

SciTalk

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Number 4 – October 2010

Are you teaching the different text types in Science 7–10?

When asking students to present scientific information, it is important that they know what text type (genre) to use and how to use it. They need to be taught which genre is the most appropriate for presenting different types of information to different audiences.

Students first need to be shown correctly how to write the different text types and then be given adequate practice using them in a variety of situations if they are to develop scientific literacy skills. Teachers should be mindful that words and phrases in Science often have a specific meaning that is different to the everyday meaning and from the way they are used in other subject areas, e.g. drawing a table in Science does not mean presenting a table as an artist would a piece of furniture. Hence students must be shown exactly what is required before being asked to write.

We need to provide our students with opportunities to learn and develop the various literacy skills necessary for them to be able to effectively demonstrate their knowledge in Science. The Science 7-10 Syllabus contains the following outcomes for us to aim to achieve:

- 4.18: A student with guidance, presents information to an audience to achieve a particular purpose.
- 5.18: A student selects and uses appropriate forms of communication to present information to an audience.

During the process of a student learning to present information, the syllabus specifies

... continued on page 9

End-of-year Fun Park Excursions


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 into your school calendar
 for next year's Physics is Fun
 in National Science Week

Resources for the 2010 International Year of Biodiversity

SciTalk's website (at www.odlumgarner.com) has many internet addresses for online resources, lessons and activities to use when teaching about biodiversity ... to help Science teachers focus their students' attention on environmental issues this year. You can just copy and paste these internet addresses to go straight to the resources.

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★★ 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.

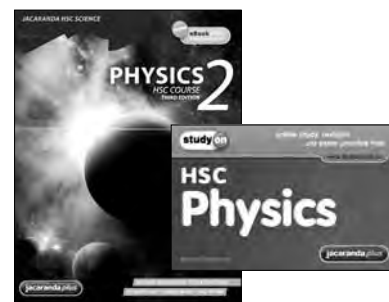
PRIZES TO WIN!

★ ★ 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

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studyON HSC Physics
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+ eBookPLUS



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The Value Pack for HSC Physics caters specifically for the NSW Stage 6 Physics syllabus. It includes the **textbook**, **Physics 2 HSC Course 3E**, as well as **eBookPLUS**, which gives online access to the student text and supporting multimedia resources and **studyON**, which is a study, revision & exam-practice tool to help students to understand key concepts in a fun and interactive way. More details are at www.jacplus.com.au/

TO WIN: Send in your name, school & school address, on the back of an envelope
by **17 December 2010 to:**
Book Giveaway, PO Box 442, Freshwater 2096

★ ★ ★
Winner for SciTalk 3/10

Congratulations to Jenny Zhang, St George GHS, who won an *in2 Physics @ HSC Student Text & Activity Manual* (rrp \$79.95) published by Pearson Australia.

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

Diary Dates



International Year of Biodiversity

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 appear on the BOS website.

Curriculum to use in 2011 (BOS 18/10)

All NSW schools are to continue to use the existing NSW K–12 syllabuses for 2011.

Review of NSW School Certificate

The BOS is reviewing the Year 10 School Certificate as part of changes to the NSW school leaving age. An initial report is to be released at the end of 2010.

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

“All the strength you
 need to achieve anything
 is within you.”
 ... Sara Henderson
 from “The Strength in Us All” (1995)

NOVEMBER 2010

- 1 Biol & Environ. Sciences Science Teachers’ Workshop. Uni of Sydney.
- 2 & 3 Chemistry Science Teachers’ Workshop. Uni of Sydney.
- 4 & 5 Physics Science Teachers’ Workshop. Uni of Sydney School of Physics:
<http://sydney.edu.au/science/physics/foundation/education/stw.shtml>
- 1, 5, 15, 19 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 22 Science Teachers’ Forum. Children’s Medical Research Institute. www.cmri.com.au
- 22, 26, 29 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

DECEMBER 2010

- 3,7–10,13–17 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 22 Summer Solstice (10.38 am AEDT)

2011 – International Year of Chemistry

- For:** Shell Questacon Science Circus 2011 program: www.questacon.edu.au/html/on_the_road.html
- tba:** Astronomy Open Nights & Lectures: Macquarie Uni, www.physics.mq.edu.au/astronomy

JANUARY 2011 National Youth Science Forum. For yr 11 students selected mid-2010. Enquiries: Ph: 61252777

MARCH 2011

- 6–13 Seaweeek 2011: www.mesa.edu.au Some resources will also be at: www.ausmepa.org.au
 Theme: ‘Spotlight on Marine Science’
- 4 Schools’ Clean Up Australia Day. Ph: 1800 282 329. www.cleanupaustrialaday.org.au/
- 21, 25, 28 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 21 Autumn Equinox (10.21 am AEDT)

APRIL 2011

- 1, 4 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 22 International Earth Day. www.earthday.net/ & www.earthsite.org/ [Note: 20 March is the original day to celebrate the equinoctial Earth Day, but it is now celebrated on 22 April in many places.]

MAY 2011

- tba Science at the Shine Dome conference, Australian Academy of Science: Details tba
- tba Science Teachers’ Forum. Children’s Medical Research Institute. www.cmri.com.au
- 6, 27 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

JUNE 2011

- 3, 6, 10 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 5 World Environment Day
- tba Closing date Crystal Growing Comp. www.chem.unsw.edu.au/RACI/ Ph: (02) 9663 4960
- 17/18 (metro) NSW Schools Titration Competition. www.nswtitration.com/ (see website for regional dates)
- 22 Winter Solstice (3.16 am EST)

JULY 2011

- 10–13 CONASTA 60 in Darwin: *Science at the Top*. Details: www.conasta.edu.au/
- 25–30 National Chemistry Week. www.raci.org.au/national/events/chemistryweek.html
- 28 National Chemistry Quiz. www.raci.org.au/in/Events. Information: ph (02) 6331 5125

AUGUST 2011

- 1–14 Australian Science Festival, ACT. For school Activities visit: www.sciencefestival.com.au
- 5 Jeans for Genes Day. www.jeansforgenes.org.au/
- 12, 15, 19 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 13–21 National Science Week. *React to Chemistry*.
- 13, 16, 20 National Science Week events: Physics is Fun at Luna Park. www.odlumgarner.com
- 15 Physics Olympiad Nat. Qualify. Exam. www.asi.edu.au/olympiads/ Close date: tba. 62012552
- 17 Biology Olympiad Nat. Qualify. Exam. www.asi.edu.au/olympiads/ Close date: tba. 62012552
- 18 Chem Olympiad Nat. Qualify. Exam. www.asi.edu.au/olympiads/ Close date: tba. 62012552

SEPTEMBER 2011

- tba Rio Tinto Big Science Competition: www.asi.edu.au/bigscience/
- 9, 12 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 23 Spring Equinox (7.04 pm EST)

OCTOBER 2011

- 9–15 Earth Science Week. www.earthsciweek.org & www.ga.gov.au/education/events, ph (02) 6249 9111
- 17, 21, 24, 28 31 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

NOVEMBER 2011

- tba Science Teachers’ Forum. Children’s Medical Research Institute. www.cmri.com.au
- 4, 14, 18 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 21, 25, 28 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

DECEMBER 2011

- 2, 9, 12, 16 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 22 Summer Solstice (4.30 pm AEDT)

JANUARY 2012 National Youth Science Forum. Forms to local Rotary club by 29/5/11, interviews from July. Only for Yr 11 in 2011. 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.

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Beyond the lecture theatres, ISS scholars participate in diverse activities — experiments, museum visits, lab tours and social events such as an evening harbour cruise. These two weeks are often described by the scholars as ‘the best two weeks of my life’. All scholars are competitively selected at State level, and attendance is by scholarship only. The scholarships are valued at approximately \$3 000 and cover return travel within Australia, full board at Women’s College, 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: Chris Stewart, School of Physics, ph (02) 9351 3622, fax (02) 9351 7726, email c.stewart@physics.usyd.edu.au or visit science.edu.au/science/physics/foundation

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- Skeletons
- Planet of Minerals
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- Indigenous Australians

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Download self-guided activities from the website such as:

- Biodiversity Trail and Clue Cards (Yr 5–8)
- Evolution Trail Combo (Yr 9–10)
- Evolution, Extinction and Survival (Yr 11–12)

Sessions with a Museum educator include:

- Fascinating Fossils (Yr 7–10)
- Human Story (Yr 11–12)
- Learning from Fossils (Biology) (Yr 11–12)
- Earth and Environmental Science Fossils (Yr 11–12)
- Indigenous Gallery Talks (Yr 7–12)



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6 College Street, Sydney
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www.australianmuseum.net.au



AUSTRALIA’S BRIGHTEST WIN OLYMPIAD MEDALS 2010

After competing in the 2010 International Science Olympiads held during July in Croatia (Physics), the Japan (Chemistry) and South Korea (Biology), Australia’s 13 students returned home in triumph – with 11 medals and two honourable mentions.

The Australian Science Olympiad (ASO) program has been running since 1987 – it enables bright young minds to extend their scientific knowledge, understanding and skills. After battling through the ASO National Qualifying Exams, they went on to be ASO Scholars and attended a residential training school in Canberra. The teams were selected from these scholars after completing a final exam and eventually 13 students represented Australia. Their success illustrates their real potential as future stars in the field of Science.

These gifted students competed against hundreds of other students from all around

the world, and were given the opportunity to further develop their skills and be exposed to new ideas and technologies.

Congratulations to these students:

● **PHYSICS** (in Croatia):
41st International Physics Olympiad

3 Bronze Medals – Andrew Kam, Sydney Grammar, NSW; Alexander London, Sydney Grammar, NSW; Bob Wu, Sydney Grammar, NSW.

2 Honourable Mentions – Madeleine Barrow, MacRobertson GHS, VIC; Hilary Hunt, MacRobertson GHS, VIC.

● **CHEMISTRY** (in Japan):
42nd International Chemistry Olympiad

1 Silver Medal – Cyril Tang, Sydney Grammar, NSW. *3 Bronze Medals* – Allan Chau, James Ruse AgHS, NSW; Kelvin Cheung, James Ruse AgHS, NSW; Stuart Ferrie, Melbourne HS, VIC.

● **BIOLOGY** (in South Korea):
21st International Biology Olympiad

3 Silver Medals – Jingchun Chen, James Ruse Ag HS, NSW; Paul Khoo, Melbourne HS, VIC; Vivian Li, PLC Pymble, NSW. *1 Bronze Medal* – Gina Tonkin-Hill, The Uni.HS, VIC. □

Enquiries: ph 6201 2552 or www.asi.edu.au/



“Arriving at one goal is the starting point to another.”
... John Dewey (1859-1952)

Teaching the chemical elements in the Periodic Table

A great way to either introduce or revise elements in the Periodic Table is the Tom Lehrer 'Periodic Table' song. The song is sung to the tune of 'I am the very model of a modern Major-General' from 'Pirates of Penzance', an operetta by Gilbert & Sullivan. It always fascinates students to hear this song – and they are especially taken by the speed at which it gets sung!

Several versions of Lehrer's song can be found on the internet. Usually it is best to open up the following two versions. The first one flashes up the names of the elements as they are sung and so is best when listening to the actual song (www.privatehand.com/flash/elements.html). On this website, the song is sung by Lehrer himself. The other website to use has a photo of Tom Lehrer, as well as the actual words of the song (www.edu-cyberpg.com/IEC/elementsong.html) – you can copy and print these out if needed.

If the addresses given above do not work for some reason, just type these words into a search engine such as Google: Lehrer elements song – and many other sites will come up.

It is well known that songs help you memorise the information. Since print was invented we have forgotten our roots of why we sang songs to help us to remember. We sang history in verse after verse to remember our stories, before we invented reading and writing. Perhaps your students would enjoy trying to learn parts of this song!

The song, written in 1959, recites the names of all the chemical elements known at the time of writing, up to number 102, nobelium. The version at www.privatehand.com has a screen at the end which lists 8 of the elements discovered since the song and up to darmstadtium, discovered in 2003. The ordering of elements in the lyrics fits the meter of the song, and includes much alliteration, and thus has little or no relation to the ordering in the Periodic Table. This can be seen for example in the opening and closing lines:

There's antimony, arsenic, aluminum, selenium,
And hydrogen and oxygen and nitrogen and rhenium,
...
And argon, krypton, neon, radon, xenon, zinc, and rhodium,
And chlorine, carbon, cobalt, copper, tungsten, tin, and sodium.

It is interesting to note that Lehrer's performance of his 'Periodic Table' song is usually more monotoned than its source tune, and that Lehrer's song is accompanied solely by his own piano playing, as opposed to hearing a full orchestra when one listens to a Gilbert & Sullivan operetta. Also, Lehrer was a Harvard maths professor, and the final rhyme of 'Harvard' and 'discovered' is delivered in a parody of a Boston accent, so that the two words rhyme. Lehrer, a native of New York, does not normally speak with that accent. □

Science Updates

● Toxic time bombs

Thousands of ships sunk in the Second World War are seeping oil – and with their rusty tanks disintegrating, 'peak leak' may only be a few years away. Millions of tons of oil lost in sunken ships is threatening a new environmental disaster that could severely affect fisheries and marine life.

It is estimated that there are 8569 potentially polluting wrecks, 1583 of which were oil tankers. No one can know for sure how much oil is held in these ships. Many wrecks may have lost oil when being sunk due to major structural damage and so not pose a problem today. Exactly when a wreck will leak oil depends largely on how fast its steel corrodes. The rate of corrosion depends hugely on the circumstances of individual wrecks, e.g. water temperature, how much oxygen is available, how a wreck is lying on the seabed and affecting its structural integrity, etc.

For most countries, these old wrecks are out of sight and out of mind, until they start to leak. Then there is debate as to who should be responsible for the cost of cleaning up the oil. Once the oil spills it is a very expensive exercise to clean it up. It is actually preferable and cheaper to deal with the oil before it starts to leak, rather than trying to clear up after a major leak.

One possible method is for salvors to bore holes in a ship's tanks and heat the oil with steam lances to lower its viscosity, then pump it out. This technology for removing oil, known as hot tapping, is well established but it can be expensive, depending on the state of the wreck. This method was used for the ship

Jacob Luckenbach. Although not a wartime wreck, it is of a similar vintage, having sunk after a collision in 1953. Fifty years later, researchers found that the ship rocked from side to side on the seabed every time there was a heavy storm, releasing oil. NOAA and the US coastguards decided it would be best to remove the oil, so in 2003 salvors did just that at a cost of \$19 million (US). Another possible method to remove oil involves the use of oil-eating bacteria. □

[Source: *NewScientist* 4 September 2010]

● Cane toads fail to bring disaster

Back in 2008 scientists were reporting that 'as the toxic front of cane toads marches across Australia, it leaves mass death of crocodiles in its wake'. However, the cane toad may be one of the world's most unfairly maligned creatures. Despite its invasion of Australia, the cane toad has not triggered the overwhelming ecological disaster that some predicted.

Cane toads (*Bufo marinus*) were brought to Australia in the 1930s to eradicate a beetle destroying sugar cane. This outcome did not occur and they quickly spread. Last year, the toads were found in Australia's most western state for the first time.

Australia's frog-eating predators, including snakes, crocodiles and the northern quoll (a marsupial) have been dying *en masse* after ingesting the poisonous invaders. The worry was that mushrooming toad populations would outcompete native frogs and birds too. With the elimination of these native species seemingly imminent, an ecological catastrophe looked as if it would occur.

Studies of native frog populations and birds show that they do not appear to have changed significantly since the toads were introduced, and recent experimental studies show that while the toads do compete with frogs for food and egg-laying sites, they also help frogs by removing their predators. Many native species appear to have learnt to avoid the toads and the populations appear to be reviving. □

[Source: *NewScientist* 11 September 2010]

● Being happy

Happiness is good for your health, it makes you smarter – and our brains appear to be hard-wired for it. It would appear that we humans are built to experience happiness, and understanding why is helping psychologists work out what enhances our feelings of well-being. It even points to ways we can adapt to cope with the hardships a recession may bring, and keep smiling whatever happens.

Happiness and similar positive states of mind improve our cognitive capacities while we are in safe situations. They change the way our brains work, allowing us to take in more information, which allows us to build resources around us for the long term.

Experiments by psychologists have shown that positive moods increase and broaden the scope of visual attention, helping the brain gather more information. It has also been shown that feeling good improves people's creativity and ability to solve problems, it improves people's verbal reasoning skills, and social skills improve: people become more gregarious and trusting of others, and deal more constructively with criticism. □

[Source: *NewScientist* 25 September 2010]

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 Dec 3, 7–10, 13–17

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[Note: Luna Park is usually only open on Mondays & Fridays – but will be OPEN EVERY DAY IN LAST 2 WEEKS OF TERM 4]

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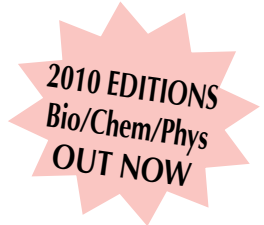
Physics is Fun was co-authored in 1983 by Robert Garner and Sylvia Jennings and was based on their earlier excursions at Luna Park in the 1970s. Robert has conducted these fun park excursions since their inception ... both at **Luna Park** (1983-1987, 1995, 2004-2010) and **Wonderland Sydney** (1990-2004) – covering many different subject areas. With the closure of Wonderland Sydney in early 2004, these Fun Park Excursions have been at **Luna Park Sydney** since its re-opening in April 2004.

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

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PhoTo Spot Effect of an enzyme on a starch granule

This SEM photograph shows a starch granule that has been attacked by the enzyme amyloglucosidase. Small granules of starch are gathered in the cavity of a large degraded starch granule due to surface tension.

The use of a biological molecule such as an enzyme to catalyse a specific chemical reaction is known as biocatalysis and such reactions are now a major part of biotechnology. Although enzymes are formed within living cells, they can continue to function *in vitro* (in the test-tube) and their ability to perform very specific chemical transformations is making them increasingly useful in industrial processes.

Amyloglucosidase is an amylase enzyme that decomposes starch into glucose by 'tearing-off' glucose units from the non-reduced end of the polysaccharide chain. Amyloglucosidase works in a similar way to salivary amylase, which is found in humans and converts starch into the sugar, maltose. Amyloglucosidase is produced by fungi, such as *Aspergillus* and *Rhizopus*. It is commercially derived by submerged fermentation of a specially selected producer strain of the *Aspergillus* fungus.

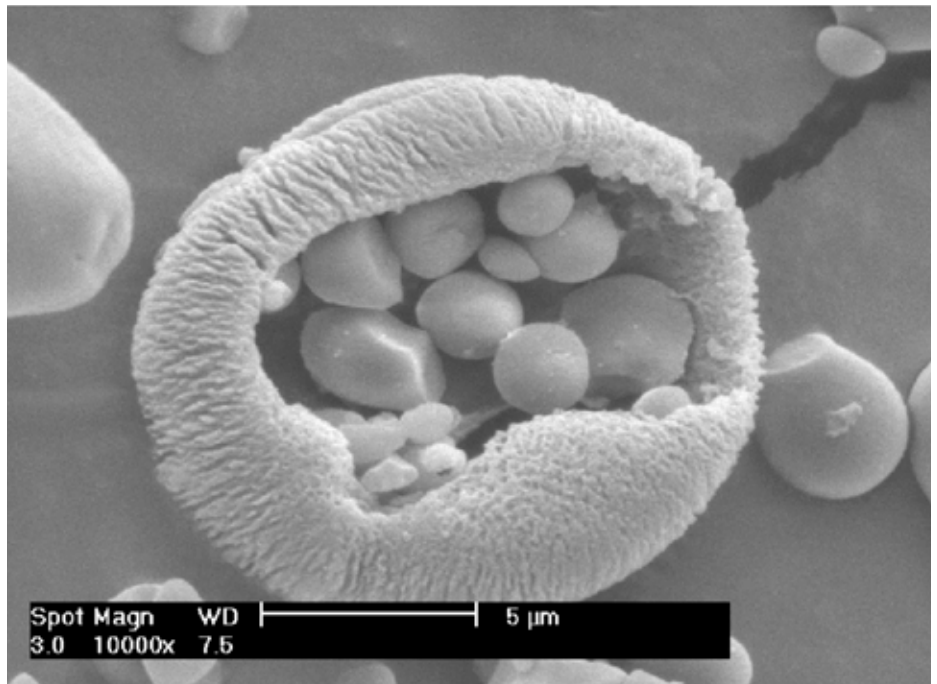


FIGURE 1: A scanning electron micrograph of a starch granule being attacked by the enzyme amyloglucosidase ... taken by Jaroslav Blazek, The University of Sydney Electron Microscope Unit.

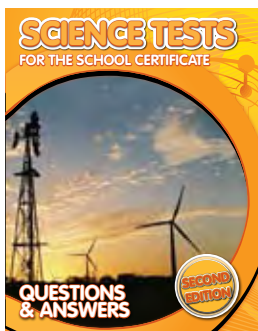
Starch is a macromolecule carbohydrate made up of bonded saccharide molecules. These saccharide molecules are biologically useful, e.g. as a source of energy. When the component molecules bond to form the starch polymer, a water molecule is eliminated at each bond. This type of polymerisation is called dehydration polymerisation.

Amylase enzymes such as amyloglucosidase catalyse the breakdown of starches into component molecules by allowing a water molecule to rehydrate the bonds in a process called hydrolysis. The water molecule splits to add an hydroxyl (OH) group to one side of the bond and hydrogen to the other side.

Amyloglucosidase is an important industrial enzyme used to manufacture high fructose corn syrup (HFCS). More than half of all commercial baked goods and practically all soft drink bottlers use this syrup instead of sugar because HFCS is both sweeter and cheaper. This glucose product has a bland sweet taste, and stores and ships well in drums or tank lorries. It therefore finds applications in canned fruit preserves, ice cream, bakery products, jam and all kinds of confectionery.

Large quantities of amyloglucosidase are also used as a booster in the fermentation of alcohol, e.g. in the brewing of beer, and also in the production of juices. Amylase enzymes are also used in bread making and the yeast can then feed on the simple sugars and convert them into the waste products of alcohol and CO₂. This imparts flavour and causes the bread to rise. □

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"Obstacles are those frightful things you see when you take your eyes off the goal."
 ... Hannah More (1745-1833)

Are you teaching the different text types in Science 7–10

... continued from page 1

in bullet 4/5.18 (a) that the student:

‘select, and use appropriately, types of texts for different purposes and contexts including a discussion, explanation, procedure, exposition, recount, report, response or experimental record for oral or written presentation’.

If students can learn to organise scientific information, they will have greater confidence when doing reports, assignments, practical write-ups and answers to exam questions. Their confidence in being able to write more easily and correctly will lead to greater self-esteem. Thus it is essential that we develop these literacy skills at all times in our students. Help your students by making sure they know the following different text types listed in the Science Syllabus and make sure that they know their purpose and get practice at using them all:

- *discussion* – presents opinions on an issue that are both ‘for and against’ or ‘positive and negative’ or ‘good and bad’
- *explanation* – tells how or why something happens, or gives reasons about something

- *procedure* – instructions on the method for doing something – written in present tense
- *exposition* – a detailed description of a theory or problem or proposal or about a text, discusses issues involved, attempts to persuade reader to believe it
- *recount* – information about what happened, when it happened, where it happened and who was involved – written in past tense
- *report* – contains detailed information about research or an investigation
- *response* – written as a reaction to an identified work, it describes the elements or features of the work and gives a judgement or evaluation of it
- *experimental record* – the results and conclusion for an experiment – results are written in past tense, conclusion in past/present tense.

[Note: There are many other text types apart from those above – the text types given here are those that students are expected to know from the syllabus.] □

Senior Science excursion

Many of the first-hand experiences in the Senior Science syllabus are covered by doing an excursion at Luna Park Sydney:

◆ **Preliminary Topic 8.4 Humans at Work**

– students assess the impact of science in the design/construction of safe rides; identify & assess potential hazards & factors that increase the risk of injury; perform an occupational health & safety style audit; & determine what safety measures are needed to protect the human body from injury.

◆ **HSC Option 9.8 Disasters** – students explore the possible consequences of a disaster such as the collapse of a ride at Luna Park Sydney, and how emergency services would assist in the minimisation of the effects of such a disaster.

◆ **HSC Topic 9.4 Information Systems** – students investigate the need/use of these.

◆ **HSC Option 9.5 Polymers** – students investigate the types used & their impact.

Interactive learning is a great way for students to learn and have fantastic fun at the same time. What better way to put fun into your lessons than to do a Physics is Fun *Senior Science excursion* at Luna Park Sydney! For details, see page 6 of this *SciTalk*. Enquiries are welcome – ph/fax: (02) 9939 6107. □

“Life is like riding a bicycle.
To keep your balance you
must keep moving.”

... Albert Einstein

Biodiversity and sustainability

Although it is nearly the end of 2010 and we are coming to the end of the International Year for Biodiversity, teachers need to be aware that biodiversity contributes to sustainability and so education in this area needs to be on-going.

Biodiversity means the richness and variety of life – of genes, species and ecosystems. Biodiversity maintains the health of the Earth and its people. It provides us with food and medicine and contributes to our economy. For example, we use plants and animals for food and medicine and we can harvest plants and animals and sell them to make money.

The higher the biodiversity of an ecosystem, the more sustainable it is. A higher/more biodiversity in an ecosystem means that there is a great variety of genes and species, which means that the ecosystem is better able to carry out natural processes (such as biogeochemical cycles, population dynamics, evolution, succession, etc) in the face of external stress. Conversely, lower/less biodiversity equals less sustainability.

Both today’s and tomorrow’s generations need to adopt a lifestyle that will help preserve the environment and enable our planet Earth to meet the needs of future generations. Sustainable development therefore needs to be encouraged – this aims to meet human needs in the present, while preserving the environment so that these needs can also be met in the indefinite future.

Sustainability involves the need to live in such a way that we do not exhaust environmental resources, we maintain biodiversity and we understand the many interconnections between economy, society and the environment. It is in everyone’s best interest to increase the sustainability of ecosystems.

Have your teaching programs for Science incorporated sustainability ideas yet? It is not too late to do something.

There are many ways that we can take action about sustainability – as consumers, households, businesses, manufacturers, etc. Some of the main things we can do to promote sustainability involve planning and managing ways to:

- reduce our consumption of water
- reduce our consumption of energy, e.g. walk rather use a car, put on a jumper if cold rather than use a heater, open a window instead of using air conditioning
- minimise wastes and use less chemicals
- consider the impact of products, not just when you use them, but how they have been manufactured and how they should be disposed of (reused, recycled, etc) – look for goods with little or no packaging.
- use efficient means of transport
- improve our care of the environment
- maintain biodiversity within the environment
- taking only the surplus of populations when fishing or hunting
- take care of the environment, especially when constructing built environments
- reduce pollution
- improve purchasing choices, e.g. actively seek out more sustainable products, buy less and buy smarter.

These may all sound familiar to us, but they are not yet being observed by everyone and should be. So make sure that you continue to advance the cause – not only this year, but forever. □



Spring to Summer Skies!

... Robert Garner & Catherine Odlum

The night skies going from Spring into Summer will provide some great viewing!

Tips for observing the night sky

Sky charts and/or planispheres (see Box 1) will help you to explore the night skies with either the naked eye, binoculars or, if you have one, a telescope. Books such as *Astronomy 2010* and *Astronomy 2011* will also help. Avoid street and other sources of light. It is always best to observe from a dark location away from city light pollution. Avoid direct light from streets and houses. You will see more after your eyes adapt to the darkness – about 10–20 minutes after you go outside. If you have to use a torch, cover the light bulb with red cellophane to preserve your dark vision. Even though the Moon is stunning to look at and often helps to locate various objects in the sky, its light is very bright and so you will actually see better on moonless nights around either New Moon or Last Quarter.

The Planets

Mercury will be hard to see as it will be either close to or below the horizon during this period. *Mars* will be low in the twilight western sky during Spring, but will be lost in the Sun's glow by late December and will not reappear until the evening skies of April 2011.

Jupiter is shining at its brightest at the moment (mag –2.9) fading to –2.5 by December. Over Spring and Summer, Jupiter continues its east to west retrograde motion until it is stationary on 19 November and thereafter resumes its normal west to east motion. The Moon will be close to Jupiter on 15, 16 November and 13 December.

Uranus and *Jupiter* will continue to be close in the skies until early 2011. This will provide a good opportunity for those with a telescope to look for Uranus (magnitude 5.8) and to also observe the motion of Jupiter's Galilean Moons.

Saturn will be in the eastern dawn sky from mid-November, along with the brighter Venus, which will be the 'Morning Star' until mid-July 2011. On 2 and 3 December the waning crescent Moon will pass above Saturn, Spica and Venus.

Earth will have its Summer Solstice at 10.38 am (AEDT) on 22 December with the Sun at its southernmost position. Sunrise will be at 5.41 am and sunset at 8:06 pm giving us our longest day.

Meteor Showers

The *Taurids South* meteors will peak around 5 November, *Taurids North* on 15 November and *Geminids* on 14 December. Best viewing will probably be in the Moon-free pre-dawn skies.

Exoplanets and 'Goldilocks planets'

An extrasolar planet, or exoplanet, is a planet outside the Solar System. As of 7 October 2010, astronomers have confirmed their detection of 492 exoplanets. Most exoplanets have been detected through radial velocity observations and other indirect methods rather than actual imaging, and are giant planets thought to resemble Jupiter. Several relatively lightweight exoplanets, only a few times more massive than Earth, have also been detected and projections suggest that these will eventually be found to outnumber giant planets. It is now known that a substantial fraction of stars have planetary systems, including at least around 10% of sun-like stars.

The discovery of extrasolar planets has intensified interest in the possibility of extraterrestrial life. As of September 2010, Gliese 581 g, fourth planet of the red dwarf star Gliese 581 (20.4 ly from Earth), appears to be the best known example of a possibly terrestrial exoplanet orbiting within the habitable zone that surrounds its star.

Such as planet is sometimes called a 'Goldilocks planet' because it falls within a star's habitable zone, although this term is often specifically used for planets close to the size of Earth. The name comes from the 'Goldilocks and the Three Bears' story, in which a little girl chooses an item that is 'just right' from sets of three items, ignoring the ones that are too extreme (large or small, hot or cold, etc). Similarly, a 'Goldilocks planet' is one that is neither too close nor too far from its star to rule out liquid water on its surface and thus life (as humans understand it) on the planet. However, planets within a habitable zone that are unlikely to host life (e.g. gas giants) may also be called 'Goldilocks planets'. The best example of a 'Goldilocks planet' is the Earth itself.

Colour of stars observed by Aborigines in Hyades

This time of the year is great for viewing the Hyades star cluster in the constellation *Taurus*, which can be found next to the familiar *Orion* constellation and to its south-west.

Taurus (see article in *SciTalk* No. 4, 2007) contains not only the well-known 'Pleiades' star cluster (see *SciTalk* No. 2, 2009), but also the 'Hyades' star cluster. Although the 'Hyades' is much closer to Earth (~151 ly) than the 'Pleiades' (~440 ly), it is not as bright because there are more stars closer together in the 'Pleiades'.

The 'Hyades' star cluster is the nearest open cluster to our solar system and contains about 300–400 stars. It is easily viewed as a naked-eye/binocular object. The four brightest member stars of the 'Hyades' are all red giants and along with Aldebaran, the still brighter red giant star to its right, they form a 'V' shape that is described as the head of Taurus the Bull. (Aldebaran is completely unrelated to the 'Hyades', even though it is a part of the *Taurus* constellation.) The 'Hyades' cluster also contains about some white dwarf stars.

The Aboriginal people were curious about their world. The 'Hyades' is a good illustration of how the Aborigines observed the night sky and classified the physical characteristics of the stars above them. For example, the Aranda tribes of Central Australia, distinguish red stars from white, blue and yellow stars. They classify the bright star Antares (Alpha Scorpii) as *tataka indora* (very red) while the stars of the V-shaped 'Hyades' cluster, which represent for them two rows of girls, are divided into a *tataka* (red) group and a *tjilkera* (white) group. The former are said to be the daughters of the red star Aldebaran (Alpha Tauri).

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 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, 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. Bookings are essential – ph 9850 4409 or email starinfo@mq.edu.au before 4 pm. If doubtful weather, phone 9850 8914 or check at www.astronomy.mq.edu.au/observatory/

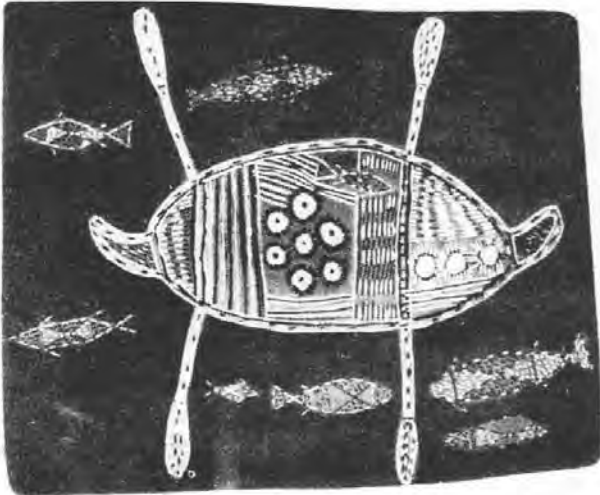


Figure 1: Drawing of a bark painting representing the stars of Orion, the Pleiades and the Hyades.

The three stars at the end of the canoe are Orion's Belt, the group of seven in the middle are the Pleiades, their wives. The paddles of the canoe are long lines of stars stretching out to north and south and including some from the constellations of Gemini and Eridanus. The fish in the canoe is the constellation Hyades and the fish in the water are stars in the Milky Way.

Credit: Mountford Collection, State Library of SA.

Reference:
'Explorers of the Southern Sky' Haynes, *et al* (1996)

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>

BOX 2 Cumulative index for 'Some Aboriginal perspectives on astronomy' series

You can read past articles in the 'Aboriginal perspectives on astronomy' series by going to the following past issues of *SciTalk* at www.odlumgarner.com –

- The Emu ... *SciTalk No. 1-2004*
- The Southern Cross ... *SciTalk No. 3-2008*
- The Moon ... *SciTalk No. 1-2009*
- Pleiades ... *SciTalk No. 2-2009*
- The Milky Way ... *SciTalk No. 3-2009*
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- The Beehive Cluster ... *SciTalk No. 1-2010*
- Venus ... *SciTalk No. 2-2010*
- The Sun and Moon ... *SciTalk No. 3-2010*
- Colour of stars in Hyades ... *SciTalk No. 4-2010*

Remember that dreaming stories and characters vary among Aboriginal groups. Although they may share many of the same beliefs, the messages and the characters in their stories are different. The various Aboriginal groups divided the night sky into about 40 different constellations. They named them after different native birds and animals, including crows, eagles, parrots, lorikeets, emus, eagles, tortoises, kangaroos, brolgas, dancing men and song men. □

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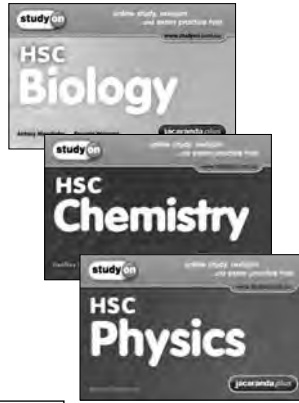
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SciTalk aims to provide science teachers with up-to-date information, important dates, the latest products available, plus 'what's on' in various excursion venues, and more.

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.

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CONTRIBUTIONS

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- *SciTalk* No. 3–August 2011 ... July 1
- *SciTalk* No. 4–October 2011 ... Sept 23

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