STATIC

The Newsletter of the Science Teachers Association of Tasmania.

National Science Week: Destination Moon

August 2019, Volume 2

stat. Science Teachers Association of Tasmania Inc.

STAT on social media.

STAT Council Members

President & ASTA Council Representative Jenny Dudgeon Sustainability Learning Centre, Hobart College, Mt Nelson	***STATcouncil@gmail.com*** **STAT** **PO BOX 1112** **Sandy Bay TAS 7006**
Past President & ASTA Council Representative and STAT Bulletin Rosemary Anderson Department of Education – Curriculum Services Hobart	**Membership Officer** Chloe Simons Woodbridge Marine Discovery Centre, Woodbridge.
Secretary John Bardenhagen John.bardenhagen2017@gmail.com	**Treasurer** Sonya Matthews Prospect High School, Launceston
TSTS Co-ordinator Doug Grubert tsts.director@gmail.com	**Awards Officer** Ann Burke Marist Regional College, Burnie
National Science Week Contact Denise Devitt ScienceWeekTas@gmail.com Hobart	**University of Tasmania** College of Science and Engineering Representative Jeannie-Marie LeRoi University of Tasmania, Hobart jeanniemarie.leroi@utas.edu.au
STATIC Editor Bob Fletcher Lambert School, Hobart **STATIC Editor email** *editorstatic@gmail.com*	**General Councillor** Heather Marshall St Marys District School
Social Media Co-ordinators Mark Cox Launceston Church Grammar School mcox@lcgs.tas.edu.au Luke Hammond Scotch Oakburn.	**General Councillor** Amanda Hughes St Marys District School (Currently on Leave)
General Councillor Associate Professor Sharon Fraser Science Education College of Arts, Law and Education (CALE) University of Tasmania, Launceston	**STATIC Editor email** *editorstatic@gmail.com*

Contents

From the Editor…

National Science Week, 2019…Destination Moon

To mark the fiftieth anniversary of the first moon landing, this year's National Science Week theme was 'Destination Moon'. Fifty years ago, the world held its breath as a footprint was made on a body in space other than Earth for the first time. There were moments etched in history that day, as Neil Armstrong broadcast the news that "The Eagle has landed". Over six hours later, he descended the ladder onto the lunar surface, stating "That's one small step for a man, one giant leap for mankind." The 'a' was rehearsed beforehand and Neil claimed he did say this, but the sound was buzzed out by static, leading to possibly one of the most widely misquoted utterances in science history. After two and a half hours on the moon, Buzz Aldrin and Neil Armstrong returned to the lander, re-joining Michael Collins, with the help of a pen to fix a faulty switch and returned to Earth as heroes.

Our view of space has forever been infused with awe and wonder, as in Shelley's Queen Mab from 1813,

Below lay stretched the universe.

There, far as the remotest line

That bounds imagination's flight,

Countless and unending orbs

in mazy motion intermingled,

yet still fulfilled immutably

eternal nature's law.

We do of course, live in a country that has been turning to space for thousands of years and forging meaning behind what we see. This has included stories about star clusters like Pleaides, the entire Milky Way and the Moon itself. In the words of Bill Neidjie, "So moon say again, Man will come back, like I come back each time. He'll come back to Earth. I look at moon. It tell me story, like stars. Moon…moon is man. He said 'These people will die, but they'll come back…like I do. They'll come back to be earth again." And so, the lunar cycle becomes the very cycle of life and death.

The idea of actually travelling to the moon was the realm of early science fiction, such as Jules Verne's 1865 novel 'From the Earth to the Moon', whose astronauts were fired from a space gun and HG Wells' 'The First Men in the Moon' from 1901, in which a material called cavorite allows gravity to break down. The magical world of cinema was transformed by the fourteen-minute epic (for its time), 'Le Voyage Dans la Lune', a wonderous visual feast from Georges Melies, including the famous scene, in which the missile-like rocket crashes into the eye of the moon.

It was Robert Goddard, an American engineer and physicist who actually thought of a trip to the moon as reality, despite general derision from his peers. Born in 1882, he began experimenting with liquid fuel rockets, calculating energy to weight ratios and using gasoline and liquid oxygen. In 1914 he patented a rocket design, which was finally launched successfully in 1926. The three metre Nell rocket was lit using a blowtorch, travelling for 2.5 seconds at 96 km/hr, reaching an altitude of 12 metres. Despite being 400,000 km short, his vision for lunar travel formed the basis for rocket science today.

On the eve of the Second World War, a German engineer, Walter Dornberger felt he had ushered in a new era of space transportation by developing the ballistic missile in 1938. This technology was enhanced by the Nazi war effort and morphed into the V-2, a terrifying missile with 320km of range at 5,600 km/hr. When its fuel elapsed, its erratic flight path ended, simply dropping onto civilian targets causing huge devastation. This paved the way for the development of guided missiles.

Emerging from this terrible legacy however, the original vision of Goddard and Dornbeger could be realised. In 1961, Yuri Gagarin had orbited Earth and six weeks later, JFK was pitching the Moon landing to congress. On September 12th, 1962, John F. Kennedy announced the ultimate STEM project at Rice University.

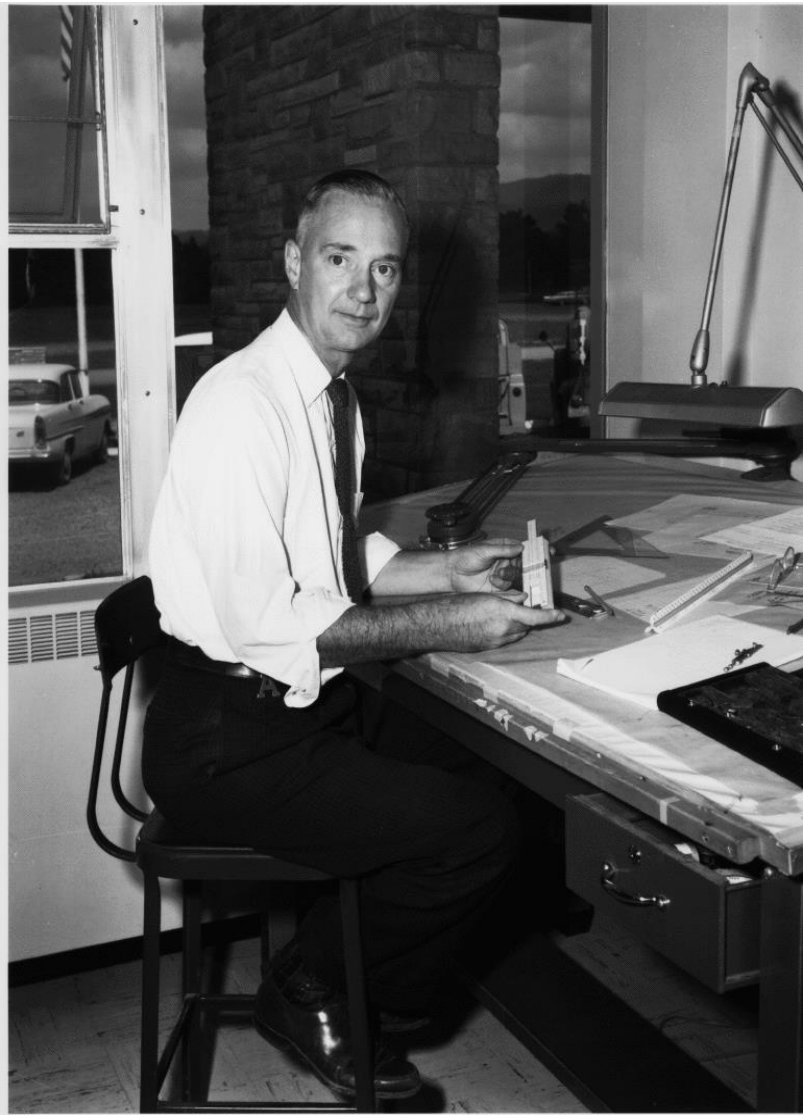
“We choose to go to the Moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organise and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win.”

In the space race, there had been a Soviet victory in the shape of Sputnik and the success of Vostok I, but they were never planning to send cosmonauts to the Moon. This was a political move on behalf of the USA and it has taken 50 years for scientific justification for a lunar return. The Moon’s lower gravity means less force required for launch and the presence of ice means a ready supply of hydrogen and oxygen for use as rocket fuel. Could the Moon be the launchpad for future space exploration? Could one of our students become the first person to take off from the Moon, bound for further destinations in the solar system?

Space remains a fascinating and engaging aspect of the science curriculum and the National Science Week resource book is packed with ideas for the classroom. There were many activities during Science Week itself, spread right across the State. In this edition of Static, we meet Grote Reber, whose ground-breaking research in radio astronomy was partly set in Tasmania. We review, and offer a chance to win, the new third edition of ‘The Art of Teaching Science’. There is also an overview of National Science Week and the recent Conasta 68 held in Darwin. We also have the latest STEM opportunities, science discoveries and news. Enjoy!

Scientist in Focus

Grote Reber



Radio Waves from Space

In 1931, attempts were being made to develop transatlantic telephone calls carried by short-wave radio signals. However, it soon became clear that static would distort signals, so Bell Laboratories commissioned physicist Karl Jansky, who set out to find the source of the static. Since the 1950s we have been familiar with the use of weather radar, so it is no surprise that storms were part of the signal found. However, a regular background hiss was also present, pulsing daily from the direction of Sagittarius, the centre of our galaxy.

From Illinois, a ham radio operator decided to investigate further by engineering a steerable parabolic reflector and mapping these radio sources from space. His name was Grote Reber and Tasmania was soon to be his home. He realised that Jansky's discovery was

significant, but that the technical quality of equipment at the time would not be sufficient to extend beyond its narrow limits.

The Significance of Radio Waves

Radio waves from space are weak and long. The wavelength is between 1mm and 30m and equipment needs to be highly sensitive. The total energy received through radio waves from space is less than the energy you are using reading this. Therefore, innovative techniques are required to pick these signals up. Sir Martin Ryle connected several small telescopes along the Oxford to Cambridge railway, to act as an effective single 5km telescope. Simultaneously linking receivers on opposite sides of the globe has yielded sensitivity equivalent to seeing a human hair from a distance of 10km. Telescope arrays, such as the Very Large Array in New Mexico and the Square Kilometre Array in Australia are based on this idea. Extending our senses in this way, enables us to study individual features such as Cygnus A or the Andromeda galaxy, as well as mapping the structure and rotation of the Milky Way. The 21cm wavelength of hydrogen is a particularly important area of study, since hydrogen is the most common element in the universe. Reference to this has been made on the disc carried on the Voyager spacecraft which relays human cultural references and knowledge. It is thought that any intelligent life finding Voyager would be able to interpret this through their knowledge of the hydrogen radio waves.

Grote Reber: The Innovator

Grote Reber was born on the 22nd December, 1911 in Wheaton, Chicago. He remained in Illinios to gain a degree in electrical engineering and worked for various radio companies. In 1937, following Karl Jansky's discovery of radio waves from space, he built the first parabolic reflector telescope in his back yard to map these radio sources. This is now on display in West Virginia. He first published in 1940 and by 1943 had completed an extended version of his radio sky map. This was to pave the way for all future research, providing the means of detecting radio waves and locating sources.

By the 1950s, research was progressing quickly with the development of high-tech equipment. However, medium frequencies were not being observed, so he chose to move to Tasmania in 1954 and work with Bill Ellis at UTAS. It takes long, cold and still winter nights to allow the atmosphere to produce conditions conducive to this kind of observation, along with little other sources of radio waves, so Tassie was perfect.

In the 1960s, he built a house 7km outside of Bothwell on sheep grazing land known as Dennistoun. This began as a load of bolts bought at auction, which ended up holding the building together. He imported double glazing, which he installed north facing, coupled with many elements of passive thermal heating design. When operating an oven in the kitchen, the temperature would reach 50 degrees Celsius, due to the thermal efficiency of the design. He also planned to use dolerite as a heat sink in the house, but found it too difficult to move as he got older. This does prompt the thought that we could be sitting on a major design resource as we develop more energy efficient building materials.

He was a visionary in many ways, with many innovative designs to his credit. At Bothwell, he hooked up a long wire across lines of telegraph poles to act as a radio wave receiver. He built an electric car, although this is a surprisingly old idea, the first being conceived in 1842, over forty years before the conventional motor car. The photographs of Grote Reber show a face sparkling with intelligence and curiosity, self-assured in his unique way of thinking. His resolutely independent thoughts included the interpretation of redshift as the absorption and re-emission of electromagnetism by dark matter, rather than as evidence of an expanding universe.

Grote Reber died at the Ouse Disrict Hospital, two days before his 91st birthday in 2002. His ashes were scattered at Bothwell cemetery and at a number of radio telescope sites throughout the world. The modern discipline of radio astronomy owes a lot to his ground-breaking work and innovative approach. Much of this comes down to the clear, quiet skies over central Tasmania, one of the great privileges of living here.

Grote Reber's legacy can be further explored in Cambridge at the Grote Reber museum, open to school visits by appointment.

http://www.groterebermuseum.org.au/

These guided tours feature a chance to observe the dish and control room in action, see some of Grote Reber's work and inventions, make solar observations and experience a parabolic whispering gallery.

Book Review:
'The Art of Teaching Science'
3rd Edition
Edited by Vaille Dawson, Grady Venville and Jenifer Donovan

Publisher: Allen and Unwin Academic
Aimed at: Student, graduate or early career teachers, although there is plenty here for the more experienced practitioner.
Length: 250 pages across 14 chapters.
Recommended Retail Price: $49.99

First Impressions
The tone of this new edition is set from the opening sentence, 'I have always been concerned by the lack of conversation in science education about the nature of science and how teachers make decisions about what counts as science.'

This is a book that takes a hard look at science education from a practical and philosophical standpoint and steers the reader into a reflective view of their own practice. It covers both the art and science of what a successful science classroom might look like, without being prescriptive, allowing a developing teacher to forge their own perspective within each concept.

The book has three major sections, covering understanding, implementing and extending the art of teaching science. Each chapter is set out with clear goals, useful snapshots of classroom activities and examples, chapter summaries, thoughtful discussion questions and an extensive reference list, including web-based resources. In a distinction from previous editions, this book aligns each chapter to AITSL standards and covers a total of 23 AITSL standards at graduate level. This would be very useful for those gathering evidence for registration purposes. Other additions include a greater emphasis on teaching strategies, differentiation, ICT and STEM.

Reading Deeper
The nature of science is discussed, including Indigenous perspectives and leads the reader to develop their own understanding through thought-provoking discussion questions. This requires a developing understanding of constructivist philosophies and the perception of the development of science in society. Regular snapshots of a diversity of classroom ideas such as a focus on the work of Marie Curie or an experiment in which different liquids are dropped onto coins, can be easily adapted into the classroom and springboard into investigations. The first section of the book also delves into data interpretation, theories on learning, literacy and conceptual change. Each is dealt with in pleasing depth for a relatively short text.

There is plenty of discussion on planning at various levels, including for inquiry-based learning and STEM. Practical examples of planning documents are used, making it very easy to see how an idea can emerge from the curriculum, encouraging beginning teachers, and those more experienced, to innovate. Graduate teachers would find it easy to understand

how frameworks such as the 5 E's could be effective given the clear explanations of how and why they work. An entire chapter is devoted to inquiry-based learning, including an example of an astronomy program, illustrating explicitly what this may look like from a theoretical and practical point of view. A similar approach is used in a chapter looking at diversity and differentiation, which outlines clear strategies for the classroom.

There is an emphasis on understanding key teaching strategies, with clear illustrations on how to implement these. Plenty of external resources are also provided, especially in chapters on O, H and S and implementing digital technologies, which emphasise the book's practical value. Guidance towards innovation is provided, including a section entitled 'How to STEM-ify the STEM subjects', enabling teachers to see how this can be integrated into science teaching rather than offered as an optional extra.

In Conclusion…
At 250 pages, it is a credit to the 21 contributors that this book manages to reach both breadth and depth in its coverage of key topics across fourteen chapters. It provides inspiration for student and early-career teachers, especially the presentation of theory through practical ideas which can be easily adapted to any context. There is enough emphasis on the changing face of science education in the modern classroom, that more experienced teachers looking for support in innovation would find plenty of food for thought. Finally, thinking back to that opening sentence regarding the very nature of science, this book will provide valuable opportunities for all practitioners to be reflective on their own practice, and what effective science education should look like.

Bob Fletcher

Competition Time!

Thanks to Allen and Unwin, we have two copies of 'The Art of Teaching Science' to give away! The first two teachers to answer the following puzzle (yes, you have to earn it!) will receive a copy of the book. Please email your answer, name and contact details to editorstatic@gmail.com

Fill in the blanks to reveal the hidden scientist:

---------- Oldfield, ---------- Radiation, --------- and Juliet, The Times of ---------, --------- Beach

---------- Watts, School ----------, Where for art though ----------, East ---------- Company, ----------and the Bunnymen

Conasta 68 Review

"Unchartered Territory: Innovation in Science Education"

By Samantha Bannister, Ogilvie High School

STAT CONASTA 68 Scholarship Winner

Crocodiles, amazing sunsets, and an abundance of enthusiasm: this was CONASTA 68. This year's annual conference for Science teachers and laboratory technicians was hosted by STANT (Science Teachers Association of the Northern Territory) and held from the 7th July – 10th July.

Delegates were welcomed to Darwin in style, experiencing all that the Mindil Beach Market had to offer. The evening was spent meeting new people and catching up with old friends for happy hour, while Darwin flaunted a spectacular sunset over the water.

The first evening at Mindil Beach; some Tasmanian delegates (L-R): Sam Bannister, Jenny Dudgeon, Rose Anderson, Ann Burke; Sunset over Mindil Beach.

Convening at Darwin High School for the opening address, conference delegates met in an almost 19 million litre capacity water tank, now re-purposed as the gymnasium. The first full day of the conference was opened by Dr Alan Andersen from the CSIRO, who delighted some and horrified others when he delivered the first keynote address of the conference: Savana ant communities. He enlightened us about the vast speciation of ants that occurs

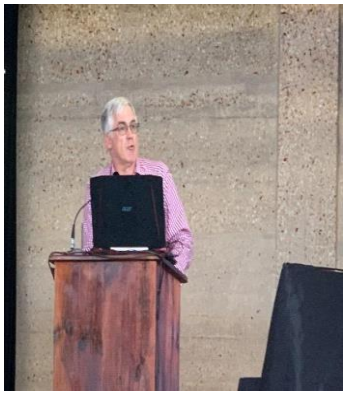
within the smallest of distances, and that the top 10 species in the world by biomass are all ants from the same family!

Following this, attendees enjoyed the first of many amazing morning teas before moving to their initial workshops. The variety of topics, content, and amazing presenters meant that there was plenty to learn and bring back to our colleagues and our classrooms. Some delegates were able to experience off-site tours; one at a liquefied natural gas facility, the other amongst the mangroves.



CONASTA 68 Conference Dinner (L-R): delegates enjoying the evening; Fire twirling entertainment; Floaty McFloatface, our table's centrepiece and also a floating windfarm.

Later that day was the safari-themed conference dinner, hosted at the Darwin Ski Club. I was confused at first, as to how anyone could ski in the Top End, let alone have an entire club dedicated to it. Soon after arriving though, I realised that this was a club for enthusiasts who ski on water, not snow! We were treated to yet another amazing sunset looking out over the water, fire twirling, live music, and a challenge to make our own table-top decoration. The winning table made an amazing piece that even moved!



Keynote Speaker Dr Graeme Sawyer, Environmental Education Specialist

The second full day of CONASTA 68 consisted of workshops and several outstanding keynote speakers. After some morning sessions everyone returned to "the tank" to hear from Dr Graeme Sawyer, an environmental education specialist. Graeme began his career as a teacher, and has worked in several educational and research areas, including time as an education adviser. Graeme spoke about making science interesting, enjoyable, and relatable for students, and the significance of getting out of our classrooms and into the environment.

Even in an inner city setting, students can look at what exists in their immediate ecosystem, from insects to plants to birds. He stressed the importance for students to form a connection with their environment, so that they can take pride in caring for it. Graeme spoke to the importance of integrating subjects and ensuring that as teachers, we endeavour to use the General Capabilities and Cross-Curriculum priorities throughout all subjects.

Keynote Speaker Professor Lyn Beazley OA, Former Chief Scientist of Western Australia

Following Graeme's engaging and thought-provoking speech, the audience was delighted by the third Keynote Speaker, Professor Lyn Beazley OA. After starting her career in brain research, Lyn became Chief Scientist of Western Australia and remained in the role for over 7 years. Lyn spoke briefly about her accomplishments throughout her career, before lamenting that when she was younger there were not many female scientists, she was able to look up to. She stated how pleased she was that science is now more accessible for women, and that female students now have role models they can aspire to be like. Lyn iterated though that there is still more work to be done, and that it's not just a case of supporting more females in the industry, but also changing culture.

A few more afternoon workshop sessions ensued, and then conference goers travelled to Sky City, Darwin's casino. We congratulated those who received awards from ASTA, and then sat on the edge of our seats in anticipation for the Stanhope Oration. This year's speaker was Dr Adam Britton, who conveyed to us his love of crocodiles, and the love-hate relationship humans have with them.

Conference delegates enjoying the sunset and warm evening following the Stanhope Oration from Dr Adam Britton

Crocosaurus Cove

Left: A juvenile crocodile

Right: Contest winners diving with Wills and Kate, croc royalty

A slide from Dr Ian Morris' Keynote speech, discussing Aboriginal scientific knowledge.

The final day of the conference saw attendees have an earlier start, meeting for the conference breakfast at Crocosaurus Cove. We were treated to another amazing meal, before the brave amongst us were given the opportunity to handle a carpet python and a juvenile crocodile. Two lucky contest winners won the chance to dive with croc royalty and meet Wills and Kate up close. They weren't the only celebrities though; Burt the octogenarian croc and Hollywood star also lives at the cove. He starred in the Australian classic, Crocodile Dundee, and is looking well for his age.

A CSIRO workshop for Culturally Responsive Assessment: Learning goals, high expectations and good practices.

After our hugely exciting morning, we returned to Darwin High School for the last time. We were treated to a CSIRO panel speaking about Learning on Country; how important it is for all students, and that it cannot be achieved without involving the local community. Following this, conference-goers attended their last workshops, and then were treated to the final Keynote Speaker for the event; Dr Ian Morris. He began his science teaching career in 1971 working for a mission in Arnhem Land. Dr Morris was enthralling to hear from, and

I'm sure most of us could have stayed for hours listening to what he had to say. He stressed that he learnt much more from those in Arnhem Land than he ever taught any of his students there, and that he learnt very quickly how important it was to listen to and learn from others. Understanding others' cultures and languages opens our own small worlds up to new ideas and new lenses through which to view the world. Ian also discussed stories representing events that have happened throughout Australia's past, passed down through generations of First Nations' Peoples for thousands of years, and how many of these have now been proven using modern technology. This led to a notable dialogue about the importance of oral language.

There were so many resources and innovative ideas that were demonstrated during CONASTA 68. One of these will shortly be released for free online from the CSIRO. Two-Way Science will be available from their website later this month. It contains lesson plans and information to allow students and teachers to understand and apply Aboriginal knowledge to scientific concepts.

I would like to thank STAT and Ogilvie High School for the amazing opportunity that I have experienced and look forward to being involved with STAT in the future.

Next year's conference will be hosted by SEA*ACT in Canberra from 5–8 July, and early bird registration opens March 2020. Ten out of ten, I would highly recommend future CONASTAs to everyone.

For the next big PD opportunity not to be missed:

Registration now open for STEM X Regional Workshops in Hobart and Burnie. These FREE two-day workshops will be delivered by the CSIRO and are open to primary and secondary science teachers. For further information and to register go to: https://stemx.edu.au/about/stem-x-regional-workshops/

NATIONAL SCIENCE WEEK TAKES OVER TASMANIA

Thousands of Tasmanians stream into venues across the state, big and small, to experience science, technology, engineering and maths events every August. Starting with TastroFest in Ulverstone (1-3 Aug), the curious were drawn to everything from custom dance performances based on local research to large festivals; from pop-up bars to intimate talks with world leading scientists; from quiz nights to nature tours.

With over 60 public events state-wide and around 200 including schools, there was an event for everyone.

The 2019 schools theme was DESTINATION: MOON. Many schools held their own events with some open to the public such as the Huon Valley STEM Expo (6 Aug) and the Mountain Heights School Science Fair (15 Aug). Children's University was also involved with events outside of school hours and conducted a Make Your Own National Science Week Program Cover activity.

School resources are available free online at the Science Week website. The 76 page 2019 Resource Book of Ideas (24 MB, PDF) for National Science Week offers teachers and students the opportunity to investigate the people, space agencies, universities, and science organisations that are all delivering solutions in space science. There are also an Australian Space Science Timeline (6 MB, PDF) and a Student Journal (8 MB, PDF) available to download.

Public Events

In the South, the Australian Institute of Physics presented Dr Helen Maynard-Casely, a top scientist from ANSTO, in How Neutrons Can Save the World (6 Aug); Women in Technology presented industry leaders, who discussed their careers in tech (7 Aug); epic festival Festival of Bright Ideas returned to Princes Wharf No. 1; the Australian of the Year, Craig Challen (10 Aug) discussed his incredible life including the 2018 Thai cave rescue mission; scientists contributed to NEON, an impressive youth dance performance inspired by local research (14-17 Aug); and roving scientists and speakers were part of a carnival of science at pop-up bar BeakerStreet@TMAG (16-17 Aug).

In the North, the Queen Victoria Museum and Art Gallery held their Science Open Season (10-16 Aug) which included a talk and panel discussion in partnership with the Institute for

Marine and Antarctic Studies (16 Aug). TastroFest (1-3 Aug) – Australia's biggest astronomy festival, MakerX Burnie (18 Aug) - a large fair for tinkerers and makers, and Science in the Pub's first ever Zeehan event (29 Aug), were some highlights of the northwest program.

State-wide, Curious Climate aimed to demystify climate science and have open discussions between the public and experts. The Young Tassie Scientists toured the state throughout August engaging with schools and local communities.

The Festival of Bright Ideas (Hobart, Sat 10 Aug) featured main stage science shows, hands-on workshops, and exhibitor stalls – there was something for people of all ages. Magnus Danger Magnus' explosive comedy show, Marty McBubble created bubble rockets and volcanoes, and the chance to learn some DIY science with Clare Van Dorssen were enjoyed by many. On the floor, visitors heard about medications of the future, the importance of healthy soil, using VR to tackle the sea urchin problem, drones for work, how to make an electric racing car, VR moon discovery, wild data, robots and more! Visitors also met the Young Tassie Scientists, real working researchers, to find out what they do. STAT also had a stand at FOBI with hands on experiments that intrigued families.

And for those more into nightlife, the Science Street Party (3 August) engaged visitors through street art and live performances; Science Comedy with two Melbourne International Comedy Festival favourites headlining shows in New Town (14 Aug) and Franklin (15 Aug); Science meets improv in the pub with SciPubImpro (14-15 Aug). Launceston hosted the Bright Ideas Pitch Night (16 Aug) for the start-up crowd; BeakerStreet@TMAG (16-17 Aug) returned with a cabinet of curiosities and oddities at the annual pop-up bar. Two quiz nights engaged the trivia inclined in Penguin (5 Aug) and Hobart (13 Aug).

Science and the arts merged this year with live street art at the Science Street Party in Hobart that featured the Tasmanian National Science Week Patron, Nobel Prize Winner Professor Emerita Elizabeth Blackburn. The Hadley's Art Prize is Painting a Changing World (11 Aug); Elizabeth College asked you to go back to school with botanical art (7 Aug); on Bruny Island, people learnt about a vintage scientific photography technique with Blueprints of Nature (10 Aug); Science improv aimed to merge theatre and research in the pub for SciPubImpro (14 & 15 Aug); Matter with Sean O'Connell was on at the Moonah Arts Centre and the artist spoke about the science behind the work. (17 Aug)

About National Science Week

National Science Week is Australia's annual opportunity to meet scientists, discuss the hot topics, do science and celebrate its cultural and economic impact on society.

First held in 1997, National Science Week has become one of Australia's largest festivals. Last year saw a staggering 1.2 million people participate in over 2100 events and activities.

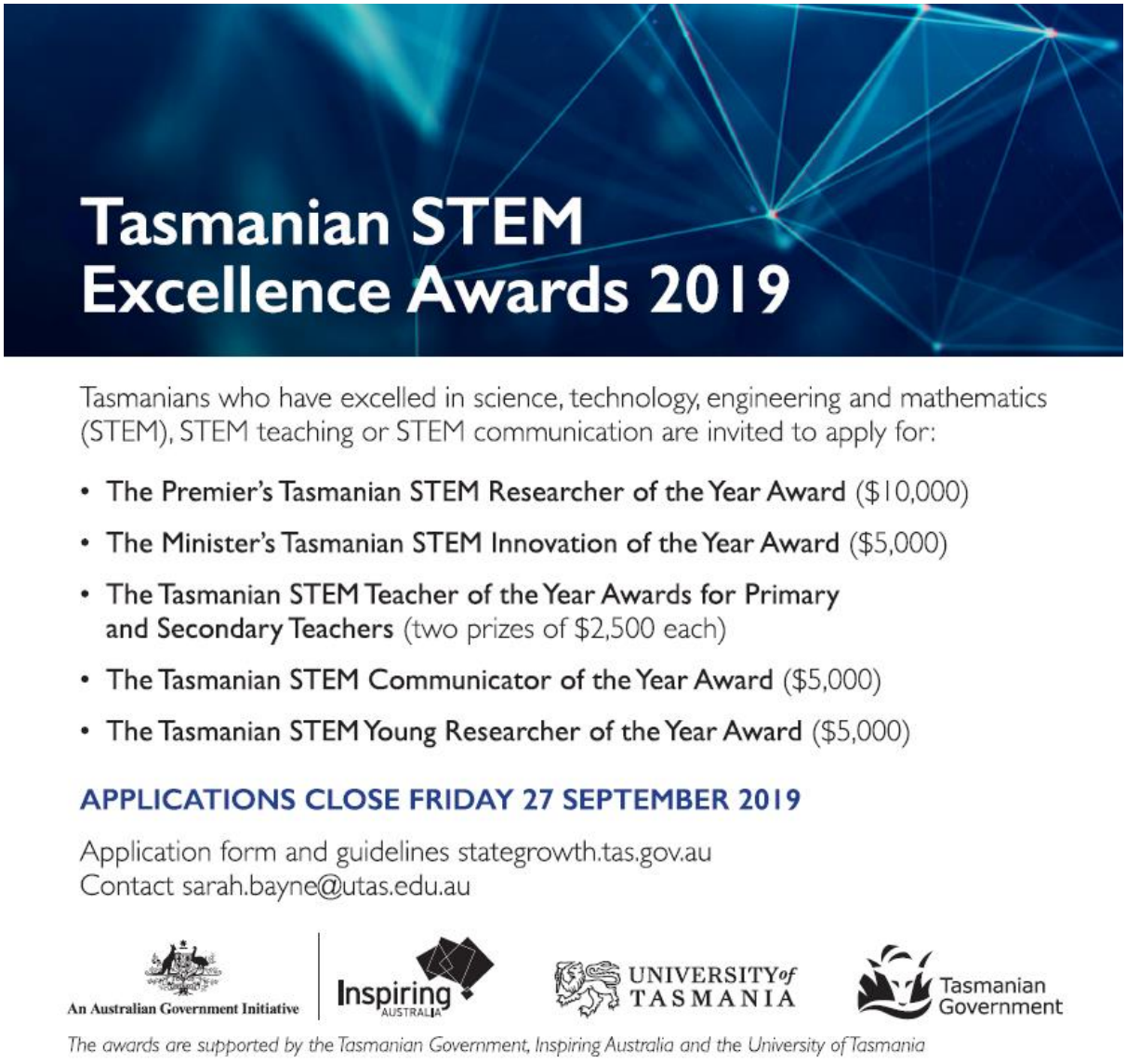
In 2019, National Science Week events were held throughout Australia—from Corals in the Outback in western Queensland to TAStroFest astronomy in the Apple Isle, and from the Perth Science Festival to The Innovation Games at Sydney Olympic Park—with everything

from science festivals, music and comedy shows, expert panel discussions, interactive hands-on displays, open days and online activities.

The festival is proudly supported by the Australian Government; partners CSIRO, the Australian Science Teachers Association and the ABC; and media sponsors including *Cosmos* and *Popular Science*.

National Science Week 2019 ran from 10-18 August but events in Tasmania occurred all throughout August. Event details can be found at www.scienceweek.net.au.

All events can be found at http://bit.ly/TASscienceweek.



Scientific Snippets and Discoveries

Recent advances in knowledge worth sharing…

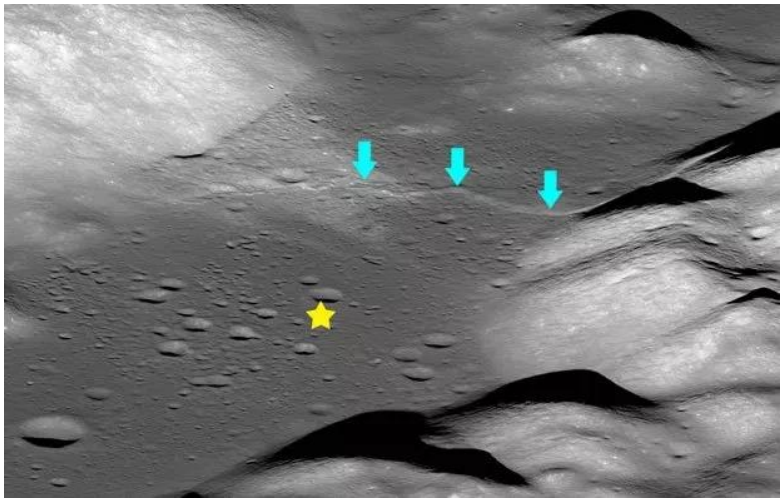
Enhanced Reflexes Trick the Mind

Researchers from the University of Chicago have wired up volunteers with precisely placed and timed electrical impulses to control hand reflexes. They had to touch a symbol on a touchscreen, only their nerve/muscular response was entirely controlled by the electrodes. Normal reaction times are around 280 milliseconds, but this system could bring this down to 200 milliseconds. This could be useful for training people requiring precise and fast reactions. Participants felt in control at these speeds, feeling it was still their own reactions they were experiencing. However, this perception was lost when the system was speeded up, even though their level of control actually remained the same.

https://blog.doublehelix.csiro.au/super-quick-reflexes-just-add-electricity/

Moonquakes Revisited

One of the tasks carried out by the Apollo missions was to lay seismometers on the moon to measure lunar seismic activity. However, in the past, the analysis of the data has been hampered by a lack of sophisticated computer power. This has now been addressed, with a recent re-analysis of the data, enabling the identification of the precise locations of moonquakes, seen to be associated with fault lines, shown by the blue arrows in the NASA picture below. The timing of these quakes coincides with the furthest distance between the Earth and the moon, showing it is tidal rock movements triggering the activity. These tidal rock movements occur on Earth as well, causing a 30cm 'wave' across the surface each day.



https://blog.doublehelix.csiro.au/quakes-on-the-moon/

Cats recognise their own Names

A team of Japanese animal behavioural scientists have studied the response of cats to their names. Body movement was monitored, such as ear twitching and tail flicking, as cats were subjected to a list of words read by their owners. Without changing pitch or volume, it was

shown that the cats did respond when they heard their own names. The question remains, does this extend to other species that use vocalisations to communicate?
https://blog.doublehelix.csiro.au/do-cats-recognise-their-own-names/?utm_source=Double+Helix+Extra&utm_campaign=6b366d8dcb-EMAIL_CAMPAIGN_2018_03_01_COPY_01&utm_medium=email&utm_term=0_36b345597f-6b366d8dcb-53724041

The Limits of Human Performance

A team at Duke University, North Carolina, has studied metabolic rates in elite athletes in some of the toughest sporting events in the world. This includes the Tour de France and Race Across America. They found that in the short term, the body can produce spikes of heavy energy usage, but this is not sustainable. In the long term, by measuring resting metabolic rates against endurance performance, it was found that the upper limit of the body is to purr along at 2.5 times the resting rate. In marathons, the rate jumps to 15.6 times higher, for riders in the Tour it is 4.9 times higher and for pregnant women it is 2.2 times higher. What causes this barrier to endurance? The digestive system can only absorb so much food intake over a certain amount of time, and it is this, rather than limits imposed by the lungs or the heart, that provide the brakes on what we can achieve.

https://www.bbc.com/news/health-48527798?utm_source=Nature+Briefing&utm_campaign=3d353ceda1-briefing-dy-20190815&utm_medium=email&utm_term=0_c9dfd39373-3d353ceda1-42715383

https://advances.sciencemag.org/content/5/6/eaaw0341?utm_source=Nature+Briefing&utm_campaign=3d353ceda1-briefing-dy-20190815&utm_medium=email&utm_term=0_c9dfd39373-3d353ceda1-42715383

Limits on Coffee Drinking Refined

A study funded by the British Heart Foundation conducted from the Queen Mary University of London, followed 8412 people of varying levels of coffee consumption. One group consumed less than one per day, another group one to three per day and the final group up to 25 per day. They each received MRI scans and Infra-red pulse wave tests to monitor changes in blood vessels. It was found that coffee consumption has no affect on hardening of the arteries. Given the popularity of coffee drinking, the affects it has on health is still an active area for research.

https://www.theguardian.com/food/2019/jun/02/up-to-25-cups-of-coffee-a-day-safe-for-heart-health-study-finds?utm_source=Nature+Briefing&utm_campaign=3d353ceda1-briefing-dy-20190815&utm_medium=email&utm_term=0_c9dfd39373-3d353ceda1-42715383

STATIC QUIZ

Easier:

1. What sort of animal is a Dusky Antechinus?
2. Is an Echidna a marsupial?
3. Which element used to be added to petrol?
4. What fills lighter than air balloons?
5. What force keeps a paper aeroplane in the air?
6. What number system uses I, V, X, L, C and M?
7. Why does Australia play in green and gold?
8. Which is the largest planet in the solar system?
9. Which element is used to make electronic chips?
10. Which colour is made when you mix yellow and blue paint?

Harder:

1. Enriched Uranium uses atoms of what atomic mass?
2. Who was part of the first moon landing, but didn't walk on the moon?
3. What is the name of cosmic gases that can be sites for star formation?
4. What is the third brightest object in the sky (the sun and moon being the first two)?
5. Complete the name of the animal: Strong-billed….?
6. What is the most populous city on Earth?
7. What colour is Indigo carmine in an alkaline solution?
8. In Toy Story 2, what event spelled the end of 'Woody's Round-up'?
9. Which European country is closest in size to Tasmania?
10. How many species of frogs are endemic to Tasmania?

Answers:

Easier:

1 Marsupial mouse
2 No
3 Lead
4 Helium
5 Lift
6 Roman Numerals
7 The colours of the wattle tree
8 Jupiter
9 Silicon
10 Green

Harder:

1 235
2 Michael Collins
3 Nebulae
4 Venus
5 Honeyeater
6 Tokyo
7 Green
8 The launch of Sputnik
9 Republic of Ireland
10 3 (Tas Tree Frog, Tas Froglet, Moss Froglet)