Providing support and promoting excellence in science education

# SciTalk

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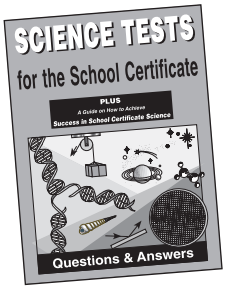
Number 2 – June 2006

## Book Giveaway

*You could WIN this book ...*

### *Science Tests for the School Certificate*

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




WIN

***RRP: $32.95***

This book is essential practice for Year 10 students who want to score well in their Science Test. It includes a guide on *How to Achieve Success in School Certificate Science*. The questions are comprehensive and cover the syllabus content and outcomes.

*Science Tests for the School Certificate* contains six specimen Science Tests, complete worked answers that would score full marks, explanations for all MC answers and a BONUS section of longer free response questions for additional practice.

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

**by 30 June 2006 to**

Book Giveaway, PO Box 442, Harbord 2096

★ ★ ★

**Winner for *SciTalk 1/06***

Congratulations to Jenny Piper, Lurnea HS who won *Science Focus - Books 2 & 4 & CDS* ($44 ea / $49.95 with CD ea) by Kerry Whalley *et al*, donated by **Pearson Education Australia.**

## ★★ 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, 4, & 12*

*Send in your entries now*

*(ALL IN THE ONE ENVELOPE if you prefer!)*

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

## *Starving the enemy ... a malaria update for science teachers*

Malaria researchers at the Australian National University (ANU) have found a way to block the food source of *Plasmodium,* the parasitic protozoan that causes malaria.

Malaria kills more than one million people each year, mostly young children. It occurs mainly in tropical or equatorial countries, as these areas provide the ideal habitat for the mosquitos that transfer the disease from person to person. In many of these areas there is little money and so little commercial incentive for pharmaceutical companies to develop new antimalarial drugs. Thus most of the research into malaria and how to beat it is taking place in research institutions and university departments such as ANU.

A new antimalarial drug is needed as the *Plasmodium* parasite that causes the disease is becoming increasingly resistant to most of the available antimalarial drugs and there is still no vaccine in sight. There are a number of difficulties in developing an effective vaccine for malaria. The immune response to malaria which is caused by a protozoan is somewhat different than the immune response to bacteria and viruses. Immunity to malaria is only partial, whereas immunity to diseases caused by bacteria and viruses is complete.

Researchers from the ANU, Professor Kiaran Kirk and Dr Kevin Saliba, have worked together on the malaria problem for nearly nine years. They have discovered that an ingredient found in shampoo, pantothenol, may be the answer to developing a new antimalarial drug, as pantothenol not only makes your hair shiny, but also has a lethal effect on *Plasmodium*.

The *Plasmodium* parasite has a life cycle that is split between humans and mosquitoes. *Plasmodium* can enter the human bloodstream when an infected female *Anopheles* mosquito bites their host.

The parasite invades the liver and later the red blood cells of their host, gradually

*... continued on page 7*

## INSIDE SCITALK ▶▶▶▶



Success is a state of mind.
Start thinking of yourself
as a success. (Anon)


*CELEBRATE 2006 National Science Week with Physics is Fun at Luna Park Sydney*

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

*Why pay more?*

*SPECIAL SCHOOL PRICES*

*are available for ALL subject areas for Fun Park Excursions to Luna Park Sydney through Physics is Fun. See p7.*

LUNA PARK just for fun

*EDUCATIONAL EXCURSIONS & FUN DAYS AT LUNA PARK*

*for primary & secondary students through Physics is Fun*

**Secondary**: Science 7–10, Physics, Biology, Senior Science, Maths, Technology Visual Arts, Peer Support, Commerce, Business Studies, Tourism

**Primary**: Science & Technology, English, Mathematics, Art & Peer Supporturism ★

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

# Diary Dates 2006

***2006 – International Year of Deserts & Desertification***

**JUNE 2006**

| | |
|---|---|
| 2, 5, 7, 9 | Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105 |
| 5 | World Environment Day. http://www.unep.org/wed/2006/english/ |
| 8 | World Ocean Day. http://www.theoceanproject.org/wod/ |
| 15–16 | Science Teachers' Workshop for Physics. Uni of Syd. Details on page 4 |
| 16 | Closing date Crystal Growing Comp. www.chem.unsw.edu.au/raci/crystal_grow/index |
| 16/18 | School Titration Competition. www.nswtitration.com |
| 17 | World day to Combat Desertification and Drought |
| 21 | Winter solstice (= shortest day of year) |
| tba | RACI Nyholm Lectures. Details soon at: www.chem.unsw.edu.au/raci |

**JULY 2006**

| | |
|---|---|
| 9–13 | CONASTA 55: Science + Education: Inventing the Future. SA. www.sapmea.asn.au/conasta55/ |
| 20–21 | Science Teachers' Workshop for Physics. Wagga Wagga. Details on page 4 |
| 23–29 | National Chemistry Week. www.raci.org.au/national/events/chemistryweek.html |
| 27 | National Chemistry Quiz. www.raci.org.au/national/events/nationalchemistryquiz.html |

**AUGUST 2006**

| | |
|---|---|
| 4 | Jeans for Genes Day. Enquiries: CMRI, 1800 677 260, www.jeans4genes.com.au/ |
| 12–20 | National Science Week: Theme – Our Dry Continent. http://scienceweek.info.au/ |
| 18, 21 | Science Week events: Physics is Fun at Luna Park. http://homepage.mac.com/robertgarner |
| 12–20 | Australian Science Festival, ACT. School Activities 16/8–18/8. www.sciencefestival.com.au |
| 20 & 25 | Faraday Lecture 2006. See Out & About on page 2 for details |
| 23 | Physics Olympiad National Qualifying Exam. www.aso.edu.au Closing date: 28 July |
| 30 | Biology Olympiad National Qualifying Exam. www.aso.edu.au Closing date: 28 July |
| late Aug/early Sept | Science Teachers' Workshop for Physics. Armidale. Details on page 4 |

**SEPTEMBER 2006**

| | |
|---|---|
| 1 Sept– 16 Oct | Great Australian Marsupial Night-stalk. www.perthzoo.wa.gov.au/nightstalk/ |
| 2 | Astronomy Open Night & Lecture. Macquarie Uni E7B. 6–10 pm. (02) 9850 7111, www.physics.mq.edu.au/astronomy/cal.html |
| 6 | Chemistry Olympiad National Qualifying Exam. www.aso.edu.au Closing date: 28 July |
| 7 | National Threatened Species Day. www.deh.gov.au/biodiversity/threatened/ts-day/ & www.deh.gov.au/biodiversity/threatened/information/ |
| 14 | Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105 |
| 30 | BHP Billiton Science Awards closing date http://scienceawards.bhpbilliton.com |

**OCTOBER 2006**

| | |
|---|---|
| 8–14 | Earth Science Week 2006. www.earthsciweek.org/ |
| 19 Oct–17 Nov | HSC exam period. Full timetable available at: www.boardofstudies.com.au |
| 20, 23, 30 | Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105 |

**NOVEMBER 2006**

| | |
|---|---|
| 3,13,17,24,27,30 | Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105 |
| 13–17 | School Certificate Tests (see box on this page for details) |

**DECEMBER 2006**

| | |
|---|---|
| 1, 8 | Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105 |
| 19 | HSC results released. |

**JANUARY 2007** National Youth Science Forum. Forms to local Rotary club by 15/5/06, interviews July. Only for Yr 11 in 2006. Enquiries: 6125 2777, fax 6125 8015, email: nsss@anu.au, www.nysf.edu.au/

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

## 2006 School Certificate Tests

**13 November**
- English: 9.20–11.30 am (includes 10 mins reading time)
- Science: 12.50–3 pm (includes 10 mins reading time)

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

**15–17 November** *(each school on one of these days)*
- Computing skills test

## 2006 HSC Science Examination Dates

| | |
|---|---|
| **27 Oct** | Physics: 9.25 am–12.30 pm |
| **1 Nov** | Earth & Environmental Science: 1.55–5 pm |
| **2 Nov** | Senior Science: 1.55 pm–5 pm |
| **6 Nov** | Biology: 9.25 am–12.30 pm |
| **10 Nov** | Chemistry: 9.25 am–12.30 pm |


**Some relevant websites:**

- *www.globaleducation.edna.edu.au/globaled/page2006.html* … for facts about deserts, desertification, the background, Australia's response, and the global agenda.
- *www.agric.nsw.gov.au/reader* … about natural resources, environment, climate, weather, weather maps, salinity, and more.
- *www.pmel.noaa.gov/tao/elnino/nino-home.html* … for information on El Niño.
- *www.bom.gov.au/lam/climate/index.htm* … on climate education (plus many links).
- *science.uniserve.edu.au/school/sciweek/2006/* … links on desertification and how plants/animals are adapted to survive.

## Update on BOS matters

The School Certificate (SC) section has the '2006 SC Specimen Science Test Package including a mapping grid' and the 'SC Science scope statement and test specifications for 2006 and beyond'. The Science Test is now 2 hours. The types of questions and their difficulty will be similar to past years. Increasing the time gives students more time to answer all sections to the best of their ability. The test format has been simplified – see new Specimen Test. A stimulus booklet is provided for use in Sections 1 and 2 – such material can be used for several questions, reducing the reading time and giving students more time to demonstrate what they know and understand.

**Grading & Reporting Student Achievement**
From 2006 all reports to parents by all schools are to describe students' achievements using a grade A to E (or equivalent).

**Mapping Information & Communication Technologies (ICT) in Revised Mandatory Stages 4 & 5 Syllabuses**
The ICT is now integrated within the outcomes and content of these syllabuses. A searchable online database and downloadable Excel file are available here. Go to: *www.boardofstudies.nsw.edu.au/syllabus_sc/mapping_information.html*

**Assessment Resource Centre**
This area has been updated with the addition of activities and work samples for Science Stage 4 at *http://arc.boardofstudies.nsw.edu.au/*

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

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

# OUT AND ABOUT



## SCIENCE IN FOCUS AT IMAX

IMAX THEATRE

31 Wheat Rd, Darling Harbour, Sydney 2000

★ **NEW FILM:** ***DEEP SEA 3D***

***SEA LIFE IN A WHOLE NEW WAY!***

Through the magic of IMAX 3D technology, we travel below the surface of the oceans to swim with some of the planet's most unique, dangerous and colourful creatures. From the Mantis Shrimp, who engages in a one-on-one, matador-like challenge with a threatening octopus, to the Green Sea Turtle, who allows schools of fish to clean its shell of unwanted algae, ***Deep Sea 3D*** focuses on the unusual and often surprising alliances struck between some of the world's most exotic creatures.

***Available for school bookings now. Discounted Joint Excursions with Sydney Aquarium are also available.***

★ For other films and their session times, please visit: ***www.imax.com.au/schooltimetables***

## IEE FARADAY LECTURE 2006

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

**on SBS TV in Science Week**
**Sunday 20 August 2006: 11 am–12 noon**
**Friday 25 August 2006: 2–3 pm**

*Emission Impossible – Can Technology Save the Planet?* looks at technology that is helping to tackle climate change and make better use of Earth's precious resources. This one-hour talk uses a mixture of live demonstrations, video and graphics, to examine how Earth regulates itself, how we affect this equilibrium and how alternative sources of energy and efficiency improvements can redress the balance.

This talk can also be viewed now online at: *www.iee.org/Events/Lectrs/Faraday/2006/index.cfm* – just click on it in the 'Links' box. Click on 'Background Notes' for some great notes, classroom activities and websites to accompany the lecture. □

## ABC TV: SCIENCE PROGRAMS FOR SCHOOLS

ABC TV

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

Science program details, dates & times are at: *www.abc.net.au/schoolstv/titlelist.htm* and teachers' resources are at: *www.abc.net.au/schoolstv/tresources.htm* □

## UNSW Medical Sciences PD Day 2006 & Schools Programs

**At Museum of Human Disease & Hall of Health**

The Museum of Human disease is a pathology museum offering interactive programs with amazing insights into the nature and progression of disease in its many forms. Curriculum-based Biology/Senior Science programs are available. These include:

- 2 hr workshops for Biology students on 'The Search for Better Health'
- 2 hr workshops for Senior Science students learning about 'Bionics'
- 2 hr workshops covering micro-organisms, infectious and non-infectious diseases included in the Science 7–10 Syllabus
- latest exhibition on digestive system & dietary disorders: *Gutsy Stuff*
- **Teachers Professional Development Day** – Thursday 20 July 2006

★ **NEW LOCATION:** Gr'd floor, Samuels B'lding, UNSW (map is on web)
**Cost:** Student workshops $8/student (GST exempt). Bookings are essential.
**Enquiries:** Ph (02) 9385 1522. Fax/ph (02) 9385 1747
**Email:** museum.hallofhealth@unsw.edu.au
**Website:** http://hallofhealth.med.unsw.edu.au

## SCIENCE CENTRE & PLANETARIUM

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

★ ***Taking bookings for 2006!***

★ **Star Trails Outreach Program 2006** – we visit schools with a portable planetarium and interactive Science Shows.

★ We have an extensive range of ***shows & exhibits***, including:

- **Stellar Evolution** – planetarium program for HSC Physics
- **Superconductors & Liquid Nitrogen** – live science show
- **Zap! Understanding Electricity**
- **Energy and Motion**
- **The Changing Earth**

★ 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 your school excursion.
For information and bookings, phone (02) 4286 5000.
Website: sciencecentre.uow.edu.au

## COMBINE A FUN PARK EXCURSION AT LUNA PARK SYDNEY WITH EITHER IMAX / SYDNEY AQUARIUM

You can combine a Fun Park Excursion at Luna Park Sydney booked through Physics is Fun with a visit (before or afterwards) to either IMAX or SYDNEY AQUARIUM for a great action-packed, fun time of interactive learning. These excursions are a great way to capture students' interest and demonstrate learning in action.

**• COSTS, BOOKING DETAILS & WORKSHEETS – GO TO:**

IMAX: www.imax.com.au/schooltimetables
SYDNEY AQUARIUM: www.sydneyaquarium.com.au
PHYSICS IS FUN: http://homepage.mac.com/robertgarner

**• PLANNING YOUR DAY:**

Allow 1 hr for IMAX (any film),
or 2 hrs for a Sydney Aquarium excursion.
Allow 2–3+ hours for Luna Park Sydney (open 11 am–6 pm)

**BOOK & PAY SEPARATELY FOR EACH EXCURSION**

## The University of Sydney

The Science Foundation for Physics & The School of Physics

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

**Sydney**: *Thurs 15 & Fri 16 June 2006 – at School of Physics, The University of Sydney*
**Wagga Wagga**: *Thurs 20 & Fri 21 July 2006 – Wagga Wagga Christian College, Kooringal*
**Armidale**: *Late August/early September – dates & venue to be announced*

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

## Kickstart HSC Physics Student Workshops

*KickStart* is a University of Sydney program that gives HSC students a chance to do experiments and demonstrations of key ideas in the syllabus that are often difficult to do in the classroom. Over the last four years we have hosted thousands of Year 11 and 12 students through our physics labs — now thanks to the generous sponsorship of IBM Australia, we're taking *KickStart* on the road to **Wagga Wagga** and **Armidale** in conjunction with STW06. *Kickstart* also runs all year at the School of Physics.

Classes can book in for *KickStart* hands-on sessions on *From Ideas to Implementation* and *Motors and Generators*, as well as interactive talks on *Astrophysics* and *Relativity*. Each session is $2\frac{1}{2}$ hours long and costs $10/student.

*For STW and KickStart bookings and details: www.physics.usyd.edu.au/foundation/stw06.html*

**For more information:**
Dr Chris Stewart, Executive Officer, Science Foundation for Physics
School of Physics A28, The University of Sydney NSW 2006
**Phone**: 02 9351 3622 **Fax**: 02 9351 7726
**Email**: c.stewart@physics.usyd.edu.au **Web**: www.physics.usyd.edu.au/foundation/

# Science on the Web

**New topics on NOVA: Science in the News – *www.science.org.au/nova***

Two new topics have been recently added to NOVA:

**• Weeds – the real alien invaders**

Invasive weeds threaten the environment, agriculture, and people's health – and the threat is growing. Vast areas of land and nearly all ecosystems are affected.

More than 27 000 species of plants have been introduced to Australia, for industries and gardens. Many are now serious weeds. By out-competing native plants, weeds threaten their survival and reduce plant diversity needed to support insects, birds and animals.

Changes to the natural flora cover can lead to increased soil erosion and greater bushfire intensities, further damaging the land and organisms that rely on it.

Agriculturally, weeds can reduce or contaminate crop yields and poison or injure livestock. Weeds cost Australian agriculture about $4 billion every year.

Invasive weeds also cause human health problems. Introduced species make up 20 out of the 25 major seasonal allergens in Australia. The health costs of weeds would be over a billion dollars annually.

**• Nanotechnology**

Working with ultra small promises to become mega big. But things may not look all that different from today. The nanohouse and nanocar make use of nanotechnology research. The nanohouse would be energy-efficient, with self-cleaning surfaces, cold lighting systems and dye-sensitised solar cells. It would be cheap to run and comfortable. The nanocar would be of superlight, superstrong, recyclable fibre composites, and run on hydrogen and atmospheric oxygen, combined in fuel cells to produce electricity. The hydrogen gas would be safely stored absorbed to carbon nanotubes and released as required by mild heating.

It's important to explore the social, ethical and safety concerns connected to these technologies.

**• Some other recently added topics:**

– Impact of global warming on biodiversity
– Predicting natural events
– Carbon currency – the credits & debits of carbon emissions trading
– Bird flu: the pandemic clock is ticking
– The buzz about insect robots □

## WIN A FREE PASS TO SYDNEY AQUARIUM

Sydney Aquarium at Darling Harbour is a great science excursion venue. It showcases Australian aquatic habitats, their fauna and flora, information on habitat characteristics, animal adaptations and conservation issues. Bookings are essential, excursions are self-guided. Information: *www.sydneyaquarium.com.au*

* * * * *

**TO WIN A FREE FAMILY PASS TO SYDNEY AQUARIUM:** (for 2 adults & 2 children worth $65) … send in your name, school, & home address on an envelope by **30 June 2006** to:

*Sydney Aquarium Teacher Offer, PO Box 442, Harbord NSW 2096*

**WINNER:** Joan Stead, Dunedoo Central, won the Sydney Aquarium family pass for *SciTalk No. 1–2006.*

## WIN A FREE FAMILY PASS TO IMAX

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

★ ✧ ★ ✧ ★ ✧ ★

**TO WIN A FREE FAMILY PASS* TO IMAX:** (for 2 adults and 2 children worth $46) … send in your full name, school, home address & ph no. on an envelope **by 30 June 2006** to:

*IMAX Give Away, PO Box 442, Harbord NSW 2096*

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

**WINNER:** L Gray, Northlakes HS, Noraville won the IMAX Sydney family pass for *SciTalk No. 1–2006.*

# Exam Choice

ABN 56 345 318 164

**Fax: 02 9975 1886**
**PO Box 71 Forestville NSW 2087**

## Trial and Preliminary Science Exams

**Exam Choice** is a group of teachers highly experienced in all facets of the exam process.

This is our second year of producing **Trial and Preliminary Science Exams** which:

- assess over the **full range of performance**
- are mapped to outcomes and the syllabus
- use the prescribed verbs in clearly worded questions
- come with **clear marking guidelines** and sample answers
- are delivered **on time**
- are reasonably priced

Complete the order form below and fax this sheet back to us.

**Contact Person** .....

**Phone No.** ..... **Fax**.....

**School** .....

**Delivery Address** .....

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

| | Price | Tick to order | Total |
|---|---|---|---|
| Biology Trial | $55 | | |
| Biology Preliminary | $45 | | |
| Chemistry Trial | $55 | | |
| Chemistry Preliminary | $45 | | |
| Physics Trial | $55 | | |
| Physics Preliminary | $45 | | |
| Combination pack (all six papers) | $250 | | |

All papers will be delivered in week 1 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 15 August (Trial) or 19 September (Preliminary).

## Starving the enemy … *continued from page 1*

destroying these cells while clogging the capillaries that carry blood to the brain and other organs. By living inside the host's cells, the parasites evade detection by the immune system, while drawing on resources to survive from the surrounding plasma.

Kirk and Saliba believe that understanding how substances are taken up into the infected cell and into the parasite will enable the development of new antimalarial strategies, as well as providing insight into how the parasite becomes resistant to antimalarial drugs.

Pantothenol is almost identical to vitamin B5. Mammals are able to convert this compound into vitamin B5, but *Plasmodium* parasites cannot. Instead, pantothenol actually kills the parasite. *Plasmodium* needs to take up vitamin B5 from our plasma to survive. The scientists are trying to determine how the parasite takes this up and what it does with it, as this will be a means of interfering with the parasite and killing it. However, since pantothenol is converted into vitamin B5 by the human body, they are now looking for compounds that have the same effect but will remain deadly for the parasite. Of the 50 compounds so far tested, about 15 or so are able to kill the parasite, so they are optimistic that the parasite will not become resistant to this kind of drug, as vitamin B5 is essential to its survival.

So, keep a look out for where this ground-breaking research may lead. This research may yet be the answer to overcoming malaria. Until then, or until a vaccine is developed, malaria control will largely be dependent on vector control measures such as improvements in housing construction, source reduction, bednets impregnated with insecticide, and residual insecticide treatment.

* * * * *

Note: Another important and recent advance in malaria research is the mapping of the *Plasmodium falciparum* genome. This current project involves scientists from several different institutions in collaboration.

* * * * *

### Some malaria facts

- No. of people who die from malaria annually: more than 1 million
- Percentage of world's population infected: 1 in 10
- No. of countries in which disease is present: 90
- No. of seconds between every child dying of malaria: 30
- Highest proportion of deaths: 90 per cent in sub-Saharan Africa
- No. of malaria strains: 4

[Source: BBC]

Some great websites on malaria:

- *www.malaria.org/learnaboutmalaria.html* … for facts and links on malaria
- *www.wehi.edu.au/MalDB-www/intro.html* … on life cycle of *Plasmodium*
- *www.malariasite.com/malaria/DrugResistance.htm* … drug effectiveness on malaria
- *www.who.int/mediacentre/factsheets/fs094/en/index.html* … WHO site on malaria. □

*[SOURCE: http://info.anu.edu.au/mac/Newsletters_and_Journals/ANU_Reporter/097PP_2006/_01PP_Summer/_starvingenemy.asp]*

## Scanning breakthrough for medical imaging

Sydney doctors at the Royal North Shore Hospital have developed a new scanner. This scanner combines the best of two other forms of medical imaging.

The combined technology will not only reveal an abnormality in a patient, but will also accurately detect its position in the body. Thus it will greatly assist in the investigation of problems such as fractures, blood clots and cancer.

The scanner combines single photon emission computed tomography (SPECT) with computed tomography (CT). This means that a patient can now be imaged in a single visit, and the exact location of the abnormality can be accurately pinpointed. Previously this would have been difficult. For example, it can be difficult to determine if a cancer near the spine is in the bone, the muscle near the bone, or the soft tissue nearby. However, with the new technology, the patient can be kept in exactly the same position and have a CT scan immediately after the SPECT scan if it has revealed a tumour and so locate the tumour exactly.

This new technology will greatly improve diagnosis and treatment. □

# Photo Spot Silica spheres

## Silica spheres are found in opals

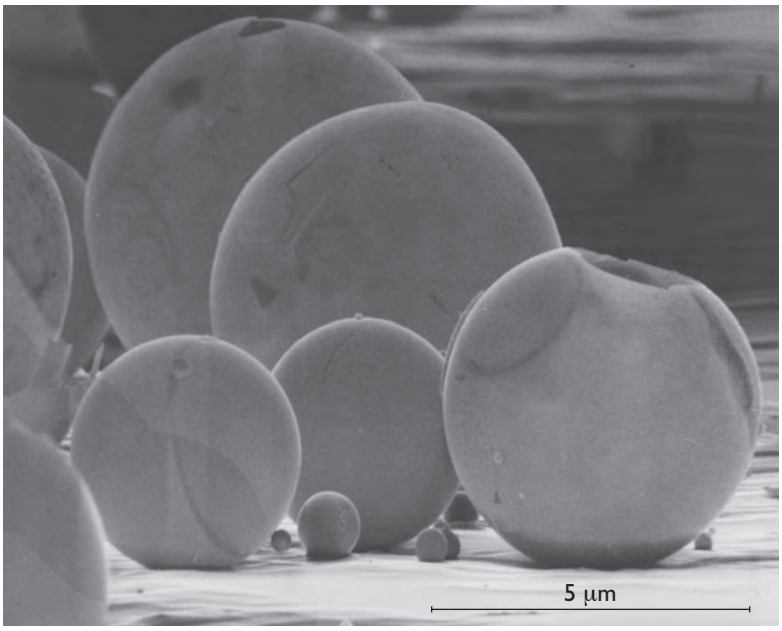
Silica spheres occur naturally in opals. The diameters of the silica spheres in opals range from approx. 200–400 nm.

Opal is a hydrated silica ($SiO_2.nH_2O$) with a hardness of 5.0–6.5. It is similar to quartz, but opal contains a variable amount of water within the mineral structure. This water content varies between 2–20%, with precious opals containing 6–10%.

Opals in Australia are thought to have formed in the late Cretaceous (120–140 million years ago) to mid-tertiary period (30 million years ago) as a result of ground water rich in silica permeating down through sedimentary rocks and accumulating in the apertures created by faults and dissolved objects. Solidification occurred and the silica spheres were arranged into a closed packed structure.

Opal is found as two types: volcanic opal which infills vesicles and cracks in igneous rocks, and the more familiar sedimentary or sandstone type which is found in Australia's main fields. Most deposits in other countries are volcanic opal, much of which is prone to crazing.

More than 95% of the world's precious opals come from Australia. There are four main types of precious opal – black, crystal, boulder and white/milk. Black opal is mainly from Lightning Ridge (NSW) and Mintabie (SA). Other opals come from Quilpie (Qld), Coober Pedy and Mintabie (SA).




ABOVE: Artificial silica spheres. This photomicrograph was taken by Dave Gove, Electron Microscope Unit, Queen Elizabeth Hospital, Adelaide. It is reprinted with permission. The article on silica spheres is by Catherine Odlum.

Opals first became popular about 100 BC within the Roman empire. Their name comes from the Greek word 'opalus' meaning 'to see a change (of colour)'. Opal is used as a gemstone, or ornamental stone in jewellery, carvings, inlay material and mosaics.

The range of colour in an opal is determined by the diameter and layer spacing of the silica spheres in its 3D structure. Both ordered and disordered arrays of these spheres occur in opal.

When the spheres are uniform in size and in an ordered array, the structure diffracts visible light giving opal its play of colour. The silica spheres, which result in the play of colour, are translucent and generally give the opal a milky appearance. Smaller diameter spheres (about 200–250 nm) diffract the blue-green end of the spectrum, while larger diameter spheres (about 400 nm) diffract the red end. The background colour for the diffracted colour play may be milky white, grey, blue, black or colourless. The black is due to the presence of impurities of iron oxides among the silica spheres, and also to carbon in some opals. A black band forms with layers producing colour above it. Black opals are the most sought after and hence most valuable form of precious opal.

An interesting feature of opals is that the colour of an opal can change depending on the angle of light incidence. So when an opal is rotated, its colour can change or disappear.

If the size of the silica spheres is uneven, they do not form a regular array, which is required for colour diffraction. The spheres may also be too small to produce a visible play of colour. Such opal is called 'common opal' or 'potch'.

## Artificial silica spheres

Silica pellets, or spheres, can be made artificially and are found in a wide variety of applications – from little bags of absorbents found in electronics packaging to critical catalysts in complex chemical reactions.

Scientists at the Australian Nuclear Science and Technology Organisation (ANSTO) have found a way of producing artificial silica spheres and using them as an ingenious chemical delivery system, called CeramiSpheres.

This system involves the production of tiny silica spheres that can carry a wide range of 'payload' molecules which can be released at a controlled rate. It is analogous to the slow-release fertiliser balls used with pot plants to release fertiliser at a measured rate over an extended time period. CeramiSpheres work in the same way but on an entirely smaller scale.

The ability to adjust the size of the spheres and the rate at which they will release their payload has resulted in many applications across a wide range of industries including the food, chemical, agricultural, cosmetic and pharmaceutical sectors.

CeramiSpheres can be produced in a vast range of sizes from 10 nm up to 500 μm. Thus the silica spheres at the small end of the range are on the scale of atoms and molecules, and so can be used to deliver included chemicals to capillaries of the circulatory system.

The size of the silica spheres produced is controlled by the use of an emulsion for the 'sol-gel synthesis process' that is used to produce them. By controlling the size of the water droplets in the emulsion, and through the choice of solvent and surfactant, the size of the resulting silica particles is controlled.

The pH of the sol-gel mix also determines the size of the gaps between the silica spheres and this in turn also affects the rate at which the CeramiSpheres deliver their payload. The smaller the gaps, the slower the delivery.

The advantages of using silica is its relative chemical inertness, and optical transparency. Other CeramiSpheres can also be produced using materials other than silica, such as titanium, aluminium and zirconium.

CeramiSpheres have a wide range of possible uses apart from drug delivery, e.g. releasing enzymes in washing powders, flavours in food, oils in perfumes and biocides in paint.

While some of the more basic uses for silica particles do not require uniform, consistent sphere size, or pore volume distribution, this is important for catalyst supports and many other petroleum, chemical and process industry applications. Scientists at Shell have developed a drying technique for the sol-gel process that ensures that the silica particles have a narrow distribution range of both particle size and pore volume.

Silica spheres have also been used in atomic force microscopy (AFM). A typical AFM probe is too sharp to measure biological cells quickly while they are alive, and not gentle enough to get reliable statistical data. By using a silica sphere on the tip of the AFM probe scientists have successfully measured the elasticity of individual live human epithelial cells from tissues such as the skin and other surfaces of the body (including blood vessels, kidneys, liver, brain, eyes, etc). They were able to press the ball slowly against the cell being studied and record how much deformation was caused by the pressure being applied. They found that older epithelial cells were more rigid than younger ones. This helped to explain why skin often looks and feels more leathery as we age.

Another use of silica spheres has been to produce large 3D arrays of tiny glass spheres. Such structures may one day be used to make new types of optical filters, optical switches, or more efficient lasers. □

Astronomy

# The long and the short of it

Well, we are still here despite all the doom and gloom that some folks said would befall Earth on 25 May when it was supposed to be hit by debris from Comet P73/Schwassmann-Wachman 3.

Comet P73/Schwassmann-Wachman 3 is a periodic comet that passes near Earth every 5 or 6 years. It has been fragmenting on its current approach to the Sun. This is not the first time that the comet has fallen apart. It split into several large pieces in 1995. Both Fragment B and Fragment C of this comet will be early morning objects close together in Cetus in the south-eastern sky during early June.

This comet broke up in spectacular fashion as it passed the Earth last month. Images from NASA show the comet debris in the tail that was trailing Fragment B (see Figure 1).

Whilst there are no spectacular comets on the horizon for the next few months there are some brilliant views to be had with the winter Milky Way overhead and using your binoculars or a small telescope.

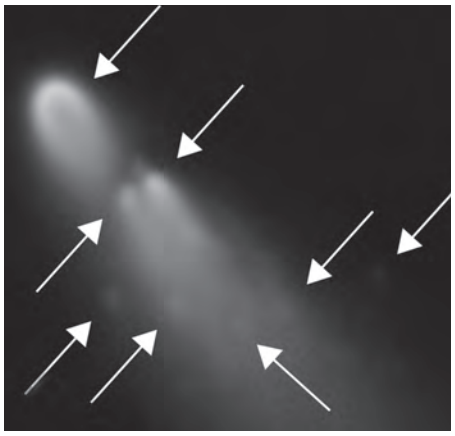


Figure 1: Image of Fragment B and associated mini-comets.

(Digitally enhanced image courtesy of European Southern Observatory)

## Planets

In mid June, the planets Mars and Saturn, and the Beehive Cluster (Messier Object 44, M44) will be very close together in the north western sky about an hour after sunset. Between 15–18 June, Mars will move in front of the M44. Around 28 June, Mercury and the new Moon will join Mars, Saturn and M44, and will be great viewing between sunset and 7 pm.

Throughout winter, Jupiter is visible each night setting close to dawn at first but setting earlier as winter progresses until it sets near midnight in mid August. In fact Jupiter will be the only planet visible in the evening sky by early August.

Venus is a morning 'star' throughout the winter months, and is best seen in the two hours before sunrise, and is joined by Saturn at the end of August. Mercury will also be seen near these planets near dawn between 9–13 August.

## Winter Solstice

The Winter Solstice is when the period of daylight is at its shortest, and so the period of night is at its longest. Our Winter Solstice will occur at 10.26 pm on 21 June. This is when the Sun reaches its most northern apparent position before heading south for the next six months. The name 'solstice' implies this change in direction as it comes from two Latin words meaning sun and stand. At this time, the North Pole tilts at 23° 27' towards the Sun and the solar rays are vertically over the Tropic of Cancer at noon. This means that the Southern Hemisphere is tilted away from the Sun and so experiences winter. In summer the conditions are reversed, and our Summer Solstice occurs – with the South Pole tilting toward the Sun and the solar rays shining directly over the Tropic of Capricorn at noon (this will occur at 10.22 am, 22 December).

## Constellations

Winter evenings are a great time to get your Sky Map* and to explore our galaxy, the Milky Way. Early in June, Sirius (α Canis Major), the brightest star in the night sky, will be low in the western sky. In the eastern sky, the constellation Scorpius will be seen rising around sunset. You can see the bright red star Antares in Scorpius. As Scorpius rises, the teapot shape of Sagittarius will be seen rising below it. The centre of the Milky Way which is at a distance of about 26 000 light years from Earth is in the direction of Sagittarius. Binoculars will reveal how the Milky Way consists of millions of stars. By July and August, Sagittarius will be high in the evening sky to provide good viewing.

Below Scorpius and just above Sagittarius is Ptolomy's Cluster (M7). It was discovered and described by Ptolomy in 140 AD. It contains about 80 stars at a distance of 780 light years. While the twelve brightest stars are naked eye objects brighter than 6th magnitude, many more can be seen with binoculars.

Crux, the Southern Cross, is high in the south-west evening sky during winter. Between the two brightest stars of Crux, α Crucis and β Crucis, lies a dark region, the Coalsack nebula. In Aboriginal astronomy, the Coalsack represents the Emu's head with the eye just visible. The Emu's long neck runs down through α Centauri and β Centauri (the two pointers to Crux), its body starts to form here and continues across Scorpius and down into Sagittarius, and its legs extend into the faint constellation of Scutum. The best time to view the Emu is from 9 pm in June, moving to earlier in July and August.

## Antares very close to the Moon

This may be difficult, but if you can see the Moon at 4.48 pm on 8 July (it will be in the eastern sky away from the Sun) you will see it occult Antares (with a telescope).

## Meteors

The annual meteor shower, the Southern Delta Aquarids, will peak on 28 July. This is one of the better meteor showers for the southern hemisphere. It has a Zenith Hourly Rate (ZHR) of 20. As it coincides with a new Moon period this year there should be some good viewing with many leaving long persistent trains.

The Alpha Capricornids meteors will also be active on 30 July. Whilst the ZHR is usually less than the Southern Delta Aquarids, these normally do have bigger, slower meteors with occasional fireballs and long trains.

## Satellite passes

You can get information on visible satellite passes over your position by free registration with Heavens Above at *http://www.heavens-above.com/* (if you are away from a major centre, you need to know your longitude and latitude but most towns show up).

* * * * *

Many amateur astronomers enjoy the clear winter skies. If you venture out to observe, remember to dress warmly as it can get cold waiting to observe the night sky.

*Enjoy winter.*

*… Don Whiteman & Robert Garner*

* You can download a free map of the sky from Skymaps at *http://www.skymaps.com/* (you need to specify that you want the southern hemisphere version).

Figure 2: The 'Emu' as seen in our night sky, its head on the right. It appears to be 'flying'.

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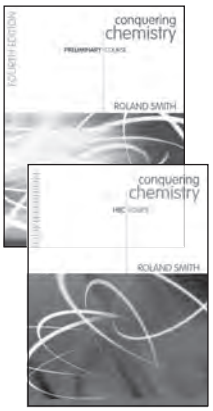


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*SciTalk* aims to provide science teachers with up-to-date information, important dates, the latest products available, plus 'what's on' in various excursion venues.

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

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**All enquiries to the *SciTalk* Editor**:
Catherine Odlum
PO Box 442, Harbord 2096
(34 Ocean View Rd Harbord 2096)
Ph (02) 9939 6107. Fax (02) 9939 6105
Email: cathie_odlum@mac.com
ABN 54 942 891 924