An Australian Government Initiative

Inspiring AUSTRALIA

national science week

Artwork created by a family visiting the Indigenous Science Experience in Redfern.
Photo: National Science Week

Celebrating the first sciences of these lands:

Aboriginal and Torres Strait Islander peoples share their stories

Inspiring ideas for National Science Week

FOREWORD

A warning to Aboriginal and Torres Strait Islander people that this brochure may contain images and words of people who have died. All images have been used with permission.

NATIONAL SCIENCE WEEK acknowledges Australia's Aboriginal and Torres Strait Islander peoples as the traditional custodians and first scientists, makers and innovators of this land and their continuing connection to Country. We pay respect to all Elders past and present, and to First Peoples everywhere. First Peoples culture is the oldest continuous culture in the world. The first scientists passed on the lessons of the land, sea and sky to the future scientists of today through stories, song and dance. First Peoples call this caring for Country. If you care for Country, the Country will care for you.

Foreword by the Aboriginal and Torres Strait Islander brochure advisory committee: Professor Lisa Jackson Pulver AM, Dr Michael Doyle, Mr Steven Ross and Mr Corey Tutt.

First Peoples science is everyday science. Science has always been, and continues to be, a part of everyday life for Aboriginal and Torres Strait Islander peoples. Science is embedded into every aspect of our culture and our understanding of Country. Cultural stories, songs, art, dance, family connections and knowledge systems are all forms of science and science communication.

Aboriginal and Torres Strait Islander peoples' scientific knowledge is interwoven into the broader Australian community. Most Australians have tea tree oil in their medicine cabinet and know it can be used as an antiseptic, anti-fungal, antimicrobial and anti-inflammatory agent. Many Australians also know that if there is an influx of ants it could mean rain is on its way. These examples are just a tiny taste of the scientific knowledge that has come from Aboriginal and Torres Strait Islander peoples and is part of everyday Australian use.

Aboriginal and Torres Strait Islander people have cared for Country for tens of thousands of years. Understanding and respecting Country has been critical for surviving and thriving in the vastest of landscapes and the many climates of our lands over millennia. We understand how to live with and manage Country sustainably to ensure there is food and water for future generations. Our understanding of the environment comes from researching, respecting and learning from the land, waterways and skies, and their complex interactions with us and each other. Our scientific knowledge has helped our cultures be recognised as the oldest continuous living cultures in the world. We are the first scientists, makers and innovators of these lands and waters.

First Peoples science continues today. Many prominent Aboriginal and Torres Strait Islander people continue to make invaluable contributions to modern science. Our cultural stories contain a wealth of scientific knowledge on how to sustainably look after Country and the many species that live here. We are the first doctors, healers and health innovators. As the climate continues to change due to human impact, our knowledge and sustainable practices are more valuable than ever. The combination of our knowledge systems with modern science is vital for sustainably managing the land, waterways, animal and plant life and the health of our many communities into the future.

National Science Week is a great annual opportunity to continue to inspire the current and next generation of scientists in Australia. We welcome this year's focus on celebrating Aboriginal and Torres Strait Islander science and encourage all to listen, learn and better understand First Peoples science.

Jarli stands in the outback with her family in **the animation *Jarli***. The animation was created in a collaboration between UTS Animal Logic Academy and the Royal Australian Air Force's Jericho Disruptive Innovation. *Jarli* was developed to encourage an interest in space-focused careers and STEM among young Australians.
Source: Department of Defence

Jarli. Source: Department of Defence

A NATIONAL WEEK OF SCIENCE

National Science Week is Australia's annual celebration of science and technology, running each year in August.

Aboriginal and Torres Strait Islander knowledge systems contain a wealth of scientific information. They contribute significantly to Australian STEM research and to the broader Australian community. The integration of First Peoples science and western science is becoming more widely recognised in Australia and abroad.

This brochure offers examples of the important contributions Aboriginal and Torres Strait Islander science and traditional knowledge make in understanding our world and our place in Australia. It contains examples of how science is everywhere, from the land to the skies and waterways. This brochure also provides resources and guidance on how Aboriginal and Torres Strait Islander people, and First Peoples science, can be an integral part of all National Science Week events.

CORNUCOPIA OF EVENTS

During National Science Week, over one million people participate in more than 1,000 events across the country.

Each year, these events attract a wide audience – from children to adults, and from science amateurs to professionals.

Events are held by universities, schools, research institutions, museums, science centres, libraries, industries, community groups and private organisations.

Participating organisations play an important role in the community, with the opportunity to connect with official National Science Week events.

With so many fascinating stories to share, this publication could have been a book rather than a brochure. The selected stories aim to provide a taste of the inspirational knowledge known by Aboriginal and Torres Strait Islander peoples across the nation.

Photo: National Science Week

Aboriginal and Torres Strait Islander scientists

Aboriginal and Torres Strait Islander people have been using science and developing scientific techniques for millennia. Aboriginal and Torres Strait Islander peoples practise science in all aspects of life – such as using fish traps, navigating via the stars, fire management and agriculture. The use of science and a deep understanding of the environment contribute to the longevity of cultures and knowledge systems.

Many Aboriginal and Torres Strait Islander scientists make important contributions in physics, maths, astronomy, architecture, engineering, biology, art, health, conservation, marine science and more. Caring for Country requires careful observations, measurements, trials and adaptations – the very things that underpin the process, understanding and application of science.

There have been many prominent Aboriginal and Torres Strait Islander scientists. For example, in the 20th century David Unaipon, a Ngarrindjeri man from South Australia, developed the concept of a helicopter by studying the way boomerangs spin through the air decades before the first helicopter was built. David Unaipon now features on Australia's $50 note.

Kirsten Banks is a proud Wiradjuri woman and passionate astrophysicist and science communicator. She has been involved in National Science Week, leading presentations on the importance of astronomy in First Peoples culture and knowledge. Kirsten has discussed how we can all learn so much from each of the First Nations' different connections to the skies.

In the health sciences field, Associate Professor Misty Jenkins, a Gunditjmara woman from Victoria, is an immunologist who has contributed years of knowledge to the medical world, including research into brain cancer.

Dr Michael Doyle, a Bardi man from the Kimberley in Western Australia, works in public health research specialising in Aboriginal and Torres Strait Islander health issues. He said, 'I see more and more research projects being led by Aboriginal and/or Torres Strait Islander researchers. I think there is a real advantage in our own mob working with researchers to understand health.'

But you don't need a degree to do science, and science isn't always done in a laboratory or on a computer. Using cultural and scientific knowledge to care for Country can be done everywhere, every day. Science contributes to traditional and modern Aboriginal and Torres Strait Islander knowledge. This knowledge is used to observe, measure and manage the environment, wellbeing and health of First Peoples communities, and all communities across Australia.

Caring for Country requires careful observations, measurements, trials and adaptations – the very things that underpin the process, understanding and application of science.

Jarli in her space suit. Source: Department of Defence

Torres Strait environmental challenges: traditional knowledge and western science join forces

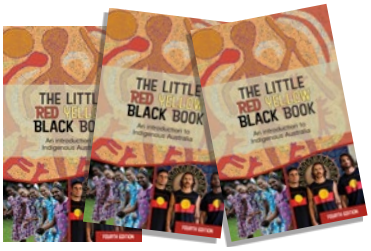
Torres Strait Islander people have thrived in harmony with their Sea Country (located between mainland Australia and Papua New Guinea) for many thousands of years.

Actions led by Traditional Knowledge Custodians, alongside western science, help First Peoples deal with ocean acidification, mining, plastic pollution, rising sea levels and climate change, all of which threaten the continuity of traditional ways of living and long-held cultural practices.

In 1993, Torres Strait governance bodies adopted the first Torres Strait Marine Strategy. Communities have since worked vigorously to protect their interconnectedness to Land and Sea. Examples include creating artwork from discarded fishnets, developing sustainable land-use plans to reduce the impacts of population growth, and establishing seasonal calendars that incorporate traditional knowledge.

AIATSIS

Australian Institute of Aboriginal and Torres Strait Islander Studies
https://aiatsis.gov.au/



The Little Red Yellow Black Book: An introduction to Indigenous Australia (Fourth Edition)

https://aiatsis.gov.au/publication/34972

National Science Week Indigenous Teachers' Resource Book 2021

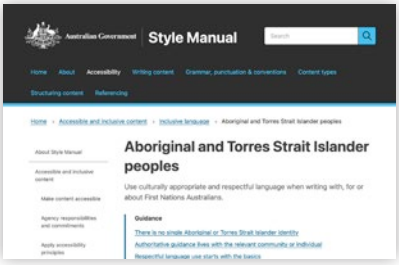
https://www.scienceweek.net.au/wp-content/uploads/2021/08/2021_Indigenous_Resource_Book.pdf

Regional First Peoples' knowledge resource examples

Yarkuwa Indigenous Knowledge Centre
http://www.yarkuwa.org.au/

Indigenous Knowledge Centres https://www.slq.qld.gov.au/about-us/partnerships-collaboration/local-government-and-public-libraries/indigenous-knowledge

Look for more local resources in your area.



The Australian Style Manual: inclusive language

https://www.stylemanual.gov.au/accessible-and-inclusive-content/inclusive-language/aboriginal-and-torres-strait-islander-peoples

INSPIRING IDEAS

How to hold an engaging and respectful First Peoples science event

Inspiring ideas of how to include First Peoples science in a National Science Week event:

Learn about the lands of your area and open your event with an Acknowledgment of Country. For example:

We acknowledge all Aboriginal and Torres Strait Islander Traditional Custodians of Country and recognise their continuing connection to land, sea, culture and community. We pay our respects to Elders past and present and those emerging.

Understand that an Acknowledgment of Country is different to a Welcome to Country. An Acknowledgement of Country can be given by anyone as a way of showing respect. A Welcome to Country is performed by the cultural custodians of the land.

Recognise that there is huge diversity within Aboriginal and Torres Strait Islander groups, and while this is a collective term it is important not to generalise.

Understand that Aboriginal and Torres Strait Islander peoples belong to continuing and deep cultures. Use present tense when describing cultural practices and knowledge.

Seek guidance from Aboriginal and Torres Strait Islander people on the most respectful and preferred naming convention. For example, many people prefer the term Traditional Custodian to Traditional Owner; some prefer the term Cultural Custodian or Cultural Authority.

Be respectful of the role that spirituality and culture have in First Peoples science.

Always seek permission to use someone's name, photograph or voice. Always seek guidance on how to use stories and knowledge belonging to Aboriginal and Torres Strait Islander people.

When including Aboriginal and Torres Strait Islander knowledge in a National Science Week event, it is important to know who the knowledge belongs to and understand who has the right to share it, and how.

It is essential to consult early with Aboriginal and Torres Strait Islander people about how to portray knowledge and culture of Country, Skies and Sea.

Don't assume that every older person is a recognised Elder. When speaking to an Aboriginal and Torres Strait Islander older person, check if it is okay to call them Aunty or Uncle.

Uncle Brendan Kerin and his yidaki.
Photo: Uncle Brendan Kerin

The science of sound

Hearing can be a sense that we overlook in a modern world where we rely on sight more than sound. Yet if we know how to listen, sound can teach us so much about our world. This is what Uncle Brendan Japangardi Kerin, a proud Marrawarra, Barkindji, and Arrernte man, explained during the 2021 National Science Week event, *The Science of Sound*.

‘Listening means you can understand,’ Uncle Brendan said. ‘Listening to the wind tells us what direction it’s coming from, how far away the weather might be. Wind sounds different moving through different trees. Sound helps us to hunt and to survive.’

In 2021, Uncle Brendan talked to primary school students about the importance of listening, wherever you are.

‘You don’t have to be in the bush, you can be in the city and get a bird feeder and learn about the birds’ calls. By listening, you can learn the language of the animals.’

During the online event, Uncle Brendan played his yidaki, explaining how vibrations are the cause of sound.

Uncle Brendan showed the students a bullroarer, a wooden instrument on a long piece of string. He explained that the bullroarer is used to communicate over long distances. ‘It was like the first mobile phone.’

As part of the event, a representative from the sound, visual and display technology company *Dolby* discussed the science of the inner ear and explained the types of jobs available to students of sound technology.

The Science of Sound event was organised by the National Indigenous Science Education Program, Macquarie University, and Redfern Community Centre.

Gula Guri mayin (Heal the body) – painting by Bernard Lee Singleton.

Painting parasites

In 2015, the Australian Society for Parasitology entered into a unique partnership with a group of Aboriginal and Torres Strait Islander artists in Far North Queensland.

The project explored the themes of parasites and health. It centred around Cairns artist Bernard Lee Singleton's magnificent painting, Gula Guri mayin, which means 'heal the body'.

The project raised awareness of the impact of parasite-related illness on Aboriginal and Torres Strait Islander communities. The painting teaches the life cycle of parasites and serves as a reminder of the importance of hygiene in preventing these diseases.

Cameron Raw is a Lyluequonny man, a veterinarian and PhD candidate, who works in *One Health* programs in Australian Indigenous communities.

He worked with the Australian Society for Parasitology during National Science Week to educate communities around Australia about parasites. His work with One Health also recognises the interconnection between parasites, people, animals, plants, and their shared environment.

Cameron said the art styles and content Bernard used in his painting are great examples of Indigenous cultural and scientific knowledge.

'Rich knowledge is encoded in many wonderful ways in Indigenous culture,' he said. 'Here we see the X-ray painting style revealing detailed anatomy, and the cyclical life of parasites is reflected in our song cycles and dances.'

Supported by an Inspiring Australia grant, Bernard Lee Singleton created the painting Gula Guri mayin in 2015. Tai Inoue and Russell Milledge also produced digital art to accompany the painting.

The artworks and animation are available at https://www.parasite.org.au/outreach/gula-guri-mayin/

> "Rich knowledge is encoded in many wonderful ways in Indigenous culture.

Michael Shawn Fletcher at the Bolin Bolin Billabong.
Photo: Jack Banister

Managing bushfires with traditional knowledge and science

In 2020, Wiradjuri man and University of Melbourne Associate Professor Michael Fletcher-Shaw, and the Bureau of Meteorology's Sandra Whight, spoke about how Australia can learn to manage bushfires better.

The online presentation was run for the public by the Australian Academy of Science as part of National Science Week.

Michael said the key to managing fire in Australia is the combination of cultural knowledge and modern science.

'We need to debunk the myth that caring for Country means leaving it alone, as wilderness. Australia's landscapes were not wilderness, they were managed and cared for by First Peoples,' Michael said. 'We need to continue this management today by getting out onto the ground and reconnecting with Country, and by using modern science, for example, remote sensing technology, or aerial support to help with cultural burning.'

Michael also said while many Aboriginal and Torres Strait Islander people had a wealth of critical knowledge to share, trust between First Peoples and science needed to be re-built and the knowledge sharing process given time and the appropriate credit.

'Aboriginal and Torres Strait Islander peoples' knowledge has not been forgotten, although many people mistakenly think it has,' Michael said. 'Our knowledge is strong, but it has been long exploited and now there needs to be reciprocity.'

Michael hopes that the presentation will help educate more Australians about the importance of combining traditional knowledge and modern science to manage Australia's landscape and reduce catastrophic bushfires in the future.

Mitch Mahoney constructing an eel trap at Footscray Community Arts.
Photo: Nicole Cleary

Rejuvenating rivers through sustainable art

In 2019, Mutti Mutti/Yorta Yorta and Boonwurrung/Wemba Wemba artist Maree Clarke and Boonwurrung artist Mitch Mahoney and a community of over 300 people, constructed a 10-metre eel trap.

The project was a collaboration between Science Gallery Melbourne and Footscray Community Arts.

Mitch said the eel trap is a key technology used by a lot of First Peoples as a sustainable fishing practice. 'The purpose of this event was to get people thinking in a sustainable way – thinking about how we deal with our waste in Australia, our attitudes to waste and how we can live more sustainably.'

The eel trap was completely biodegradable, made from river reeds. Once completed, it was released into the Maribyrnong River. While Maree brought the idea for the piece to life, the community helped make it possible.

Maree said participants contributed to weaving the trap over six weeks, including during National Science Week. 'There were artists and non-artists of all ages who helped,' Maree said.

'The trap ended up catching rubbish down near where the old pier was. And because we made the trap from reeds, as it decomposed, the reed's seeds ended up washing downstream where they will grow more reeds to support the waterway.'

> "The purpose of this event was to get people thinking in a sustainable way – thinking about how we deal with our waste in Australia, our attitudes to waste and how we can live more sustainably.

Ntaria Community School student building a mini rocket.
Photo: CSIRO

Rural outreach

In 2016, CSIRO led a National Science Week experiment at the Ntaria Community School in the Northern Territory.

Aimee Woods, a Wiradjuri woman and Assistant Dean at Dunmore Lang College at Macquarie University, was a CSIRO cadet. Along with other CSIRO staff and volunteers, Aimee performed science experiments for approximately 170 students.

'We made mini rockets and had competitions to see how high they could go, and then raced robots made out of toothbrushes,' she said.

Aimee said these events were important to inspire the next generation and show students that scientists are real people.

'I grew up in a remote town and I still went to university,' she said. 'I think it's really important to show these rural kids that people in the same circumstances as them can still choose a career in science or a university if they want to.'

Due to their popularity, the National Science Week events have continued each year at Ntaria.

> "We made mini rockets and had competitions to see how high they could go, and then raced robots made out of toothbrushes.

Teangi Brown giving the Science of the Black Box presentation.
Photo: Tasmanian Museum and Art Gallery

Black-box science

Teangi Brown is a proud Umpila, Kantju, Kuku-Yalanji, Trawlwoolway, Plangermaireener and Bunurong First Nations man who grew up in Lutruwita (Tasmania) and on Trowunna (Cape Barren Island) in the Bass Strait.

He is a First Nations interpretations consultant and is passionate about sharing knowledge on Tasmanian First Nations culture.

Teangi's passion led him to create the ***Science of the Black Box* presentation** for the Tasmanian Museum and Art Gallery.

The online learning program is aimed at encouraging young people to explore Tasmanian First Nations artefacts and the modern science behind them.

During the *Science of the Black Box* presentation, Teangi discusses several First Nations scientific principles, including oxidisation of kelp to make baskets, the uses of shearwater birds (including their oil and meat) and why the grass tree needs to be burnt to germinate.

'Science is embedded in our culture, and it is all about balance,' Teangi said. 'You only ever take a little bit from nature.'

In 2020, Teangi presented a live-stream *Science of the Black Box* presentation for National Science Week. He used green screen technology to visually engage with participants and allow them to get close to the materials he presented.

Teangi said Science Week events can have a profound effect on young people. 'It's about presenting science through a lens kids can understand. Some of my fondest scientific memories go back to the science presentations I saw as a kid.'

Corey giving a Deadly Science presentation.
Photo: Deadly Science

You can’t be what you can’t see

National Science Week aims to be truly ‘national’. But not all Australian students have the same access to science.

That is where proud Kamilaroi man Corey Tutt comes in. Corey is the CEO and founder of ***Deadly Science***, an organisation dedicated to increasing science education in remote and regional schools across Australia, with a focus on Aboriginal and Torres Strait Islander communities. Since 2018, *Deadly Science* has been inspiring a love of science in school students by providing science book packs and equipment, such as microscopes.

In 2021, Corey became Chair of the NSW Executive Committee for National Science Week and Inspiring Australia and gave a keynote speech during National Science Week. He said National Science Week plays an important role in encouraging young people’s interest in science and is a great opportunity for Aboriginal and Torres Strait Islander peoples to share their science expertise.

‘We need more kids interested in science because we need more scientists and more hope,’ he said.

Corey stressed the importance of having Indigenous representation in science events and science textbooks so that Indigenous people have the chance to see their culture and their role models in STEM.

‘Science is for everyone, but you can’t be what you can’t see,’ he said. ‘All kids in Australia, no matter what background they have, should have access to a science education, but also the real education, the education of our people, the first scientists.’

This is what led Corey to write *The First Scientists*, about Australia’s Indigenous people and their connection and ongoing contribution to science through astronomy, engineering, forensics, ecology, land management and more.

‘Aboriginal and Torres Strait Islander peoples’ contribution to science is not a past tense thing,’ he said. ‘The knowledge is still important today, maybe even more so.’

Kobi Morrison presenting to researchers during National Science Week 2019.
Photo: Tasha Faye

Engaging with First Peoples' knowledge

Kobi Morrison, a Bibbulmun Noongar man, is a Noongar cultural facilitator in Western Australia.

In 2019, he ran a workshop with Propel Youth Arts Western Australia at the Perth State Library to encourage researchers from Western Australia to engage with First Peoples' knowledge.

Kobi explained that people are often afraid to discuss or include First Peoples science in their work.

'People don't do anything because they don't want to do the wrong thing,' he said. 'But this is really damaging to the continuation of our knowledge.'

Kobi said there are a few simple actions people can do to start engaging with First Peoples' knowledge.

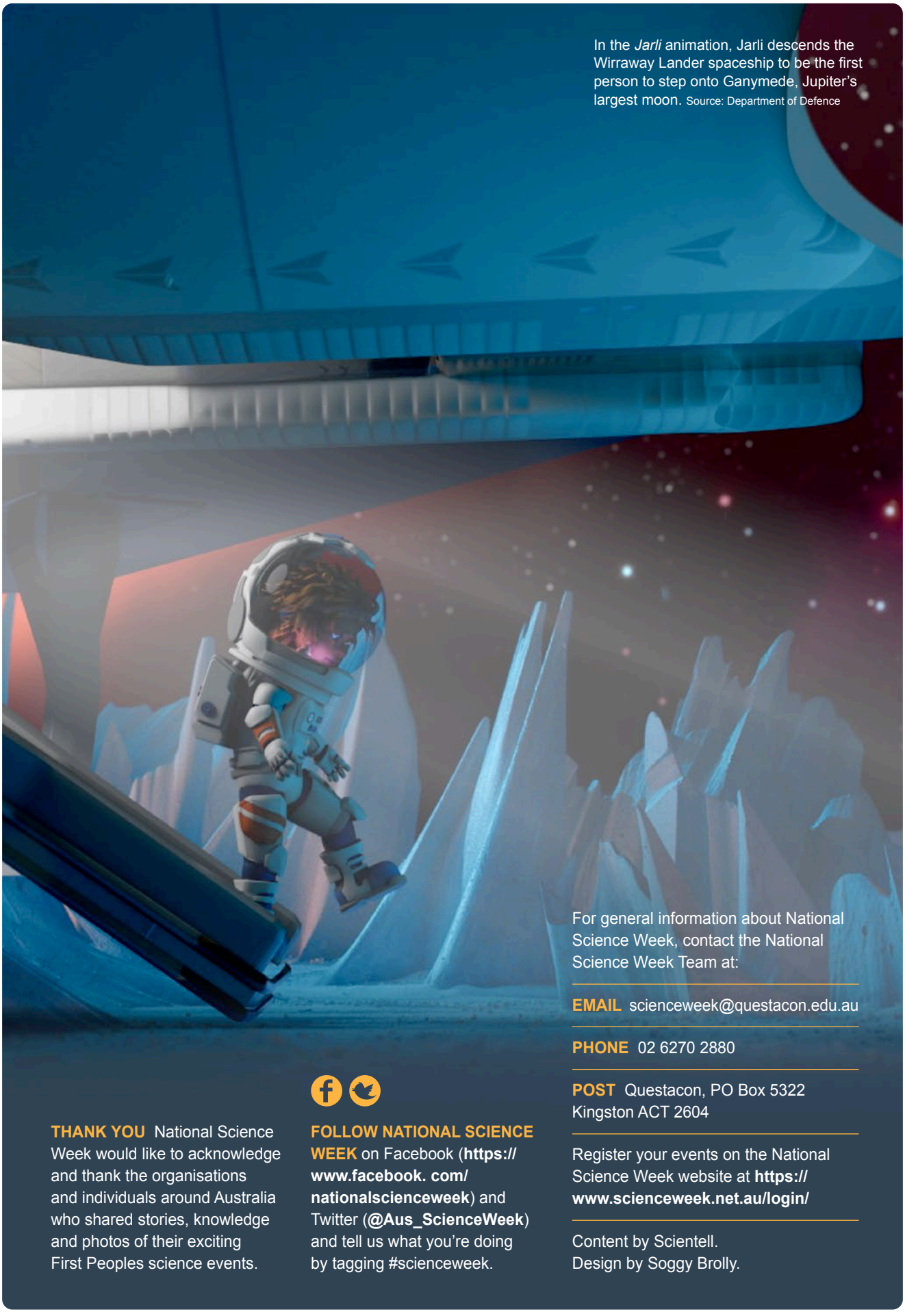
'Everyone can give an Acknowledgment to Country, find out who are the leaders in their local community, get an Elder's opinion and integrate language into research using word lists.'

Kobi also said research must consider the diversity of the hundreds of First Peoples.

'Many people lose sight of the First Peoples' variety of knowledge because of the generic term Aboriginal,' he said. 'Also, we need to remember that a nation's science is relevant to the world around us.'

"Everyone can give an Acknowledgment to Country, find out who are the leaders in their local community, get an Elder's opinion and integrate language into research using word lists.

ACKNOWLEDGEMENTS & CONTACTS



In the *Jarli* animation, Jarli descends the Wirraway Lander spaceship to be the first person to step onto Ganymede, Jupiter's largest moon. Source: Department of Defence

THANK YOU National Science Week would like to acknowledge and thank the organisations and individuals around Australia who shared stories, knowledge and photos of their exciting First Peoples science events.

FOLLOW NATIONAL SCIENCE WEEK on Facebook (**https://www.facebook. com/nationalscienceweek**) and Twitter (**@Aus_ScienceWeek**) and tell us what you're doing by tagging #scienceweek.

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Register your events on the National Science Week website at **https://www.scienceweek.net.au/login/**

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