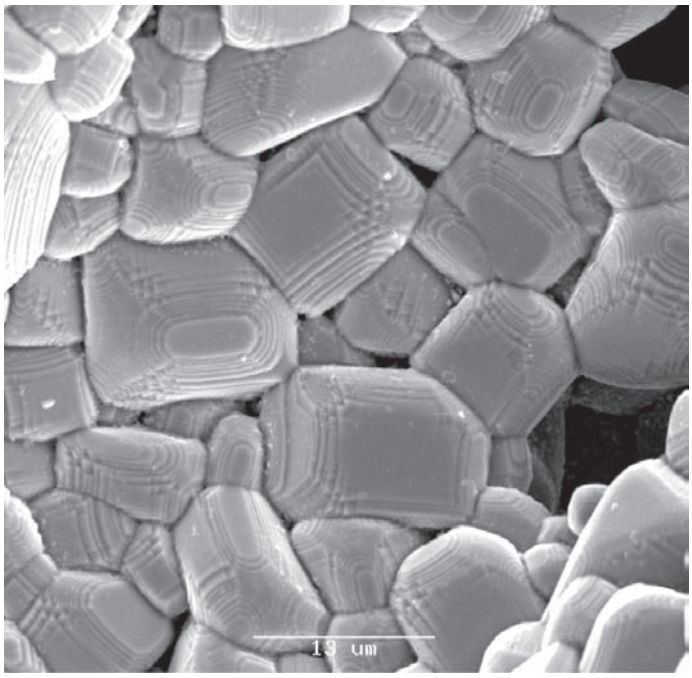

FIGURE 1 (above): 'Perovskite crystals', an SEM secondary electron image of high temperature sintered perovskite crystals.

This photomicrograph was taken by Huijin Li, ANSTO.

The discovery of perovskite superconductors revolutionised this field. Previously it had been found that the resistance of a frozen mercury rod abruptly dropped to zero when cooled to the boiling point of helium, 4.2 Kelvin. By 1987, superconductivity in perovskite materials could be induced to above 77K, the boiling point of liquid nitrogen. This significant advance made superconductors cheaper to cool to their critical temperature, since liquid nitrogen is considerably less costly than liquid helium. As of 2009, the highest critical temperature for a superconductor was 164K under high pressure and this is held by a cuprate perovskite. Many of the minor increases in the critical temperatures of ceramic superconductors at ambient temperature have stemmed from the utilisation of increasingly exotic elements in the base perovskite. □

All about snowflakes

Snowflakes are beautiful and complex. They are conglomerations of frozen ice crystals, which fall through the Earth's atmosphere. They begin as snow crystals that develop when microscopic supercooled cloud droplets freeze.

Snowflakes come in a variety of sizes and shapes – two of which are shown on the right. Complex shapes emerge as the flake moves through differing temperature and humidity regimes. Individual snowflakes are nearly unique in structure. Although it cannot be conclusively shown to be true, many scientists have studied snowflakes under a microscope and are of the opinion that no two snowflakes are alike.

Australia may not experience a large amount of snow, however these two websites will help you to answer all those questions that Science students ask so frequently:

- *www.its.caltech.edu/~atomic/snowcrystals/*
- *chemistry.about.com/od/moleculescompounds/a/snowflake.htm*

These sites provide excellent information on snowflakes … from a photo gallery, to synthetic snowflakes, to frost crystals, to the physics and chemistry of snowflakes. They answer commonly asked questions about snow, ice and snowflakes.

Then you can go to:

- *http://www.treehugger.com/galleries/2009/12/the-unbelievable-world-of-snowflakes.php*

for a great slideshow of 16 beautiful snowflakes, called 'The Unbelievable World of Snowflakes'. □

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Exam Choice is a group of teachers highly experienced in all facets of the exam process. Once again we are producing **Trial and Preliminary Science Exams** which:

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School .....

Delivery Address .....

..... **Postcode**.....

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Biology Trial	$75	
Biology Preliminary	$65	
Chemistry Trial	$75	
Chemistry Preliminary	$65	
Physics Trial	$75	
Physics Preliminary	$65	
Bio/Chem/Phys pack (all six papers above)	$350	

Total cost of order

Trial Science School Certificate	$90	

New for 2010

	Price	Tick to order
Senior Science Trial	$75	
Senior Science Preliminary	$65	

All prices include delivery, are exempt from GST and are current for 2010.

All papers will be delivered in **Week 1 of Term 3**. Invoices will be sent with the papers. Papers can be used as exams at any time after delivery but are not to be released to students before 16 August (Trial) or 20 September (Preliminary and School Certificate).

Astronomy

What's coming up in the night skies?

... Robert Garner

Looking at the night sky is always more pleasant when the evenings are warmer, so Term 1 of the school year is a great time to get your students to go out and look for objects in the sky.

Locating constellations

As you observe the night skies during Summer and into Autumn, you will find the summer constellations, *Taurus* and *Orion*, setting a little earlier each night. They will be in the north-western sky after night fall in February, but disappear from the night sky by Easter when they will return to the morning sky.

As the Moon moves across the sky from east to west each night, it passes through a number of constellations. At about 10 pm each night from 25–28 February and 24–27 March, you will find that the Moon passes through *Leo*, *Cancer* and then *Gemini*, which are high in the northern sky at this time of the year. These constellations will help you to locate the well-known 'Beehive Cluster' (see Box 1).

Locating Planets

Mercury will be in the morning pre-dawn sky in early February, but will be lost as it approaches conjunction in mid-March. Mercury will be hard to see until mid-winter this year.

Venus reappears in March as the Evening Star. It will be hard to see in the evening twilight, but will gradually get higher in the western sky and by April it will be clearly shining as the third brightest object we see in the heavens.

Mars will be visible at night. It rises during the afternoon and sets after mid-night for the first few months this year. Mars is stationary on 11 March, i.e. its period of retrograde motion ceases and Mars resumes its usual west to east motion against the stellar background. At this time, Mars will be between the stars, Castor and Pollux, in *Gemini* and M44 (Beehive Cluster). In April, Mars is within 1° of the Beehive Cluster from15–20 April. Mars will be found near *Gemini* and *Cancer* until mid-May, when it moves into *Leo*.

Jupiter will be visible after twilight in the western evening sky during the first week of February. By mid-February, it will disappear into the sunset as it moves behind the sun to reach conjunction on 28 February. It will reappear in the dawn sky in late March. It will remain a pre-dawn object until after Easter.

Saturn will provide good viewing throughout the autumn. It reaches opposition on 22 March and will appear low to the horizon in the Eastern evening sky. Saturn's rings will be closing until June when we see them edge on. While they are edge on, Saturn's larger moons can be seen. The five brightest moons are easily seen with a small telescope.

Meteors

The *alpha-Centaurids* will be active during February with a peak rate around 8 February. The sky is relatively moon-free from 8–28 February so it is a good time to look out for this shower in the southern skies.

The *gamma-Normids* will be active from 24 February to 21 March with a peak around 13/3/2010, when the sky is Moon-free. They are best looked for after midnight, as the constellation Norma rises late in the evening in the southern skies. □

BOX 1 The Beehive Cluster (M44)

M44 is known as Praesepe or 'The Beehive Cluster'. M44 is an open cluster of stars, thought to be about 600 million years old. M44's 'Beehive' nickname comes from its 'swarm' of stars that can seem like bees around a hive.

The Beehive Cluster is located at the centre of the constellation *Cancer* and is a bright group of stars shining at magnitude 3.10. It lies about 580 light-years away and spans about 10 light-years across. M44 can be seen as a misty patch with the unaided eye and resolves into individual stars in binoculars. While Galileo was the first to observe the Beehive in a telescope in 1609 and was able to resolve it into 40 stars, a recent survey has found that it has possibly over 1010 stars.

Ancient Greeks and Romans saw this object as a manger from which two donkeys, the adjacent stars Asellus Borealis and Asellus Australis, are eating. These are the donkeys that Dionysos and Silenus rode into battle against the Titans.

To the Aboriginal people, the Beehive constellation was Coomartoorung, the smoke of the fire of Yuree and Wanjel (Castor and Pollus), two hunters who pursued, caught and then cooked Purra the kangaroo (the star Capella). When the Beehive disappeared from the sky, autumn had begun.

You will be able to see the Beehive cluster well in both February and March. About 10 pm – on 25 February, it will be high towards the northeastern sky and to the right of the Moon and Mars, then just below the Moon on 26 February and to left of the Moon on both 27 and 28 February. About 9 pm – on 25 March, it will be high in the northern sky and to the right of the Moon and Mars, and to left of the Moon on both 26 and 27 March. □

A 'Blue Moon' and vague Science

Did you hear all the claims that we would have a 'Blue Moon' for New Year's Eve on 31 December 2009?

There was not even a Full Moon here in Sydney for New Year's Eve, let alone a Blue Moon! The Full Moon did not occur until 3 am on 1 January 2010. So the journalists were wrong! Perhaps they were confused by references for New Year's Eve in different time zones to Eastern Australia. This is a classic example of scientific errors occurring due to the incorrect use of an information source.

The modern definition of a Blue Moon is 'the second Full Moon to occur in a calendar month'. There was only one Full Moon in December 2009. However, in January 2010 the first Full Moon occurred on 1 January and a second on 30 January 2010. This second Full Moon in January was in fact a 'Blue Moon'. This will occur again in March, as there will again be two Full Moons – one on 1 March and the other on 30 March. February will have no Full Moon. A 'Blue Moon' normally occurs on average, every 2½–3 years. Having two Blue Moons so close together as in 2010 is unusual and only happens four or five times in a century. Hence the origin of the expression 'once in a Blue Moon'. This expression is used to refer to an event that only occurs in rare circumstances.

The modern definition of a Blue Moon, as above, was based on an editorial error in an astronomy magazine. It resulted from an incorrect answer to a quiz question given in a 1943 *Sky & Telescope* magazine because the writer of the answer misinterpreted how the term was used in the 1937 *Maine Farmer's Almanac*. The farmer's almanac divided the year into four seasons, with each season lasting three months. When a given season saw four full Moons, the almanac called the third Moon a 'Blue Moon'. □

BOX 1 Sky Charts & Planispheres

- You can download free sky charts each month to explore the night sky from: *http://skymaps.com/downloads.html*
- A planisphere (star wheel) is a great aid for exploring the stars and locating constellations. These are inexpensive and available from astronomy shops, or you can download one from the internet – make sure it is for the Southern Hemisphere. There is a planisphere (star wheel) to print and use at:
  http://members.ozemail.com.au/~starrylady/Planis1.htm

CONGRATULATIONS

SciTalk No. 4–2009 'Astronomy Giveaway' winners, Johana McCarthy, Hillston Central and Deborah Thompson, St Paul's HS Boolaroo each won a copy of:

ASTRONOMY 2010
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, 84 Wentworth Pk Rd, Glebe 2037
ph 9518 7255 fax 9518 5711 email: info@bintel.com.au/
Cost: $20 (plus $3 post)

MACQUARIE UNI OBSERVATORY FRIDAY NIGHT OBSERVING

On clear nights, our 'starfinder' (planisphere) sessions demonstrate how to identify bright stars, constellations and planets. This is followed by observing with the telescopes (12" & 16" Meade telescopes). Even with the light pollution of the city, we can easily see double and multiple stars, open and globular star clusters, and the brighter nebulae. The Moon and planets, when in suitable positions, are easily viewed with any of our instruments. On dark, moonless nights with good seeing, we may also observe the brightest galaxies. In the event of cloud, our program includes a mixed al fresco presentation of slides, posters and scale models.

Located in the grounds of Macquarie Uni (access via Gymnasium Rd), the observatory is open to the public every Friday night, March–Nov inclusive, 7:30–9 pm, subject to bookings or rain. You can phone 0427 433 388 if the weather is doubtful.

"No one can make you feel inferior without your consent."

… Eleanor Roosevelt

WIN A FAMILY PASS TO IMAX

IMAX Sydney, at Darling Harbour, is open every day. More than 8 storeys high, it has the world's biggest cinema screen to give the ultimate film experience. IMAX films are entertaining and educational. They constantly change and cover a wide range of themes. Quality resource materials & teacher guides are provided for schools.

★ ✧ ★ ✧ ★ ✧ ★

TO WIN A FAMILY PASS* TO IMAX: (for 2 adults and 2 children worth $56) … send in your name, school, & school address on an envelope **by 1 April 2010** to:

IMAX Give Away, PO Box 442, Freshwater NSW 2096

* This pass will be valid for any one film for any session, except public holidays/films advertised as 'no free list'. Details at: *www.imax.com.au*

WINNER: Sam Potts, Ambarvale High won the IMAX Sydney family pass for *SciTalk No. 4–2009*.

IMAX THEATRE SYDNEY

2010 – International Year of Biodiversity *… continued from page 1*

National Science Week (14–22 August 2010) will have the theme 'Australian Biodiversity'. ASTA will be distributing a free teacher resource book to all Australian schools in May for this. This book will look at Australia's unique biodiversity with examples from the micro-world, invertebrates, vertebrates and plants as well as case studies from various terrestrial, aquatic, urban and agricultural ecosystems. Also highlighted will be conservation issues, biodiversity hotspots, threats to biodiversity, introduced species and the role of quarantine.

Some good websites on biodiversity for you to look up include:

- *www.peopleandplanet.net/doc.php?id=3707*
- *www.mesa.edu.au/seaweek2010/default.asp*
- *10000birds.com/2010-international-year-of-biodiversity.htm* □

Leeches suck

Leeches have been used in medicine for millennia. They were once believed to remove illness-causing fluids, or 'humours', from the blood. By the late 19th century such bloodletting was out of favour. However, in the early 20th century, it occurred to surgeons that the slimy annelids might have a useful medical role after all and were just the thing to help treat a dangerous complication after surgery to reattach torn or severed body parts such as fingers, ears or flaps of skin. Excess blood can collect in the reattached part, which, if left untreated, can cause tissue death and even be life-threatening. Leeches are perfect for relieving 'venous congestion', as this phenomenon is known, because the leech acts as a vein. In addition to the blood it consumes, the leech injects chemicals that stop blood clotting, which keeps blood flowing from the wound after the beast leaves.

The medical leech, *Hirudo medicinalis*, was approved for use in the US for post-surgical care in 2004, however doctors are still learning how to use these living medical devices. Leeches can be unpredictable. They may go on strike at the bedside, refusing to latch on where needed. Or in the middle of feeding, they may lose interest and creep away, or can get into open tissue if not watched and counted on and off a person carefully. Leeches can also introduce bacterial infections from their saliva and cause sepsis, so great care is needed when using them. □

[Source: *NewScientist 19/26 December 2009*]

A homework project for Science students:

How to make a red cabbage pH indicator

Have you ever wondered whether a home chemical was an acid or a base? You can find out easily by making a cabbage pH indicator.

You can go to this website to see a video clip that shows a really simple way to make red cabbage pH indicator that can be used to test everyday materials found in your home:

video.about.com/chemistry/Cabbage-pH-Indicator.htm □

WIN A FAMILY PASS TO SYDNEY WILDLIFE WORLD

Sydney Wildlife World at Darling Harbour is a great Science excursion venue. It opened back in 2006 and displays Australian fauna and flora in 9 different habitats. With over 6000 animals, this venue links well to the syllabus.

Details: *sydneywildlifeworld.myfun.com.au/*

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TO WIN A FAMILY PASS TO SYDNEY WILDLIFE WORLD
(for 2 adults & 2 children worth $85.00)

Send in your name, school, & school address on an envelope by **1 April 2010** to: *Sydney Wildlife World Teacher Offer*
PO Box 442, Freshwater NSW 2096

WINNER: Kasey Marks, Monaro HS won a Sydney Wildlife World family pass for *SciTalk No. 4–2009* and Robyn Andrews, St George GHS won a Sydney Aquarium family pass for *SciTalk No. 4–2009*.

COMPETITION CORNER

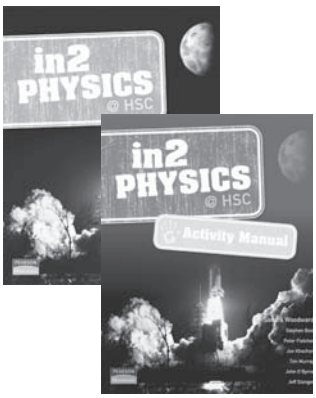
Send in an entry to WIN these books:

in2 Physics @ HSC

Student Text & Activity Manual

by Stephen Bosi, et al

Published & donated by Pearson Australia



In2 Physics @ HSC is written specifically for the NSW Stage 6 Physics syllabus. *In2 Physics @ HSC* includes a student book & CD, activity manual, teacher's resource pack and a Companion Website with online interactive activities. The student materials provide clear and easy access to the content and theory, review questions, a range of exam-style questions and features to develop an interest in the subject.

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HOW TO ENTER: Send an answer to the Quiz Question, your name, school, & school address, on an envelope to: Competition Corner, PO Box 442 Freshwater 2096 – by 1 April 2010

SciTalk 4/09 answer: Copernicium

QUIZ QUESTION: What device is used to step up or step down AC voltage?

Winner for *SciTalk 4/09*: *Science Explained* (RRP $149.95) published by McGraw-Hill Education was won by Sandra Kijko, All Saints College – St Joseph's Campus, Lochinvar.

SUBSCRIPTIONS … *SciTalk* is available FREE to all secondary science faculties in NSW and the ACT. However, if you would like to receive your OWN personal copy or extra copies of *SciTalk*, subscriptions are available for just $20 per 4 issues. Please send a cheque for $20 + GST = $22.00 (to *SciTalk*), plus your name, address and telephone number … and you will receive the next four issues of *SciTalk*.

SciTalk

SciTalk is a newsletter for secondary Science educators. Now in its 16th year, it has been produced quarterly by Odlum & Garner as a service to Science teachers since 1995. It is sent FREE-of-charge to all secondary Science faculties in schools and TAFEs throughout NSW and the ACT.

SciTalk aims to provide science teachers with up-to-date information, important dates, the latest products available, plus 'what's on' in various excursion venues, and more.

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

Contributions, advertising and inserts are welcome.

Copies of *SciTalk* are also available at:
www.odlumgarner.com

CONTRIBUTIONS

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

CLOSING DATES

- *SciTalk* No. 1–January 2010 … Jan 4
- *SciTalk* No. 2–May 2010 … April 6
- *SciTalk* No. 3–August 2010 … July 5
- *SciTalk* No. 4–October 2010 … Sept 27

ADVERTISING & INSERTS

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