Can anti-aging treatments save us from the looming threat of a nuclear WW3??

The life expectancy for Australians is around the mid 80s. While this easily outstrips our pet dogs and cats, and is much longer than the average insect, many humans feel it is not long enough. Even more so, many humans in their senior years start to feel like a young person trapped in an aged body, as cellular damage accumulates. The good news is that scientists are busily investigating this problem.

One such study has focused on telomeres. Each chromosome has a protective structure at its end called a telomere. However, each time chromosomes replicate for cell division, the telomeres become shorter. Once the telomeres are too short, the cell can no longer reproduce. Telomerase is an enzyme naturally produced in the body, which reduces telomere shortening. Several antiaging studies have focused on stimulating increased telomerase production to reduce the effects of aging. One such study used



Figure 1 Strands of DNA

[Credit: pixabay.com CC0]

a synthetic male steroid hormone called danazol, which is known to promote production of telomerase.

However, before you are tempted to buy telomerase supplements from eBay, it is important to note a few caveats to the research. Excessive telomerase is a key marker of cancer cells. In fact, telomerase contributes to the ability of cancer cells to rapidly reproduce over and over. Furthermore, studies with drugs such as danazol have only been applied to patients in small trials focused on specific conditions, such as aplastic anaemia (which is a disease involving premature aging of bone marrow stem cells). While small trials with such patients have shown signs of success, they have also had significant associated side effects. So unless your doctor has suggested otherwise, telomerase supplements should definitely be placed in the 'don't try this at home' category for now.

Another focus of anti-aging studies is NAD⁺ (nicotinaminde adenine dinucleotide). Studies have shown for some time that injecting older mice with NAD⁺ makes them appear younger. But how does it work?

Recent studies examining the biomolecular pathways of NAD⁺ have suggested that NAD⁺ can help protect DNA from damage

... continued on page 4

\star 2017 editions Past HSC Questions & Worked Solutions ... see p5 \star

INSIDE THIS ISSUE >>>> Astronomy: Spring and summer viewing......6 • Can anti-aging treatments save us?..... 1 & 4 Book to win: Astronomy 2018......6 Book Giveaway: Blitzing Biology 111 Sky Charts and Planispheres6 Diary Dates / NESA Update2 Macquarie Uni Observatory & Planetarium 6 Out and About3 Beyond the Thrills excursions to Luna Park 7 Depth Studies? No worries!.....4 & 7 Museum of Human Disease7 • Blitzing Biology 11 - out now!......4 • Competition Corner: HSC Chemistry Q&A8 2017 Past HSC papers and answers books5 NewScientist: Special Education Price8 Science Tests for Year 105 • Fizzics Education: School Science Visits 8 Understanding Science: Yrs 7&8 / Yrs 9&105 Prizes to win: Luna Park Sydney9

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Jeanette Armstrong, Lisarow HS, won *Physics* Past HSC Papers & Worked Solutions 2011-2016
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iaky Dates

2017 is the UN International Year of Sustainable Tourism for Development

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3, 6, 17 Beyond the Thrills at Luna Park Sydney. www.beyondthethrills.com.au ph (02) 9939 6107

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1-15 Beyond the Thrills at Luna Park Sydney. www.beyondthethrills.com.au ph (02) 9939 6107

8 ANSTO Teacher PD Day: about teaching nuclear science to Yr 9 & Physics

• 11–15 Curious Minds Program – for Yr 9/10 girls interested in STEM. www.asi.edu.au/programs

22 Summer solstice (03:27 am AEDT)

2018

For Shell Questacon Science Circus: NSW dates, go to: questacon.edu.au/outreach/programs/science-circus

JANUARY 2018 National Youth Science Forum. Forms to local Rotary club by 31/5/17, interviews from July. Only for Yr 11 in 2017. Enquiries: 6125 2777, email: nsss@anu.au, www.nysf.edu.au/

• 5-21 2018 Australian Science Olympiads Summer School. www.asi.edu.au/programs

7-12 2018 STEM X Academy – at ANU, Canberra (asta.edu.au/programs/stemx)

MARCH 2018

2 Schools' Clean Up Australia Day. cleanupaustraliaday.org.au/about/about-the-event/

4 Clean Up Australia Day. cleanupaustraliaday.org.au/about/about-the-event/

16, 19, 23 Beyond the Thrills at Luna Park Sydney. www.beyondthethrills.com.au ph (02) 9939 6107

21 Autumn Equinox (03:15 am AEDT)

• all Tm 2 NSW Crystal Growing Competition - start growing crystals are to be grown in Term 2

APRIL 2018

9, 13 Beyond the Thrills at Luna Park Sydney. www.beyondthethrills.com.au ph (02) 9939 6107 22

International Earth Day, www.earthday.org

MAY 2018

7,11,18, 21, 28 Beyond the Thrills at Luna Park Sydney. www.beyondthethrills.com.au ph (02) 9939 6107

b/w 9-16 Big Science Competition. Closing date: 2/5/18. www.asi.edu.au/programs Ph: 6125 6228 tba Astronomy Open Night: Macquarie Uni, 6:30–10 pm, details/tickets at www.mq.edu.au/

JUNE 2018

5

1, 4, 8, 15, 18 Beyond the Thrills at Luna Park Sydney, www.beyondthethrills.com.au ph (02) 9939 6107

World Environment Day. www.un.org/en/events/environmentday/

around 16 (tbc) NSW Schools Titration Competition. Entries close in May. raci.org.au/branches/nsw-branch

Winter Solstice (08:07 pm AEST)

30 (tbc) Close date Crystal Growing Competition (growin Tm2): raci.org.au/branches/nsw-branch

JULY 2018

8 - 11CONASTA 67 – annual conference of Australian Science Teachers Association (ASTA).

Theme: Spotlight on Our Future. Venue: Sydney University.

11-14 Curious Minds Program – for Yr 9/10 girls interested in STEM. www.asi.edu.au/programs

31 (tbc) ANCQ (Australian National Chemistry Quiz). schools.raci.org.au/competition/ancq/

AUGUST 2018

8 Chemistry Olympiad Exam. Closing date: 18/7/18. Ph: 6201 2552, asi.edu.au/programs

10 Earth Science Olympiad Exam. Closing date: 18/7/18. Ph: 6201 2552, asi.edu.au/programs

3 Jeans for Genes Day. www.jeansforgenes.org.au/

13 Biology Olympiad Exam. Closing date: 18/7/18. Ph: 6201 2552, asi.edu.au/programs

15 Physics Olympiad Exam. Closing date: 18/7/18. Ph: 6201 2552, asi.edu.au/programs

10, 13, 17 Beyond the Thrills at Luna Park Sydney. www.beyondthethrills.com.au ph (02) 9939 6107

- come on any of these dates to celebrate National Science Week

11-19 National Science Week. 'Game Changers & Change Makers'. www.scienceweek.net.au/schools/

SEPTEMBER 2018

4-10 Seaweek 2018. www.aaee.org.au/seaweek/ & www.aaee.org.au/seaweek-resources/

10, 14 Beyond the Thrills at Luna Park Sydney. www.beyondthethrills.com.au ph (02) 9939 6107

• tba National Schools Titration Competition. raci.org.au/branches/nsw-branch

Spring equinox (11:54 am AEST)

OCTOBER- DECEMBER 2018

Beyond the Thrills at Luna Park Sydney. For dates please go to: www.beyondthethrills.com.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.

Update on NESA matters

All teachers must regularly check NESA's website at: educationstandards.nsw.edu.au to ensure they have the latest information on syllabuses, past exam papers, news, official notices, statistics archive and more.

You need to be aware that syllabuses must be constantly checked now, as clarifications and amendments can occur at any time to ensure that you are teaching the correct work. Make sure that from the 2018 Year 11 you are teaching the new Stage 6 syllabuses. These will be examined for the first time in the 2019 HSC.

NESA has just released the HSC exam specifications to align with the new syllabus content and directions. These specifications are available now on the NESA website.

Some NESA official notices from 2017 that Science teachers need to be aware of:

- Errata new Biology & Physics Syllabuses for implementation with Year 11 from 2018 [8-9-17]
- · Clarification New Physics Stage 6 Syllabus for implementation with Year 11, 2018 [25-8-17]
- · Changes to Stage 6 Science Pattern and Pathways of Study [21-6-17]

For the 2019 HSC examination students can study up to 7 units of Science in Year 12 - this is to allow for the study of Science Extension in Year 12.

- Clarifications and errata new Biology, Chemistry and Physics Stage 6 Syllabuses for implementation with Year 11, 2018 [30-3-16]
- ... plus these earlier ones:
- Minor edit for HSC Physics Data Sheet [10-2-17]
- Student work samples to be retained for Stage 5 and Preliminary courses [27-2-17]
- New Periodic Table for HSC [19-5-16]

You can be sent weekly emails by NESA to keep you abreast of NESA matters.

NESA enquiries:

Ph: 9367 8111, fax: 9367 8484 educationstandards.nsw.edu.au

Science contact: Kerry Sheehan Senior Inspector and Inspector Science kerry.sheehan@nesa.nsw.edu.au Ph: (02) 9367 8144

NOTE: When you purchase the Odlum & Garner Past HSC Questions & Worked Solutions books for Biology, Chemistry and Physics, you are helping to support the production of the Past HSC books for Earth & Environmental Science and Senior Science.

Thank you to all the teachers who support these projects.

* * * * *

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Contact: 02 9385 1522 diseasemuseum@unsw.edu.au







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- a depth study workbook with resources and ideas for in-class research activities.

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Website: www.ansto.gov.au/education

Email: tours@ansto.gov.au Phone: (02) 9717 3090

Location: New Illawarra Rd, Lucas Heights

Beyond the Thrills

Our prices for school excursions to Luna Park Sydney are the lowest available @ \$28.50 per student and our booking fee is also the lowest, at only a low \$25 per school.

Any school or any school faculty can come for just a fun day – OR we can provide curriculum-based worksheets (if required) for an educational excursion. These excursions will provide your students with a great action-packed fun day.

For more details and bookings, go to:

www.beyondthethrills.com.au

T: (02) 9939 6107 E: robert@beyondthethrills.com.au

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*.

Program is 4 hours, at a cost of \$22.00 per student (teachers free).

Bookings & Information:

Phone: 02 9298 3655 Fax: 02 9298 3660 Email: bookings@anmm.gov.au Location: 2 Murray Street, Sydney 2000

Website: www.anmm.gov.au/



NewScientist

Some NewScientist Events are now held in Australia!

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Children must be taught how to think, not what to think.

.... Margaret Mead (1901-1978)

Depth studies? No worries!

With the new Stage 6 Science syllabuses entering our classrooms in 2018, many teachers are feeling stressed about depth studies. While there is no singular approach to fulfilling the syllabus depth study requirements – there are certainly several ways that should feel like familiar territory and reduce your stress as you program for next year.

One of your assessments for each Year 11 Science course in 2018 will be a depth study. The depth study has to relate to at least one aspect of the course content (one Knowledge and Understanding outcome). But let's be

honest – have you ever given your students an assessment that didn't relate to at least one content outcome!? This should be a fairly easy box to tick.

The depth study also needs to include a range of skills (from the Working Scientifically outcomes). It is compulsory for depth studies to involve outcomes for *Communicating*. This

should occur quite naturally, as long as your depth study involves students sharing their

Science questions 21st Century

communication thinking processing problem solving scientific method literacy

and Understanding outcome). But let's be depth study involves students shar

work in a written, verbal or digital media format.

The depth study must also fulfill the outcomes for *Questioning and Predicting*. This is suggestive of choosing to either do a practical investigation (which should naturally involve a research question and hypothesis) or a research task — which should involve research question(s). If you are doing a research task, ensure students are given an opportunity to predict the solutions and hypothesise regarding their research questions before diving straight into secondary sources.

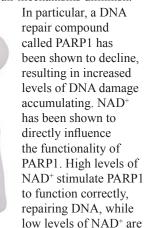
On top of this, your depth study needs to include two more skills of your choice from the Working Scientifically outcomes. If you are doing a practical investigation, it should be quite straightforward to fulfill the skills outcomes for *Planning Investigations* and *Conducting Investigations*. If you are doing a research task, this will be a good match for addressing the skills outcomes for *Analysing Data and Information* and *Processing Data and Information*.

The depth studies leave plenty of room for freedom. You may choose to give students

... continued on page 7

Continued from page 1 ...

associated with aging. Cells have natural mechanisms to repair DNA from damage. However, as we age, our DNA repair mechanisms diminish.



linked to decline in PARP1 functionality.

So when can we get our booster shot of NAD+?

Trials focused on NAD+ in mice have shown success to date. Mice have been

given a precursor to NAD+, known as NMN (nicotinamide mononucleotide). These mice showed subsequent repair of DNA damage, effectively reversing some of the effects of aging. Currently, trials are being planned to explore the effectiveness of giving humans NMN. Should such trials be successful, somewhere down the line you and I might be able to get our hit of NMN to stay sprightly and young. Perhaps more importantly in the current political climate, NMN holds the potential to help repair DNA damage from mutagens – such as nuclear radiation.

Want to learn more about this topic? And find out how a low calorie diet might just make you live longer? Then watch the SciShow video 'Why We Age — And How We can Stop It' (2012) on Youtube.com

References:

- www.sciencealert.com
- The New England Journal of Medicine (nejm. org/doi/10.1056/NEJMoa1515319)
- Science 24 Mar 2017: Vol. 355, Issue 6331



Stop stressing about the new Biology syllabus...

Blitzing Biology has ready-to-go student activities and worksheets covering the new syllabus – perfect for use in the classroom and at home for student revision

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www.blitzingbiology.com.au



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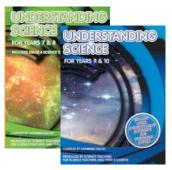
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Spring and summer viewing of the night skies ... Robert Garner

Viewing becomes a warmer event at this time of year - and so a pleasant and informative way to spend an evening looking at the night skies.

For a good night's viewing, your students will need to know the compass directions (these are on most mobile phones) and a star chart (see Box 1). Optional extras are a small pair of binoculars and a torch covered with red cellophane to read and record their notes.

The Planets – using the Moon to guide you

Looking for a planet when it is near the Moon is a great way to locate a planet, if you are unfamiliar with the night sky. Remember, when looking for a planet, Venus and Jupiter are the two brightest celestial objects after the Sun and the Moon.

The end of 2017 is not a good time for viewing the planets, as Mercury and Saturn will be low in the western twilight sky, while Venus, Mars and Jupiter will be low in the eastern pre-dawn sky.

Nevertheless, some good dates for finding planets near the Moon:

- *Mercury:* on 20 November, about an hour after sunset, it will be above the Moon in the western sky and slightly to the south.
- Mars & Jupiter: on 14–15 December they will close to the Moon and getting closer together, and will be only 3° apart on New Year's Eve and even closer at 0.2° apart on 7 January 2018.
- Saturn: on 21 November, it will be low in the west near sunset.

Stars and constellations

The best constellations to look for will be *Orion* (the hunter), with its bright stars Rigel (a blue-white star) and Betelgeuse (a red star), and *Taurus* (the bull), which will be to the east of *Orion*. As we head into summer, these will be seen high in the sky overhead each night and slightly to the north-west.

In *Taurus*, you should be able to see the beautiful star cluster, The Pleiades – also known as 'The Seven Sisters' or as Subaru to the Japanese. These are visible with the naked eye, but much better with binoculars or a telescope.

If you look at around 9 pm, you will find Crux (Southern Cross)

lying on its side with its two pointers – *Crux* will be low in the southern night skies and by January will have rotated more to the south-east.

Meteor showers

The Orionids (in *Orion*) will be active from 2 October–7 November, peaking around 21 October. The Geminids (in *Gemini*) will be active from 4–17 December, peaking about 13–14 December.

If you want good viewing, get away from city lights if you can, avoid a bright Moon, allow 20 minutes for your eyes to adapt to the dark, and schedule your viewing after 1 am or even later. Remember, meteors tend to come in spurts, interspersed by quiet periods.

Solstice

The summer solstice occurs at 3:27 am (AEDT) on 22 December 2017. This is when the Sun's track across the Australian sky reaches its highest point. It is the day that has the most daylight hours of any in the year. Although the term *solstice* only strictly applies to an instant, the term is usually applied to the whole day. It is derived from Latin: *sol* (= Sun) and *sistere* (= stand still).

International Space Station (ISS)

The ISS orbits Earth once every 90 minutes at about 400 km altitude and a speed of about 28,000 km h⁻¹. From Earth, the ISS appears as 'a bright star' steadily moving across the night sky, as its solar arrays reflect sunlight. It can sometimes be seen from Sydney with the naked eye, e.g. on 20 December, which is a good time to look as it is two days after a New Moon, there will be 2 passes: between 20:33:54 to 20:37:32 pm, as it moves NNE to E at a low elevation (about 10° above the horizon), and again from 22:08:42 to 22:15:00 as its next orbit takes it from WNW to SSE across the sky, at an elevation of up to 40°. Predictions for when the ISS can be observed are at: www.heavens-above.com

Using a Sky Chart / Planisphere

Remember, viewing the night skies is much simpler if you have a Sky Chart or Planisphere. See Box 1 to easily obtain one of these.

Box 1: Sky Charts & Planispheres

- You can download free sky charts each month to explore the night sky from: www.skymaps.com/downloads.html Make sure that you scroll down to 'Southern Hemisphere Edition'.
- A planisphere (star wheel) helps to find stars and locate constellations. These are inexpensive and available from astronomy shops, or you can download one – make sure it is for the Southern Hemisphere. While the site itself is out-of-date, there is a planisphere (star wheel) to print and use at: http://members.ozemail.com.au/~starrylady/resources.html

MACQUARIE UNI ASTRONOMICAL OBSERVATORY & PLANETARIUM SESSIONS

The Macquarie University **Astronomical Observatory** (access via Gymnasium Rd) is open to the public every Monday and Friday night (Jan–Nov inclusive). It runs from 8–9.30 pm (in AEDT) or 7–8.30 pm the rest of the year. Bookings are essential and must be made online. If doubtful weather, you will be sent an email and get a refund.

There are also **planetarium sessions** on the first Thursday of each month (Mar–Nov, not June) from 6:30–7:30 pm at Macquarie Uni. Tickets must be booked online. These sessions are not weather dependent.

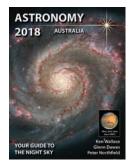
For details & bookings, go to: www.physics.mq.edu.au/astronomy then in 'Engage with us', look for 'Visit the Observatory' or 'Visit the planetarium'.

ASTRONOMY 2018 – YOUR GUIDE TO THE NIGHT SKY

by Ken Wallace, Glenn Dawes, Peter Northfield (RRP \$29.95)

For beginners to advanced amateur astronomers, this book is great for observing the night sky with just your eyes, a pair of binoculars or a telescope.

With its many pages of facts, figures, charts, illustrations & maps of stars and planets for 2018, this book is great for Science teachers to guide their students in observing the night skies. This book and a good planisphere are



great tools for those first learning their way around the sky.

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Continued from page 4 ...

extensive choice in pursuing a research or practical topic in which they are interested, or you may choose to be entirely prescriptive and instruct students to research a specific topic of your choosing, or do a specific practical investigation of your choosing. More openended tasks may increase student interest, while more prescriptive tasks will most likely be more easy when it comes time to marking consistently.

The programmed timing of the syllabus gives you 15 class hours to work on the depth study. This gives you the flexibility to scaffold and guide students through your chosen task. You may find this is a chance to have students preparing more of their work in class, benefitting from your guidance as a teacher and reducing the temptation for tutors or parents to provide a little too much assistance. Another way to easily achieve the 15 class hours is to link your depth study to an excursion or field trip.

So take a breath, have a cup of tea, and remember that the depth studies give you the freedom to choose – would you like to try something new and different? Or would you like to just tweak an existing research or investigation task to tick the depth study boxes? It's up to you!

By the time the Year 12 Depth Study comes around, you will hopefully feel like an expert at conducting a Depth Study.

The best preparation for tomorrow, is doing your best today.

.... H Jackson Brown, Jr. (b.1940)

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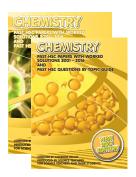
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SciTalk 1/17 winner: Anastasia Giouroukelis, St Charbel's College, won Biology 2001-2016 Past HSC Papers with Worked Solutions (rrp \$39.95), published & donated by Odlum & Garner.

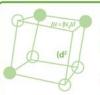


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QUIZ QUESTION:

What name is given to chemical elements with an unstable nucleus?

SciTalk 1/17 answer: Mitochondria



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CONTRIBUTIONS

SciTalk is now a bi-annual newsletter and due into schools in March and mid-year. All contributions should be directed to the Editor (see below).

CLOSING DATES

- SciTalk No. 1 March 2018 ... closes 20 Dec 2017
- SciTalk No. 2 August 2018 ... closes 6 July 2018

ADVERTISING & INSERTS

All enquiries to the SciTalk Editor:

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