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THE JOURNAL OF THE AUSTRALIAN GEOGRAPHIC SOCIETY

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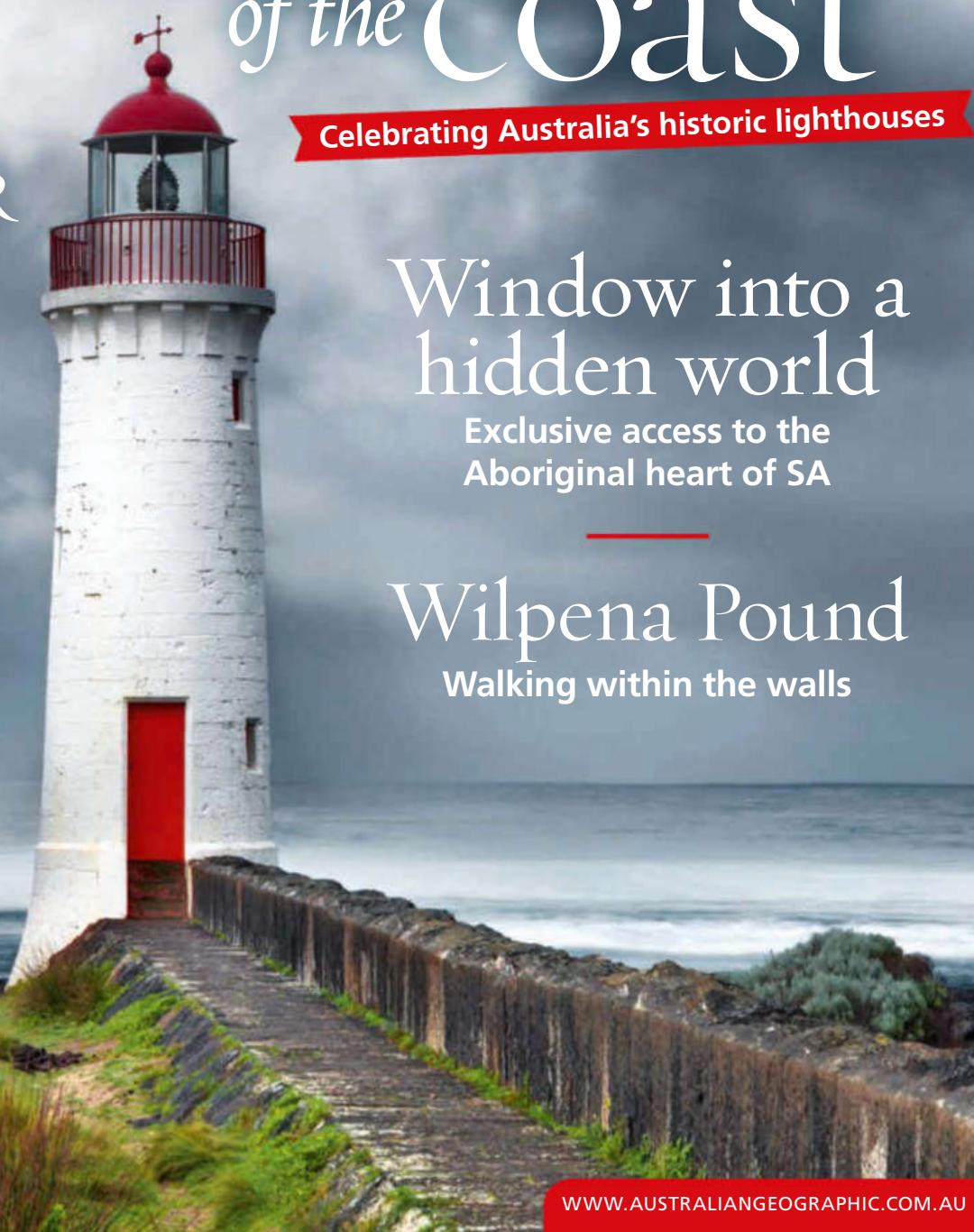
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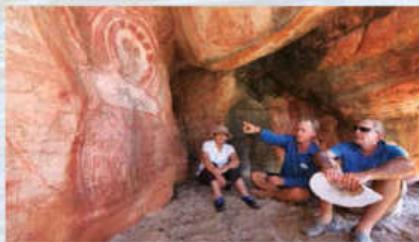


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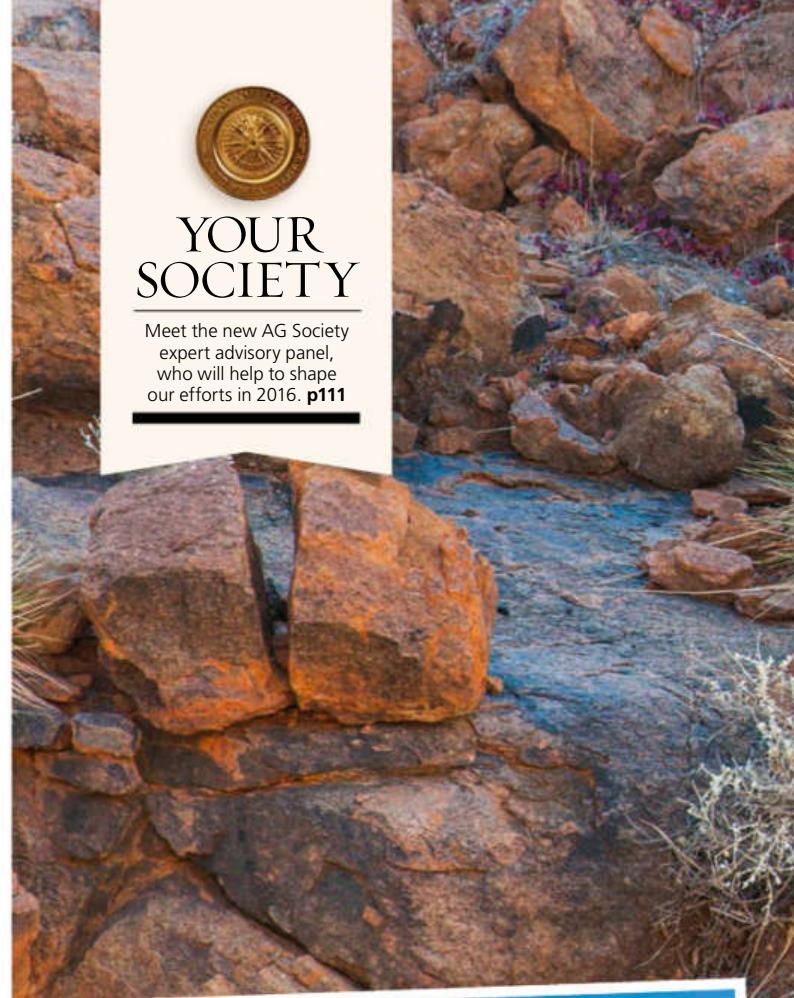
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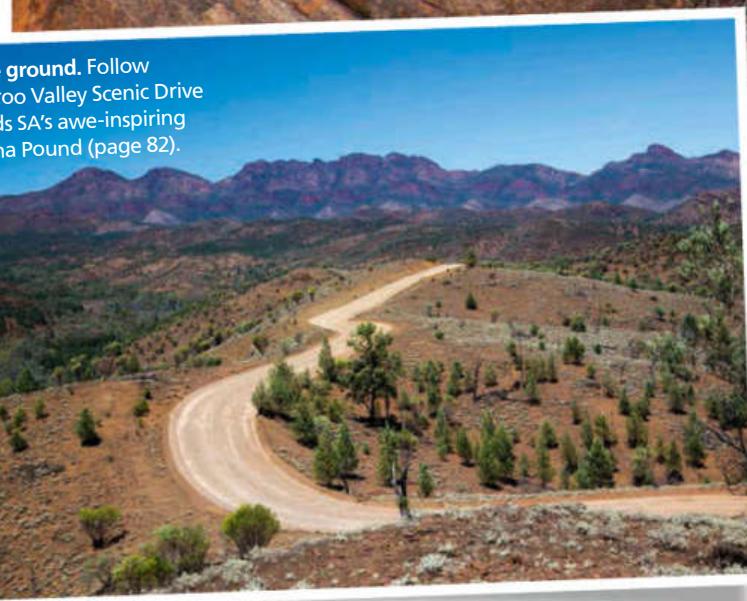


Illuminati. Lighthouse technology has changed radically in the past century (page 48).



YOUR SOCIETY

Meet the new AG Society expert advisory panel, who will help to shape our efforts in 2016. **p111**



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PAGE 58: WATCH enticing footage of lighthouses, taken with a camera drone.

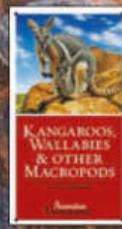
PAGE 65: SEE a video about the koalas of St Bees Island, Queensland.

PAGE 69: ENJOY a short film about the beautiful South Cumberland Islands.

PAGE 94: EXPLORE Timor-Leste in a clip from our new documentary.

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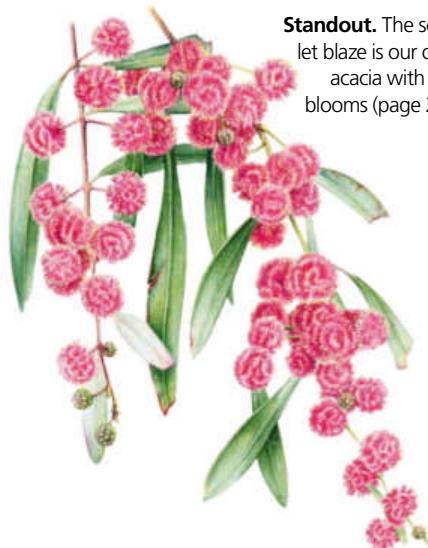


Learn all about kangaroos and other macropods – such as the wallaroo, seen here on the APY Lands – in our poster guide FREE to subscribers with this issue!



Shore thing. Cable Beach, left, in Broome, WA, is not only popular with tourists, but also polo fans (page 104).

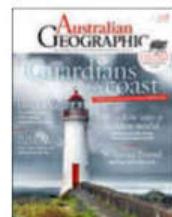
Catch of the day. Fresh seafood on display at a market in Dili, Timor-Leste's capital city (page 94).



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SUCCESSFUL BREEDING OF THE WORLD'S SMALLEST GLIDERS

Seven exquisitely small feather-tail glider juveniles have emerged from their nest boxes at Taronga Zoo.



BIOLUMINESCENCE: 'SEA SPARKLES' LIGHT TASSIE WATERS

Microalgae blooms in Hobart's Derwent River emit a bioluminescent blue glow when disturbed at night.



APOSTLEBIRDS KEEP IT IN THE FAMILY

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MOST VENOMOUS AUSTRALIAN ANIMALS

Here are 10 Australian creatures that produce some of the most lethal venoms in the world.



Australian
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CLOCKWISE FROM TOP LEFT: TARONGA ZOO / Acrobates pygmaeus; JO MALCOMSON / BLACKPAW PHOTOGRAPHY; AAP IMAGE / QUT / ERIKA FISH / Oxyuranus sp.; Iatana Gerus (tatters/flickr) / Struthidea cinerea



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THIS TIME last year, I was privileged to spend a couple of days in Timor-Leste (East Timor). I discovered a country that had suffered greatly because of its refusal to be subdued by a powerful neighbour, but also one experiencing a rapid transition to a contemporary Asian nation with all the aspirations, hopes and dreams we take for granted. It is a country that's rich in natural beauty – and the Timorese are a culturally diverse population with a proud and colourful history that they want to share.

We began to work with the Timorese government in late 2014 to create a documentary that would promote their exciting new tourism opportunities (the capital, Dili, is just a 90-minute flight from Darwin).

Our documentary filmmakers Julian Harvey and Clark Carter joined presenters Caroline Pemberton (star of our recent TV series, *Australian Geographic Adventures*) and marine biologist Dean Miller to explore this new tourism frontier on our doorstep.

Follow their adventures in *Australian Geographic Explores: Timor-Leste*, available to watch on our website, and read Dean's story on page 93. Perhaps you'll add this fascinating destination to your must-see list, and, in turn, help Timor-Leste realise its full potential.

The Australian Age of Dinosaurs Museum near Winton celebrated the completion of its first two stages last May, and the final stage is now underway (page 20). This facility will attract overseas visitors, and help to secure outback Queensland's status as the dinosaur capital of Australia. The Australian Geographic Society (AGS) donated funds in the museum's early days and it's heartening to see the

potential of that support realised.

Choosing how to distribute the funds that your subscription raises is the most important function of the AGS. We are delighted to welcome Anna Rose, Tim Jarvis, AM, and Tim Flannery to our AGS expert advisory panel to help us decide how to best spend your generous donations. They will be attending our annual awards, just a few weeks away on 28 October in Sydney, and we would love to see you there. Turn to page 111 to discover more about our new team from incoming Society chair Jo Runciman, and find awards night booking details on page 110.

Looking forward to meeting you there.

Chrissie Goldrick

Follow me on Twitter at:
twitter.com/chrissigoldrick

Contributors



Heidi Willis

is a self-taught watercolour artist specialising in natural history illustration. Her powerful and distinctive works are meticulous,

fluid reflections of our natural world. Painting full-time since 2003, Heidi quickly positioned herself as one of Australia's emerging artistic talents. Her reputation as a leading natural history, wildlife and botanical artist is now well established, with her paintings found in significant public and private collections around the world.

SPRIGS OF HOPE, PAGE 22



Glenn Morrison

is a journalist, author and musician living in Alice Springs. His work is widely published and has won him

several awards and fellowships. Early studies in geography and engineering led Glenn to combine an interest in the environment with a desire to write meaningfully about politics and places. Formerly editor of the *Centralian Advocate* newspaper, Glenn now writes a weekly column about the Centre for Rural Weekly NT, and produces for ABC Radio.

THE FLYING PADRE, PAGE 34



Penny Olsen

is a research scientist turned natural history writer. An associate professor at the Australian National University, in Canberra, she

spends much of her time at the National Library of Australia, where she enjoys digging through the collections in search of gems on Australian natural history. She was privileged to write Bill Cooper's biography, *An Eye for Nature: The Life and Art of William T. Cooper*, which reveals the fascinating history of the artist and was published by the library in 2014.

GUIDED BY NATURE, PAGE 31

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BIG PICTURE BIOLUMINESCENT BLOOM BY JOANNE PAQUETTE

Noctiluca scintillans or 'sea sparkle' is a bioluminescent dinoflagellate – a kind of planktonic organism – that, on rare occasions, blooms in great numbers and washes onto beaches, as seen here at Jervis Bay, NSW. "As the waves rolled in so did the microscopic creatures that lit up to create a blue lace effect," says photographer Joanne Paquette. "*Noctiluca* are tiny [each 0.2–2mm], so to see them so highly concentrated was very unusual."





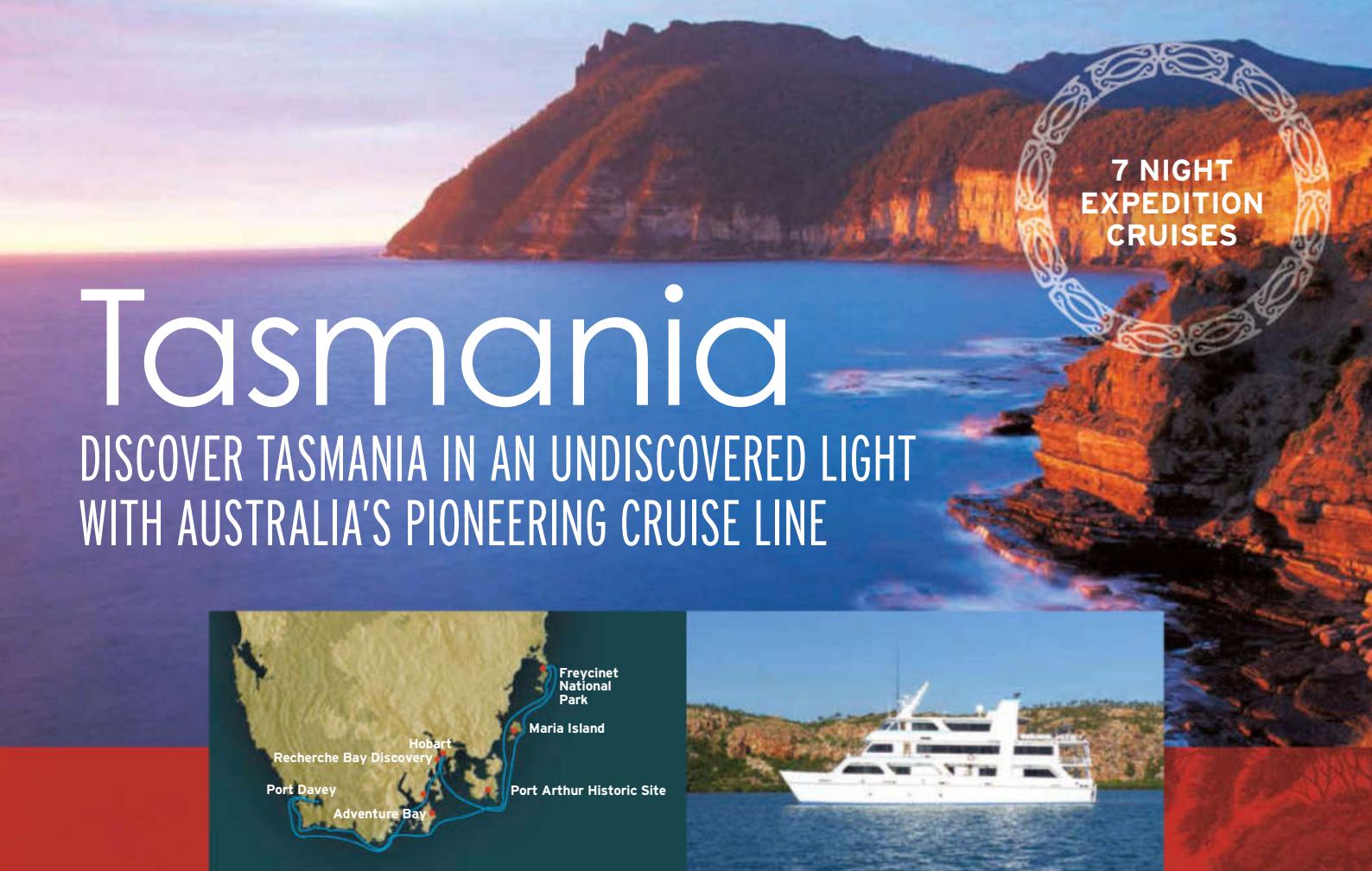
BIG PICTURE

SPAGHETTI WORM BY ALEXANDER SEMENOV

This lurid tangle of pink tentacles belongs to a 3.5cm-long polychaete worm in the Terebellidae family. It was photographed at the Australian Museum's Lizard Island Research Station on the Great Barrier Reef. Polychaetes are near impossible to photograph underwater, so Alexander Semenov used a Petri dish with a black background and strobe lights to capture images of more than 200 species of worm in the laboratory over 10 days.







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Where today becomes tomorrow

The International Date Line marks the point on the planet where globetrotters get to travel in time.

YOULD THINK the International Date Line (IDL) would be geographically precise – but it's more an ill-defined north-to-south path, roughly following 180° longitude.

The IDL is the place where we declare that time shifts by exactly 24 hours to accommodate the fact that Earth's movement causes confusion on an international scale, when the definition of a day is defined by sunrise and sunset. When you cross it

travelling west, the day and the date skip forward, but the time of day usually remains the same – cross it travelling east and the reverse happens.

Discussion about the need for a defined marker arose during the 1884 International Meridian Conference, which convened to set the prime meridian – 0° longitude. This was needed for geographical and nautical charts. The conference overwhelmingly agreed to define that line as passing

through both poles via the district of Greenwich in London.

But there was, and never has been, any international treaty, agreement or protocol to precisely define the IDL's path. And so this imaginary linear marker has shifted according to political and cultural alliances and sometimes trade pressures. The IDL shown on most modern maps is largely the one drawn up by the British Admiralty in 1921.

BACK TO THE FUTURE

1 In the early 1800s, Alaska – then part of Russia – was west of the IDL, because most travellers arrived via Siberia. When the USA acquired it in 1867, the IDL was shifted, so Alaska now sits to its east.

2 Four landmasses sit on 180° of longitude – Vanua Levu, Rabi and Taveuni islands, all part of Fiji; and **3** Russia's Wrangel Island, in the Arctic Ocean.

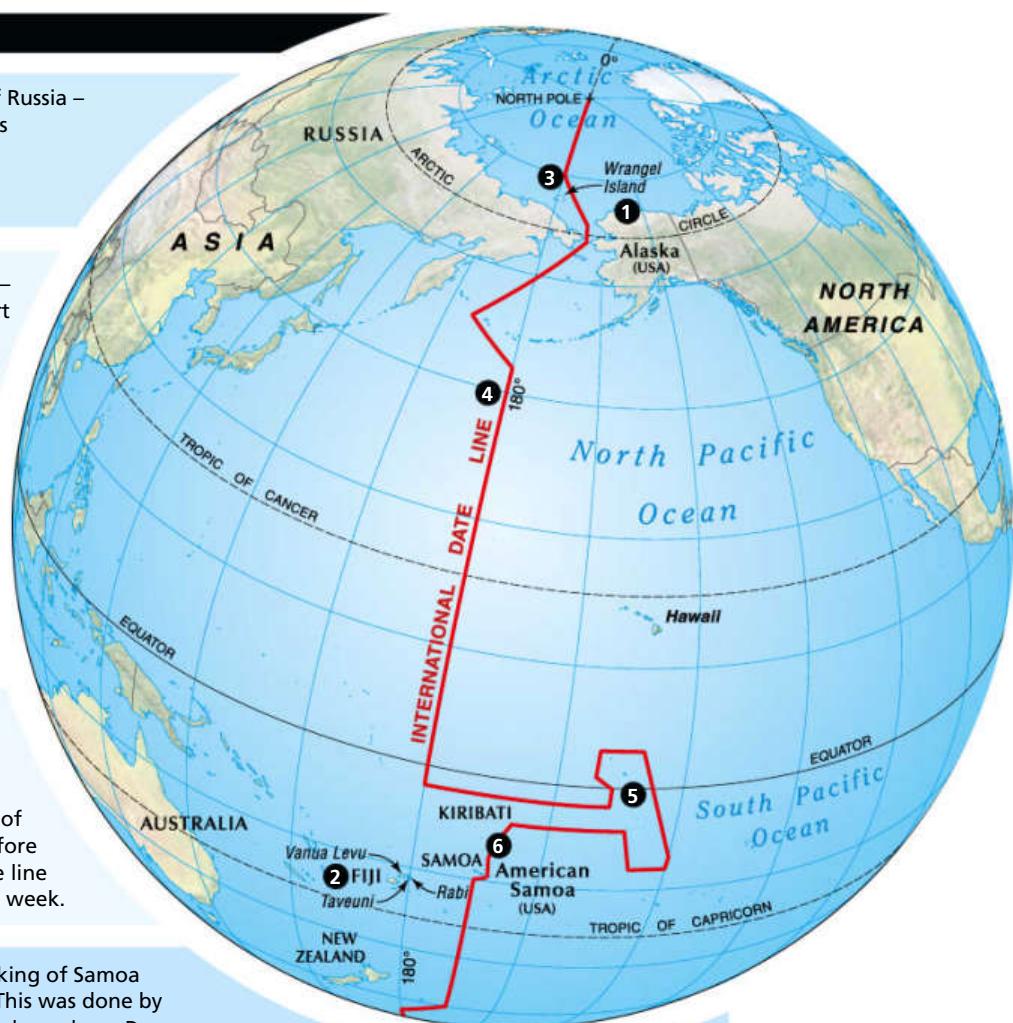
4 In 1917 the Anglo-French Conference on Time-keeping at Sea set the Nautical Date Line. Unlike the IDL, this is a legal construct determined by international agreement. It precisely follows the 180° line of longitude, except where interrupted by territorial waters.

5 The biggest kink in the IDL occurs around the Republic of Kiribati, which comprises 32 island atolls that once straddled the line. On 1 January 1995, part of the IDL was moved eastwards so that all of Kiribati's islands were on the same side. Before this, government offices working across the line could only communicate for four days each week.

6 In 1892 trading partners convinced the king of Samoa to move the line to better match the USA. This was done by repeating Monday 4 July 1892 – the USA's Independence Day.

• Friday 30 December 2011 did not exist for Samoa's 186,000 citizens, as the country jumped to the west of the IDL again to align with trading partners Australia and New Zealand. Samoa's now among the first countries to ring in the New Year, rather than the last.

• Because they are either side of the IDL, the neighbouring territories of Samoa and American Samoa (just 70km apart) experience a 24–25 hour time difference, depending on daylight savings time.

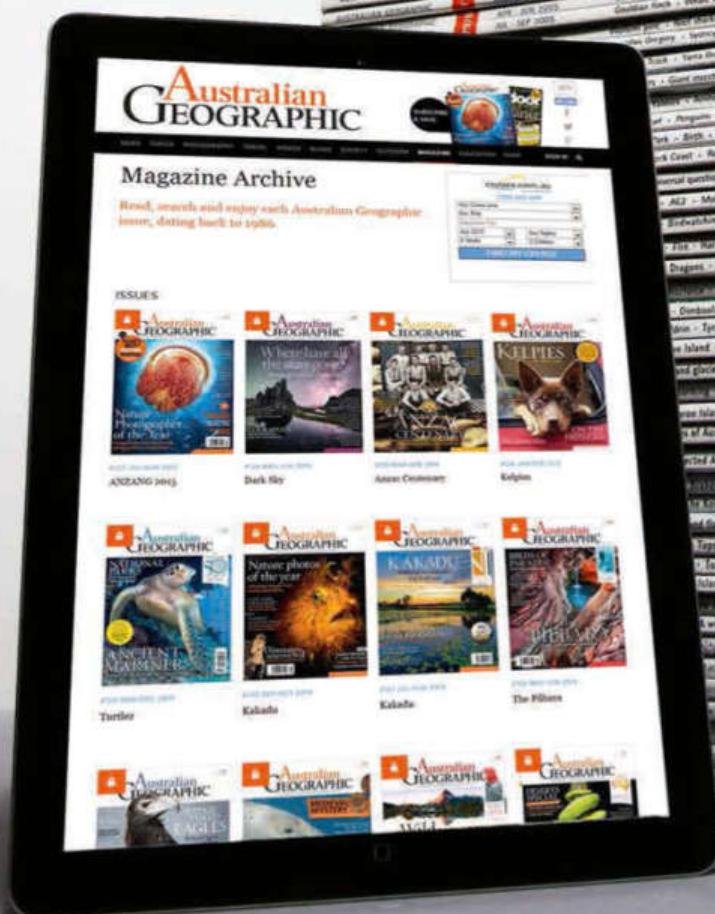


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A relationship restored

The study of fossilised dung has revealed a lost link between New Zealand's kakapo and the parasitic Hades flower – one of the world's weirdest blooms.



THIS IS A tale of two strange and fascinating species, both of which evolved unusual life histories during millions of years of isolation on the islands of New Zealand – two species that, we now know, once had a close ecological relationship.

The first is the kakapo: a large, fragrant, nocturnal bird, and the world's only flightless parrot – its numbers have dwindled to about 125, most of which are found on Codfish Island, a small speck off the south of the South Island. Here the kakapo's breeding success is linked to the infrequent fruiting

of a single tree, the rimu (see AG 115).

The second, you're less likely to have heard of. It's *Dactylanthus taylorii*, also known as the Hades flower or wood rose, or as pua o te reinga to the Māori, which means 'flower of the underworld'. It's a parasitic plant, which can't photosynthesise and has no leaves or roots. It spends most of its life underground, where it lives swaddled around the roots of the native trees from which it draws its water and nutrients.

For just a few weeks in early autumn each year, *Dactylanthus* plants throw up large numbers of dull pinky-brown flowers, which emerge from the ground around the host trees. These stud the forest floor, emit a musky, fruity scent and produce copious quantities of

Historic ties. The New Zealand lesser short-tailed bat feeds on the rare Hades flower, which scientists believe may also have been pollinated by kakapo.

nectar to attract the New Zealand lesser short-tailed bat, the plant's key pollinator. Unusually for a bat (another NZ quirk), this species spends much of its time crawling on the ground and burrowing in leaf litter.

But a study of fossilised dung or 'coprolites' found in a cave in the north-western corner of the South Island in 2012 suggests the plant once had other pollinators, too.

Researchers led by Dr Jamie Wood at Landcare Research in Canterbury have revealed that a series of 900-year-old kakapo droppings are packed with *Dactylanthus* pollen, suggesting that these birds once consumed its nectar and helped to pollinate the flowers. Similar to the kakapo, *Dactylanthus* has been reduced to just 4 per cent of its historic range – but both species were once common across the North Island and the north of the South Island.

"Kakapo and potentially many other nectar-drinking birds once fed on the nectar of *Dactylanthus* flowers, and may also have acted as pollinators or seed dispersers for the plant," Jamie says. "Coprolites are one of the only ways to reconstruct important pre-human ecological relationships, such as pollination and seed dispersal, which must be restored to conserve these species over the long term."

Intriguingly, in 2012 eight kakapo were reintroduced to Little Barrier Island, 80km north of Auckland on the North Island, one of the remaining *Dactylanthus* strongholds. This meant that the plant and its historic pollinator were once again reunited.

In 2015, for the first time, a series of camera traps has been installed on the island to attempt to find out if the ancient ecological relationship has been restored. It remains to be seen if any of the cameras have yet photographed instances of kakapo feeding on Hades flowers.

JOHN PICKRELL is the editor of AUSTRALIAN GEOGRAPHIC. Follow him on Twitter at: twitter.com/john_pickrell



AGS SUPPORTED PROJECT



High honour. AAOD Patron, Dame Quentin Bryce, congratulates David Elliott on the completion of the first two stages of the museum.

The new age of dinosaurs

Ground-breaking Queensland museum celebrates the state's prehistoric legacy.



Model predator. A life-size model of 5m carnivorous dinosaur *Australovenator wintonensis* welcomes visitors to the museum's multi-award winning main reception centre.

IT WASN'T EXACTLY a fork in the road David Elliott encountered that day back in 1999 while out mustering sheep on Belmont station near Winton. But the unexpected rock-like object which caught his eye that morning in outback Queensland – poking up from an otherwise flat, black-soil paddock – signalled the start of a journey for David and his family that would sweep them and their local community back 100 million years into Australia's prehistoric past. That was a time when

massive dinosaurs roamed across what was then a vast river plain with abundant lakes and swamps, shaded by a lowland forest of ferns and conifers. David's rocky discovery was famously identified as the fossilised femur of a giant sauropod, previously unknown to science, and the rest, as they say, is history (AG 65 and AG 83).

Sixteen years later, in May this year, David and his team hosted celebrations to mark the completion of the first two stages of the innovative Australian Age of Dinosaurs (AAOD)

museum, near Winton. The event also launched a new endowment fund that will ensure the museum's financial future, as well as the start of its third and final stage of construction.

Speaking at the event, David explained how the role of the museum had changed since he and his wife, Judy, first dreamt of a local facility to house the plethora of bones that was dug up after that life-changing 1999 find. "When we first started, we had this vision of having a little dinosaur museum in Winton," he said. "We had some bones and we didn't want to see

them leave the district. But we realised that what we have here isn't just about Winton or our regional community; this is a national treasure and something that belongs to Australia and all Australians."

This notion prompted David to broaden the quest for a suitable site beyond the town limits. The search led to a jump-up, or mesa (flat-topped plateau), 24km outside of town. The owners, Peter and Carole Britton, generously gifted a 180ha site to the AAOD and the new national museum was underway.

The main reception centre, completed in 2012, commands striking views of the surrounding plain from its precipitous position on the plateau's edge and its architecture blends seamlessly into the rusty-red, boulder-strewn landscape. Further along the clifftop is an airy laboratory where volunteer preparators work in comfort on dinosaur bones, and other ancillary buildings for staff use.

Stage three of the museum is bound to fire the imagination of every dinosaur fan. Under development are interactive outdoor exhibits, including dioramas with life-sized bronze dinosaurs and a pathway leading visitors through geological time.

David hopes the museum will achieve global recognition. "We need to build something out here that has an international pull, so we can welcome people from all over the world," he says.

The week following the big bush gathering – which boasted high-profile guests including AAOD patron and former governor-general Dame Quentin Bryce – David was awarded the Medal of the Order of Australia (OAM) for services to science. For the self-effacing grazier-turned-palaeontologist, and his extended family of friends, staff and supporters, it was yet another memorable milestone along the road to a dedicated Australian dinosaur museum.

CHRISSEY GOLDRICK

 **FOR MORE INFO** and to find out how you can contribute to the future of the museum, visit: australianageofdinosaurs.com



High flier

The 2015 Australian Geographic ANZANG Nature Photographer of the Year is David Stowe of NSW.

LONG-TIME twitcher David Stowe is keenly aware of wingbeats; the sound, feel and pressure changes as a bird's downward stroke and legs combine to thrust it skywards. It takes this special sense to capture fleeting moments of avian magnificence, a challenge that keeps bird photographers returning for more. David's been doing it for more than three decades and his entries in the Australian Geographic ANZANG Nature Photographer of the Year Competition have been numerous. He was people's choice winner in 2013, and in 2015 wins the overall contest against a record number of competing entries – 2049 in all, a 40 per cent increase on last year.

David's winning shot captured a lone white-winged tern that had just swept its wings up in preparation for take-off. His lens zoomed in on the "wonderful

symmetry and graphic simplicity" of the flight feathers sharply outlined against the blurred blue and green of Lake Wollumboola, 190km south of Sydney. The wings belonged to an outlier says David – a single white-winged tern, a migrant from Eurasia, surrounded by a bustling colony of little terns, which arrive here yearly from Japan.

"A thought-provoking image with immediate impact," this year's ANZANG contest judges said of the shot. It won David \$10,000 cash and a once-in-a-lifetime journey for two on board Heritage Expeditions' Papua New Guinea Explorer Voyage in April 2016, valued at more than \$25,000.

NATSUMI PENBERTHY

 **FIND OUT** how to enter the 2016 competition in our Jan/Feb issue, and see the 2015 category winners at: australiangeographic.com.au/anzang



WATTLES

Sprigs of hope

The small flowers and ramshackle form of many wattles belie the impact these plants have on the Australian environment.

WATTLES BELONG to the plant genus *Acacia*, which contains about 1350 species worldwide, including 1000 in Australia. Ranging from trees to minuscule shrubs, acacias dominate many of our landscapes.

"Acacia forests and woodlands of the semi-arid and arid parts of Australia are probably the most important [of these]," says Professor Michelle Leishman, a plant ecologist at Macquarie University in Sydney. Notably, stunted mulga woods and shrublands, often dominated by *Acacia aneura*, cover about 20 per cent of the mainland.

Most wattles are hardy and fast-growing. They're used extensively in horticulture and for habitat restoration, and are an important traditional Aboriginal food source. Many are also used in bush medicine and the timbers and bark of some have been used to make spears, boomerangs, clubs, fishing nets and as a canvas for Aboriginal art.

The green-and-gold colours that have come to define our national identity and are worn by our sporting heroes come from wattle. Sprigs embellish the Commonwealth Coat of Arms and the golden wattle, *Acacia pycnantha*, is our official national floral emblem. During World War I, our soldiers were sent sprigs to wear as a symbol of hope and reminder of home. National Wattle Day on 1 September each year coincides with the flowering season of many wattles – it's a day of national pride and a symbolic acknowledgement of the environment that sustains us.

WESTERN WHEATBELT WATTLE

Acacia brachypoda

Restricted to two small sites in south-western WA, this wattle is listed as an endangered species. Nursery-grown plants are being used to establish additional populations in the face of threats, such as rising soil salinity. Its thin branching leaves form a dense, rounded shrub, which glows yellow when in bloom.



PURPLE-FLOWERED WATTLE

Acacia purpureapetala

This critically endangered wattle is another with atypically coloured flowers. It's found only on the high, rocky slopes of a few mountains in far north QLD, and there are only an estimated 500 left in the wild. Although there's much interest in its mauve-pink flowers, it has proven difficult to cultivate.



RED-STEMMED WATTLE

Acacia rubida

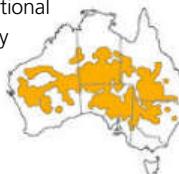
Growing on hilly terrain across the Great Dividing Range, the red-stemmed wattle can reach a height of about 5m. As with most wattles, it flowers in early spring and attracts pollinators such as bees, wasps and beetles. Wattle flowers lack nectar but pollinators swarm to collect abundant protein-rich pollen.



MULGA

Acacia aneura

This wattle is prolific across much of the inland. There are about 10 varieties – these typically form shrubs growing up to 2–3m tall in arid areas and up to 10m tall in wetter environments. Mulga is drought-tolerant and can live for more than 50 years. Its seeds are important in traditional bush tucker – they can be cooked or ground into a paste.





SCARLET BLAZE

Acacia leprosa

Most wattles, including the majority of individuals of this species, have yellow flowers. But a form with pink flowers was discovered in 1995 in north-eastern Melbourne. The Royal Botanic Gardens cultivated the scarlet variety from seeds and it is now a popular garden variety.

Also known as the cinnamon wattle, because of the scent of its leaves, it's the only Australian acacia with red flowers.



MYRTLE WATTLE

Acacia myrtifolia

Common along Australia's south-east coast and parts of southern WA, this medium-sized shrub grows to about 2m in height. Because it has red branches contrasted against pale-cream flowers, it is sometimes called the 'red-stemmed wattle'. As with most acacias, the seeds have a fleshy covering – the aril – which attracts ants.



SPIKE WATTLE

Acacia oxycedrus

Short, pointed leaves give this tree its common name – and a painful shock to those who venture too close. As with other wattles, each hairy-looking 'flower' is actually an inflorescence of many small flowers blooming together. The pale-yellow, cylindrical inflorescences of *A. oxycedrus* extend beyond its short leaves. This is a spreading shrub that can grow to about 10m across.



BLAKE'S WATTLE

Acacia blakei

Common in the northern NSW tablelands and southern QLD, Blake's wattle grows in soils derived from shale. As with many wattles, this species does not have true leaves when mature. They are reduced and the leaf stems form large flattened 'phyllodes' that play the part of true leaves.



NATURAL HISTORY

Drawing to scale

Ninety years ago, a valuable international contract called for some inventiveness, and even a little coercion, on the part of a venerable scientific institution.





A fishy tale. Ethel King adds the finishing painterly touches to a large specimen of groper in preparation for display at an international exhibition in Dunedin, NZ, in 1926.

IN MAY 1925, the Fijian government contracted the Australian Museum in Sydney to prepare a series of fish specimens. These would be for display at the New Zealand and South Seas International Exhibition in Dunedin, NZ, which was to open in November that year.

In mid-October, four fish entombed in blocks of ice arrived in Sydney aboard the *SS Sierra*. The largest, a kind of fish known in Fiji as koakoa and in Australia as a Queensland groper, weighed in at nearly 160kg and measured 2m from snout to tail.

Before the process of taxidermy could begin, the colours and other characteristics of the fish had to be carefully recorded so that they could be faithfully rendered once the creatures were stuffed and mounted on stands. Ethel King was a talented artist and scientific illustrator who worked for the museum in the 1920s and '30s. She had trained under the famous Australian artist Julian Ashton, and she specialised in fish, snakes and, occasionally, botanical subjects – most notably providing the 137 colour plates for J.R. Kinghorn's landmark book *Snakes of Australia*, in 1929.

Miss King made detailed pencil and watercolour sketches of the four specimens after they had thawed. The fish were then skinned and the skins immersed in spirits to preserve and prepare them for the next stage. Because there was no container large enough for the monster fish's skin, the museum's ever-resourceful technicians constructed a suitably sized glass tank.

In the meantime, Miss King became ill and, after surgery, was sent away to her parents' home in Lismore, NSW. The museum chiefs, ever anxious to meet their commitments, tried in vain to find a suitably skilled replacement artist. Over the next few months, taxidermists, led by H.S. Grant and assisted by J.H. Wright and W. Barnes, prepared the groper for exhibition. After pondering the challenges of tackling such a large fish, Grant employed a process usually reserved for large mammals.

Using Miss King's drawings and measurements as reference, a frame was fashioned from redwood and covered with wire gauze. A thin coat of papier-mâché was added on top. Once a coating of shellac was applied to the whole, the surface was ready to take the preserved fish skin. The fit was perfect. King was then coaxed from her country retreat back to Sydney to paint the groper's true colours back onto the giant replica, resulting in "an excellent example of modern taxidermy", according to the *Australian Museum Magazine* of the day.

The four fish finally arrived in NZ on 1 March 1926 and were exhibited during the last two months of the fair. By the time it closed on 1 May 1926, the exhibition had attracted 3.2 million visitors – more than double NZ's total population at the time.

CHRISSEY GOLDRICK

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Mystery mission. Little is known about the latest space flight of the X-37B, which launched in May.



From orbit with love

The US defence agency's 'secret' space shuttle is up to something once again.

IT'S UP THERE. Again. The US Air Force's ultra-secret X-37B robotic space shuttle was launched into orbit from Cape Canaveral on 20 May, for a mission anticipated to last about nine months. We have been told about this and previous missions that the purpose is the testing of reusable technologies, such as thermal protection for spacecraft. But space buffs are sceptical.

Although everyone is intrigued by military secrets, it's frustrating to be scratching around for crumbs of information about what is arguably one of the most exciting projects in contemporary space flight. We can understand the need for secrecy when national security is at stake, but we can also hope that one day soon, this advanced know-how will find its way into civilian aeronautics.

So what do we know about the reusable space plane? First, it bears a striking resemblance to the crewed space shuttles that NASA flew into orbit from 1981 to 2011. At 8.9m long, it's only a quarter the size, however. And it's fully robotic. Launched vertically atop an Atlas V rocket, it lands on a runway, just as the piloted shuttle did. This is the

craft's fourth mission – the last one ended with a touch-down in California, in October 2014, after 674 days in orbit.

Its heritage is also interesting. The X-37B started life as the X-37 project, a NASA venture that began in the late 1990s with the aim of exploring the possibility of shifting a spacecraft's orbit in flight. Rendezvousing with ailing satellites to perform repairs was one goal. In 2004, however, the project was abandoned by NASA, and transferred to the Defense Advanced Research Projects Agency (DARPA) – whereupon it was declared classified. And that was that.

An entirely predictable consequence of all this secrecy is the plethora of conspiracy theories that has surrounded the X-37B – these include that it is a device for dropping bombs from space or that the plan is to use it to capture and interfere with foreign satellites. Suffice it to say that the Pentagon has categorically denied that it is used as a test-bed for space weapons. The rest is just speculation. One day, perhaps, we will find out.

FRED WATSON is astronomer-in-charge of the Australian Astronomical Observatory.

Fred answers your questions

Why introduce a leap second every 18 months to compensate for the slow-down of Earth's rotation, when the accumulated effect should only amount to 7 milliseconds?

Wayne Robinson, Kingsley, WA

You're quite right that the drift of astronomical time away from atomic clock time is only partially due to the gradual slow-down in Earth's rotation. Other contributors include irregular natural phenomena such as the redistribution of magma in the Earth's mantle.

If you have a space question for Fred, email it to editorial@ausgeo.com.au

Glenn Dawes looking up

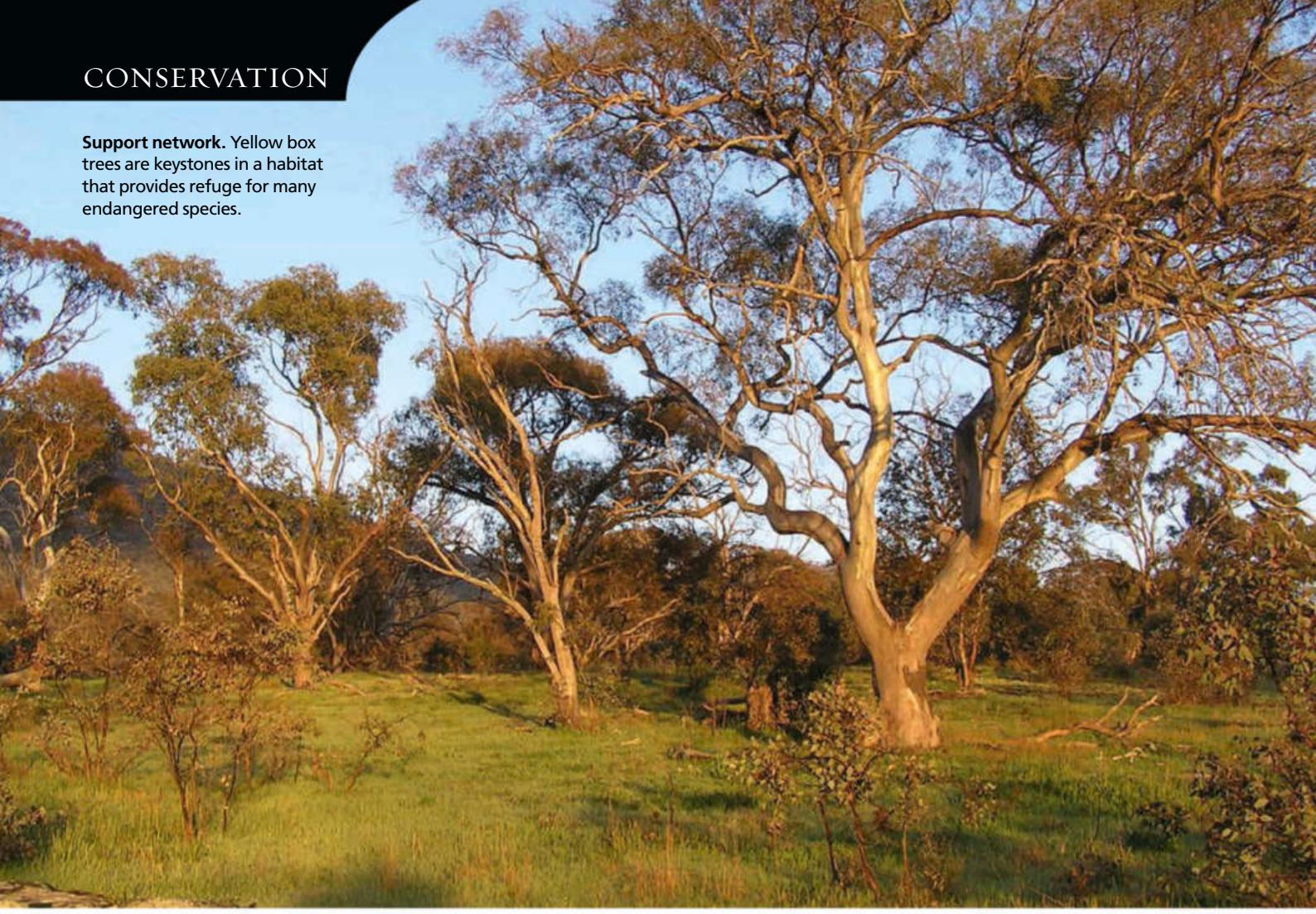
NAKED EYE Venus has become the morning star. Mars, followed by Jupiter, chases this 'Goddess of Love' as it rises out of the dawn. Jupiter passes Mars on 18 October, catching Venus on the 26th, when these beacons will be only two moon widths apart!

BINOCULARS The random group of faint stars making up the constellation of Aquarius, the Water Bearer, looks nothing like a kneeling man, but his water jar is a distinctive group of four stars arranged in a 'Y' shape.

SMALL TELESCOPE The obscure constellation of Pavo is home to two spectacular deep-sky objects. The face-on spiral galaxy NGC 6744 displays a prominent central bar, while the globular star cluster NGC 6752 has a bright centre.

Glenn Dawes is a co-author of *Astronomy 2015 Australia* (Quasar Publishing).

Support network. Yellow box trees are keystones in a habitat that provides refuge for many endangered species.



Sprouting success

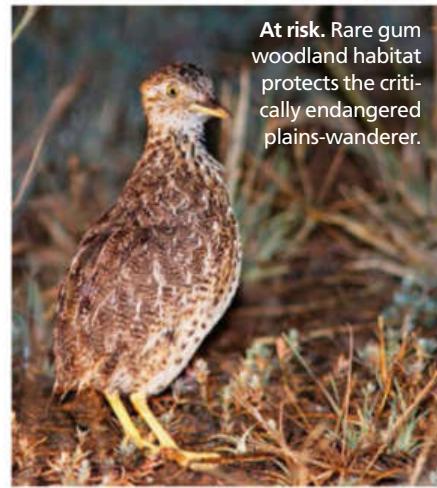
A revegetation project involving hundreds of volunteers is helping to bring back one of Australia's most endangered grassland ecosystems.

HERE WAS a time when a vast eucalypt wilderness, forming the backbone of a complex ecosystem, stretched across great swathes of south-eastern Australia, from southern Queensland through New South Wales to western Victoria. Since the first European settlers arrived, 95 per cent of this unique habitat – grassy woodlands of yellow box, white box and/or Blakely's red gum – has been lost through grazing and clear-felling for pasture.

It once covered at least 80,000sq.km, but only about 4000sq.km remain, just 1 per cent of which is of high quality. About 75km south of Canberra, Bush

Heritage Australia's Scottsdale Reserve is the site of a huge effort to reclaim this habitat and rescue the endangered species it supports. One-quarter of this 1328ha reserve, which was once cleared for pasture, has become overrun with weeds such as African lovegrass. The aim is to restore it to its former glory, where yellow box once towered over tussock grasses, such as kangaroo and snow grass, and other patchy vegetation, including peas, daisies and lilies.

In the scattered areas where it remains, this woodland type is crucial habitat for 400 native plants and many native animals, including the endangered

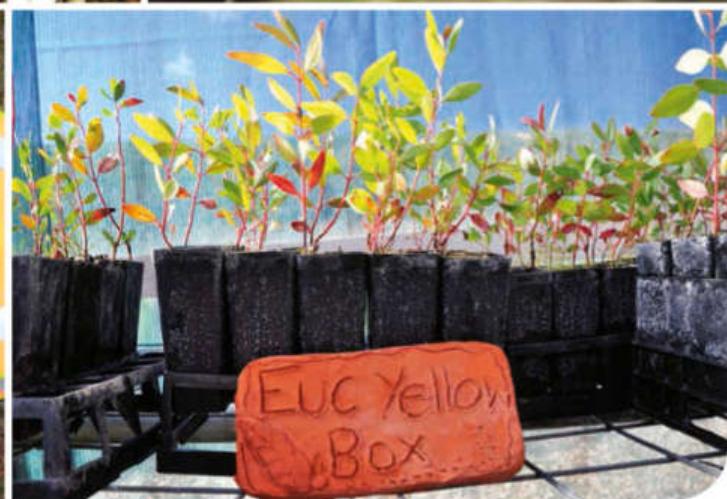


At risk. Rare gum woodland habitat protects the critically endangered plains-wanderer.

New life. Precious tree seedlings await planting into Scottsdale Reserve, south of Canberra.



Small wonder. The striped legless lizard is one of many species relying on the threatened woodland.



regent honeyeater, swift parrot and plains-wanderer and the vulnerable striped legless lizard.

An army of volunteers coordinated by non-profits Bush Heritage and Greening Australia has begun restoring rare yellow box grassy woodland by replanting key species, including the yellow box itself, famed for the honey that bees produce from its nectar.

"The question is whether the \$250,000 worth of revegetation – seedlings that have been planted by over 500 volunteers – is thriving or falling over," says Australian National University ecologist Dr David Freudenberger, who's involved with the work. "We can't expect any significant outcomes in biodiversity if it doesn't establish...the first step is to see if it survives or thrives."

Encouragingly, the revegetation project, which began in 2012, is seeing a

high success rate. More than 95 per cent of 4000 box seedlings planted during the past two years have so far survived. But the program isn't without difficulties. Experiments are run during replanting to see which techniques produce the best returns. Seedlings are carefully grown, both offsite and at a nursery on the reserve. They're monitored by volunteers, among them Sue Connelly, who's managed the nursery since 2010. She's grown thousands of yellow box seedlings herself. "I just enjoy growing plants," Sue explains. "There's nothing like watching them grow and...seeing birds live in the trees, and use them for shelter."

Once planted, the seedlings are surrounded with a tree guard for protection from animals and harsh weather. Monitoring continues, and if a seedling survives the first summer, it's regarded

Next generation. This yellow box eucalypt tubestock (above) has a 95 per cent chance of survival. Australian National University students (above left) assess the health of saplings.

as being here for good. But it's clear the revegetation project is going to take many decades to reach fruition.

"There's a lot of devil in the detail in this business," David says. "You just don't plonk them in the ground; getting seedlings to thrive requires a whole chain of sequences to be just right – from the quality of seed to the depth of the planting hole and the sturdiness of the tree guards."

A further five years research and monitoring of these methods is planned, with the ultimate goal being to grow mature trees with large hollows. These are critical habitat for bats, reptiles, birds and possums (see AG 127), which depend on hollows of differing sizes, David says. But research shows that, for trees to reach the appropriate size and state of decay, it takes at least 120 years.

LAUREN SMITH

This woodland is crucial for 400 native plants and many native animals.

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Guided by nature

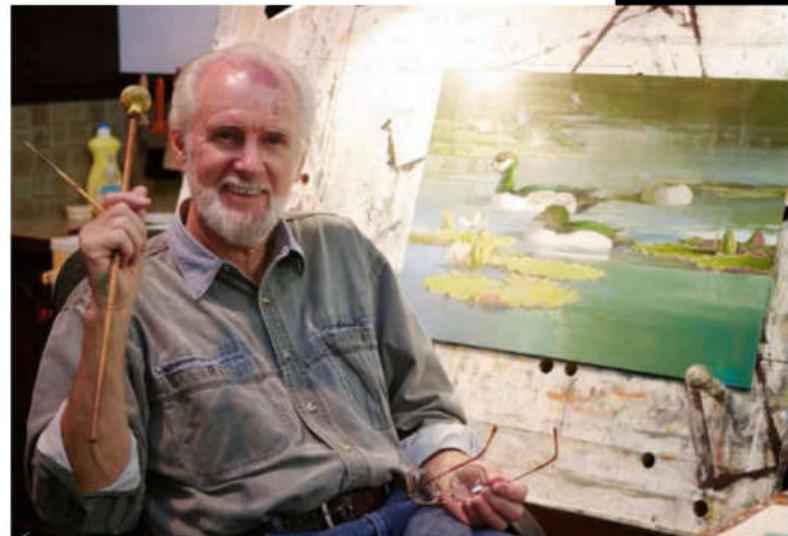
Farewell, Bill Cooper, portrait painter to the birds.

IN THE 1970s David Attenborough was leaving the offices of a Sydney publisher when he came across a line of paintings of birds of paradise along a corridor. He was stunned and later recalled: "They were most delicately coloured and marvellously drawn...[the] postures and the colouring and varying textures of their plumage had an immediacy and vivacity that Gould's artists never approached."

The paintings were by Australian artist William Thomas Cooper. David returned in the early '90s to make a documentary on 'Bill', dubbing him 'Portrait painter to the birds'. They became firm friends and the BBC broadcaster added many Coopers to his collection of natural history art. When I wrote Bill's biography, *An Eye for Nature: The Life and Art of William Thomas Cooper* (National Library of Australia, 2014), David honoured Bill by writing the foreword, something he rarely does. Here he described him as "The best ornithological illustrator alive."

The paintings David 'discovered' in that Sydney office were from *Birds of Paradise and Bower Birds*, Bill's second collaboration with ornithologist Joseph Forshaw. Between their first monograph, *Parrots of the World*, in 1973, and their eleventh, *Pigeons and Doves in Australia*, released a few months ago (see page 42), Bill and Joe covered thousands of bird species.

When Bill died on 10 May this year at the age of 81, in his home on the Atherton Tableland, the world lost one of its greatest bird artists. As David described, he was known for his accuracy in all aspects of his paintings, not least capturing the personality and mood of his subjects, which came from



Bird man. Bill Cooper (top) in his studio in Atherton, and with broadcaster and long-time friend David Attenborough (above). Final illustrations were the result of many hours of sketching and painting (left).

a deep knowledge of the natural world.

His method was to see the living bird, wherever possible, observe it for long periods and make many sketches. He eschewed photographs, but referred to museum skins for fine details, particularly plumage colours. He put great effort into researching appropriate habitats and food plants or animals, again referring to specimens collected himself or sourced from around the world. As a kid he learnt taxidermy at the local zoo, which helped him greatly with anatomy, especially the underlying structure of birds. For reference, he had his own collection of insects, shells, and bird skins and skeletons.

Although best known for his birds, Bill began as a landscape artist, and could paint anything nature presented, from thylacines to platypuses. After their move to Atherton, he and his wife, Wendy, set out to learn about the

poorly known plants of the Australian tropical rainforest. Some 17 years and two books later, Bill had drawn 1230 luscious fruits, and self-taught Wendy had become the international expert on several botanical groups. Their third joint effort in 2013 was the *Australian Rainforest Fruits: A Field Guide*.

In recognition of his contributions, Bill was made an Officer of the Order of Australia in 1994, and in 2014 the Coopers became the first couple to receive Honorary Doctorates from the Australian National University.

Bill was guided by nature. He particularly liked the words of 16th-century painter Albrecht Dürer: "Do not depart from [nature], thinking that you can do better yourself. You will be misguided, for truly art is hidden in nature and he who can draw it out possesses it."

He will be sorely missed.

PENNY OLSEN

Owls in the Outback and the Backyard



The dawn chorus was surprisingly loud — loud enough to wake me from a deep sleep. The chirps, whistles and hoots of dozens of unseen Budgies, Cockatiels and Zebra Finches combined to make me wonder whether I had woken up inside a pet shop rather than beside an outback waterhole.

Before long, a hundred other birds had joined in. From the warmth of my sleeping bag I recognised the sweet melodies of a Brown Honeyeater, a piping duet by some Pied Butcherbirds and some chirruping woodswallows, but much of the rich birdsong outside my tent was unfamiliar to me. And I knew that plenty of other birds would be gathering silently at the waterhole in the pre-dawn blush for an early-morning drink to get their day under way. Punctuating the birds' symphony was the harsh screech of a Barn Owl, probably just going to bed, to signify that the night shift was officially over.

Fast forward a couple of months. I was walking to work — a daily trudge along Elizabeth Street, amid the clatter of trams and the rumble of traffic in the early morning rush hour — when above the din I heard the calls of an angry Little Raven. When I looked up, I saw a raven flying past, hot on the tail of a Barn Owl — in broad daylight! Flying down the middle of the street, just above the trams' powerlines, the raven flapped frantically, contrasting with the buoyant flight of the crisp, white owl as it floated by. All this virtually in my 'back yard'!

Perhaps the owl had been slumbering among the rafters of the nearby Queen Victoria Market when it was discovered by the raven, scavenging for some early-morning scraps. It was a wonderful sighting but no one else in the busy street even noticed the owl fly past.

This chance sighting made me realise that it doesn't matter where your 'back yard' is — whether it's a waterhole in the Red Centre or a bustling city street — if you're somewhere in Australia, you can be sure that you'll see birds wherever you look.

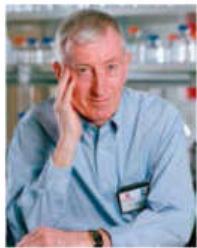
However, Barn Owls aren't your typical backyard bird — you're far more likely to see a Rainbow Lorikeet, Noisy Miner or Australian Magpie. I know this because last year I took part in **BirdLife Australia's Aussie Backyard Bird Count**. All I had to do was spend 20 minutes counting the birds I saw in and around my back yard. I didn't see any more Barn Owls, but there were plenty of other interesting native species added to my backyard bird list.

The good news is that the Aussie Backyard Bird Count is on again in 2015, between 19–25 October, and BirdLife Australia is keen to hear from anyone who is interested in the birds that venture into their back yards. It's easy and it's fun, but there's a more serious side too — the results will help BirdLife Australia understand the everyday birds which live in proximity to people.

Text by John Peter
Images by Andrew Silcocks

For more info head to aussiebirdcount.org.au or download the Bird Count app.





PETER DOHERTY

An evidence-based world

It is our personal responsibility to seek the truth on the important debates that will decide our future, says Peter Doherty.

AMERICAN PHYSICIST Richard Feynman once said “reality must take precedence over public relations, for Nature cannot be fooled”. So aren’t rising sea levels, floods, droughts and heat waves inexorably out of our control? Surely nature is not our construct; it’s the reverse! What can we possibly do about it?

But the worst strategy – if we want to ensure a bright future for our grandchildren and Australia’s unique wildlife – is to embrace this kind of “it’s not up to us” attitude and fail to engage with the cumulating scientific evidence for anthropogenic (human-caused) climate change.

Just as when opponents of vaccination discover their unvaccinated infant has contracted whooping cough, embracing the views of climate change sceptics based on ignorance, propaganda and invented narrative is naive and dangerous. The truth may be inconvenient, but we can’t allow ideological zealots, paid propagandists and scientifically illiterate politicians to promote the continued, even expanded, burning of fossil fuels.

Both our understanding of childhood infections and the availability of effective vaccines against them are grounded in sound, long-term science. Similarly, the vast and ever-strengthening body of evidence for anthropogenic climate change is based solidly on the laws of physics and painstaking analysis of massive data sets. These are acquired via a range of sophisticated technologies: from satellites and ‘dive’ buoys to the probing of atmospheric gas and temperature data stored in prehistoric ice cores sampled from glaciers and polar regions.

And there are biology readouts too, where our climate past is ‘interrogated’ through measurements from tree



rings, coral cores, and ocean sediments, while modern data show that some migratory birds are shifting their ranges away from the equator.

Hardworking, dedicated climate scientists have been accused of fraud, sometimes by extraordinarily dubious figures from media, business and politics. The general consensus of 97 per cent of active climate scientists is refuted by the pronouncements of a few scientist ‘sceptics’ (often retired or in a different field). Could anything be more ironic, even moronic?

This determination to ignore the evidence for human-caused global warming is at direct odds with the way we approach any sign of personal medical malaise. Suffering a sudden pain, we go immediately to Google and decide we have some hideous disease. Then we are immensely relieved when our GP says, “It’s minor, take an aspirin or two...you’ll be right.”

Why is it so different when looking at the health of our only home, the Earth? Like our bony skeletons, the rocks will survive. It’s Earth’s web of life that requires our duty of care.

For both medicine and climate change our capacity to define the problem and respond appropriately is

a direct result of the fact that, over the past three centuries, the societies of the West (and now the East) have embraced the evidence-based reality of science. Yet, although professional researchers may know the real story, how can those of us who lack such specific training find truth in the face of deliberate dissembling?

Most of us no longer rely only on edited newspaper, TV and radio reports for information, and, although the internet provides rapid access to a huge body of sound knowledge, it’s also a major source of sophisticated propaganda.

But the internet also allows us to probe the credentials of self-styled ‘experts’. Personally – from both insider (medical science) and outsider (climate science) perspectives – it’s easy to suggest simple, universal ‘interrogation’ techniques for the intelligent information detective.

Any scientist or commentator can be checked out via websites such as PubMed or Google Scholar, to uncover where and what they are publishing and if their analysis has serious impact. Increasingly, the science literature is open-access for all to read. No matter what our intellectual background, any smart individual can take up this science awareness challenge and tell what findings are dubious and who is fake versus who is real.

Knowledge is power – and empowered, we can seize the opportunity and act to promote the long-term well-being of our families, our species, and, indeed, of all complex life forms.

► **PROFESSOR PETER DOHERTY** shared a Nobel Prize for his work on immune surveillance, and was Australian of the Year in 1997. His latest book is *The Knowledge Wars* (Melbourne University Press, 2015).

THE FLYING

Take to the air with the Uniting Church pastor whose Central Australian parish – at more than half a million square kilometres – is bigger than many countries.



Early riser. Rev Colin Gordon readies his Cessna 182Q for take-off from Umbearra Station, one of the NT's southernmost homesteads.

PADRE

STORY BY GLENN MORRISON
PHOTOGRAPHY BY BARRY SKIPSEY





In control. Levelling out at 5500 feet gives Colin an unforgettable view of Australia's Red Centre.

SCATTERED CLOUD provides an unusual backdrop to the Alice Springs Airport, where blue skies usually reign. With the new day barely 30 minutes old, the desert glows a soft straw colour thanks to parched, introduced buffel grass that now supplants natives over much of Central Australia's red plains and ranges.

With a resonant grunt, the Reverend Colin Gordon drops a shoulder towards the tarmac to lift a fuel hose as thick as his forearm. Dressed in jeans, boots and a light jacket, he hauls the black hose from the avgas bowser to a four-seater Cessna 182Q, which bears the Frontier Services logo on its fuselage. The pastor climbs onto the starboard wing, feeds the fat nozzle into a reservoir there and pulls the trigger, releasing a flow of fuel.

"Every day is different," he calls from the ladder, taking a moment to adjust his spectacles. "Getting out and seeing people. Feeling fresh. I just enjoy it." As becomes evident during the day ahead, the Reverend grins as readily as he breathes. This time it comes with a hearty laugh.

Officially, Colin Gordon is a Patrol Minister of the Uniting Church's Frontier Services, an outback mission charged with providing spiritual, emotional and pastoral support to those living in Australia's remote heart. After almost five years serving the Red Centre, however, the 55-year-old is better known as the 'flying padre'. His flock is scattered over some 640,000sq.km of arid and semi-arid land bounded by Marla

in South Australia, Barrow Creek in the north and stretching east and west beyond state borders. Although his mission is spiritual, the padre is just as likely to be found atop a windmill grasping a pipe wrench, as he is in the pulpit brandishing a Bible.

Perhaps it's his early days as a fitter and turner that are responsible, or his time counselling troops in Afghanistan for the Royal New Zealand Navy. Or maybe a no-fuss world view comes with the territory for Patrol Ministers, for whom multi-skilling is unofficially part of the job description.

In this regard, Colin agrees he is like his famed early predecessor, the Presbyterian minister Reverend John Flynn. Via a long history of name changes, Flynn is considered the grandfather of Frontier Services, which began as the Australian Inland Mission in 1912. Development of the pedal radio later spawned Alice Springs School of the Air, which today broadcasts classes to pupils across 1.3 million square kilometres of the inland (see AG 70). Flynn's mission also founded the Aerial Medical ▶

GLENN MORRISON is an Alice Springs-based journalist whose stories about Central Australia are widely published. He is presently working on a book entitled: *Songlines and Fault Lines: Six Walks that Shaped a Nation*.

BARRY SKIPSEY is a longtime AG photographer; his last story for us, *Heartland town*, was in AG 124. As an Alice Springs resident for 30 years, he is deeply connected to the region's colours, contours and people.



Welcome words. Colin, left, has a quiet chat with good friend and Centralian artist Bob Kissing, who created this sculpture using reclaimed bottles.



School's in. Alice Springs School of the Air principal, Mel Phillips, shows Colin the school's vast network of stations and pupils.

Although his mission is spiritual, the padre is just as likely to be found atop a windmill as in the pulpit.

Men's business. Station-owner Angus McKay, left, and Colin have a yarn as they collect firewood to cook steaks for lunch.



On the job. At Kings Canyon, Colin visits a team building an exclusion fence. Ranger Pete Beddows, centre, talks with the padre as Conrad Bray tightens the fence.



Service in 1928, which was destined to become the familiar Royal Flying Doctor Service. But it was not until 1977 that a fledgling Uniting Church adopted the name Frontier Services for its outback missions.

Raised with three older brothers and a younger sister on a dairy farm in chardonnay country on the east coast of New Zealand's North Island, the young Colin Gordon harboured a dream to fly. Today, strong family ties remain significant for the padre, who displays considerable people skills, a trait he attributes to his mother. "She would see a stranger at a local cafe and crack a conversation with them," he recalls. "Next thing you know, they're having lunch with us."

At age 30, Colin turned from engineering to chaplaincy, a move he now sees as a natural progression. "It meant freedom and scope to be with people. If you are a social worker, you're a bit restricted," he explains. "Yesterday, for example, I wanted to stay another hour to talk and I could; I didn't have to justify it to anyone."

After eight years as a navy chaplain, Colin sought a new challenge and in 2011 answered a job advertisement by Frontier Services. Halfway through the interview, as he tells it, they "asked if I'd like to learn to fly".

Now the padre flies with teachers, students and others to stations, remote communities and far-flung outposts. Occasionally, he even takes volunteer playgroup coordinators. "Parents from stations around the district come together and

have a chit-chat while playgroup goes on," Colin says. "They tell me they've been waiting for someone to do this for years."

It is part of a strategy for pastoral care. Similar to Flynn before him (who had a knack for fixing sewing machines), Colin is more pragmatic than religious. "I need a fridge magnet," he jokes. "A picture from the front of my plane with a twinkle from my teeth: 'Got a problem, see the padre!'"

Being practical has advantages. It means respite for the over-worked and provides an 'in' with outback men and women. Nevertheless, men, in particular, remain challenging. "In the navy, when you wanted to talk to a bloke you played sport," Colin says. "Ask him to come to your office to talk about life, and he'd likely turn you down."

That lesson now serves him well. "I'll jump on a tractor or bike, go mustering, sharpen chainsaws. People respond because they trust you," he explains. "One bloke told me 'When I see your car coming I relax – you're not going to sell me something.' A padre never wants much; maybe a cup of tea."

Colin stows a final item – a chainsaw – in the rear of the Cessna before take-off and bangs shut the hatch. Our destination is the remote Aboriginal community of Kaltukatjara in the Northern Territory's south-western corner – 495km (and two hours) by air from Alice Springs and about 10km from the Western Australia border. There we'll cut firewood for the aged care centre and spend time with staff. As the runway rushes beneath, the aircraft hits 40 knots and the real-time aircraft tracking device



Ground work. Colin also covers about 20,000km by road, much of it along dusty outback routes.

“I’ll jump on a tractor... go mustering, sharpen chainsaws. People respond because they trust you.”

on the console blinks. It notes our departure as a safety precaution and also sends an automated text to Colin’s wife, Kim, in New Zealand.

The couple met at a wedding – he was officiating, she was the photographer – and they married in November last year, each for the second time. Now they meet every six weeks with Kim occasionally joining Colin on his travels. “Every time I take her with me, the pastoral visit is enhanced,” he says.

From an altitude of 6500 feet, the West MacDonnell Ranges seem to snake westward like a fractured spine, disappearing into a blue mist on the horizon. The temperature outside the aircraft registers on a windscreens gauge at a surprisingly warm 13°C. Tnorala, known also as Gosse Bluff, soon appears below – the remnants of a crater produced by a meteor strike 142 million years ago. Long ridges give way to giant bubbles of stone over

Kings Canyon, where Colin fondly recalls another recent wedding and two park rangers he married there. It is as if the Cessna has rendered the outback the flying padre’s backyard.

Salt and sand at Lake Amadeus fall away until Docker River’s notoriously windy airstrip emerges from the tumbled intersection of the Petermann and Bloods ranges and we set down.

Our day is long: almost 12 hours in total. We refuel at Yulara – officially known as Ayers Rock Airport – near Uluru, leaving at sunset with the surrounding desert lit like a coral-encrusted seabed. By the time the padre sets the Cessna smoothly down at Alice Springs once more, it is evening.

During the day we cut nearly a tonne of firewood, talked at length to staff and patrons at an aged care centre and responded to a pickup request from a School of the Air teacher for the next day. Colin flies about 200 hours each year, and drives another 20,000km by road. At \$268 for each aircraft hour, the service is not cheap. But the time saved over road travel is enormous.

The padre points out that with remote health being a constant worry in the bush, the value of his service is not easily measured in dollars. But dollars are increasingly pressing for Frontier Services, which receives no government funding and is financed entirely through private sponsorship. While their loss would be tragic, it remains to be seen how many of the nation’s 14 remaining patrol ministers might still be operational by next year.

Until then, weather permitting, the flying padre will continue to roam the skies over Australia’s Red Centre. **AG**

RISE OF THE RATTLEWING

From desert to rainforest, Australia's pigeons and doves inhabit almost every corner of the continent.

STORY BY FRANK POVAH ILLUSTRATIONS BY WILLIAM T. COOPER



◀ Emerald dove

Chalcophaps indica Length: 27cm

This pretty pigeon feeds on fruits and seeds found on the ground. Widely distributed elsewhere, in Australia it can be found on the mainland and many offshore islands, from the western Kimberley to the Top End, and from Cape York to south-eastern NSW. It occurs also on Norfolk and Lord Howe islands. Land clearing, especially in the south, has seen a population decline in some areas.

I'VE BEEN FASCINATED by pigeons since, as a small boy, I inadvertently frightened a near-fledged common bronzewing from its nest in a wattle. It dived into the leaf litter at the base of the shrub where its coloration made it difficult to see. Every day for the next few weeks I snuck back to check on its progress until the day it 'flew the coop'.

My interest extends to the domestic pigeon (a variety of *Columba*), which I have kept as a pet off and on since my early teens. Humankind's association

with this bird extends back at least 5000 years, perhaps longer – and there is reason to believe that the pigeon, similar to the dog, may have domesticated itself. It remains a sacred symbol in Judaism, Christianity and Islam.

The domestic pigeon occurs in a bewildering variety of colours and forms, with some of the 500-odd breeds so altered they are almost unrecognisable as pigeons. As the use of the internet spreads, new varieties constantly come to light and today's pigeon breeder is able to watch



FRANK POVAH

has been with AUSTRALIAN GEOGRAPHIC for nearly three decades, as a proofreader, copy editor and writer.

His knowledge and love of Australia runs deep and some of his stories and songs are now held in the archives of the National Library of Australia.



Wompo fruit-dove ▲

Megaloprepia magnifica Length: 45cm

Large and with plumage to rival any parrot, this is a spectacular pigeon found chiefly in, but not confined to, lowland rainforests from the Torres Strait to the Illawarra region of NSW. Of the three subspecies, *M. m. magnifica* is now rare or locally extinct in the Hunter Valley and Illawarra. It eats a wide variety of native fruits, preferring those rich in oils, and even large banyan figs are swallowed whole.

Common bronzewing ►

Phaps chalcoptera Length: 35cm

This medium-sized, stocky pigeon is widespread across Australia, including Tasmania. An Aboriginal story tells of a common bronzewing wounded by a hunter's boomerang around near where the NSW mining town of Broken Hill now stands. As it circled the area its blood and feathers fell to the ground to form the mineral deposits for which the area is now famed. The earthy colours of the minerals are seen in its wing feathers.





► White-headed pigeon

Columba leucomela Length: 40cm

One of our largest pigeons, it favours rainforest margins from Cooktown in far north QLD to the VIC–NSW border; it has also been seen in south-central VIC and on Flinders Island in Bass Strait. It has compensated for the loss of some of its natural foods by eating the fruits of the introduced camphor laurel and seems to be increasing in numbers.

videos posted online by villagers from exotic locations in Turkey, Uzbekistan and other places of legend – where the local inhabitants are no doubt equally thrilled at the sight of the strange breeds kept in the West.

The domestic pigeon descended from the blue rock dove of the region around the Middle East and North Africa. It was, however, in Gondwana that it first diversified into what is now a very large family. More than 300 species of doves and pigeons are now known worldwide. The group is found in almost every region of the planet – excluding high altitudes and latitudes – with the most diversity occurring in the tropics. Australia is very rich in pigeons, being home to 35 species, including four that are introduced, five vagrants and two known only as non-breeding visitors.

The names pigeon and dove are interchangeable, the former coming from Norman French, the latter being of Germanic origin. Over time, ‘dove’ became used for the smaller species and ‘pigeon’ for the larger, although religious texts and romantic poets always prefer dove.

Our native pigeons are a diverse lot. They inhabit almost every part of our continent, from the ancient, sun-ravaged rocks of the Pilbara to the



▲ Spinifex pigeon

Geophaps plumifera Length: 20cm

Travellers on WA’s Canning Stock Route will be familiar with this small pigeon, which is relatively common in Australia’s arid inland wherever there are suitable seed-bearing plants and reliable water. What it lacks in size it makes up for with a startling crest and jaunty attitude. It is not confined to spinifex country, but is often found in association with that plant. Similar to many outback creatures, it is an opportunistic feeder on swarming termites.

rainforests of our east coast. They range in size from the tiny diamond dove (only 21cm in length, including its rather long tail), to the flamboyantly coiffed topknot pigeon (which at 43cm is among our largest). Many, such as the fruit doves, rival the brightest of our parrots for colourful plumage.

One reason for the family’s success is the effort expended raising young. Both parents share incubation and feeding, and, for the first few days of their lives, chicks are fed pigeon ‘milk’. Formed on the lining of a pouch called the crop in the adult’s throat, this



Topknot pigeon

Lopholaimus antarcticus

Length: 43cm

Sombre as its grey and black plumage may be, the large topknot pigeon sports flamboyant chestnut-and-grey headgear like a slightly seedy Elvis impersonator. Ruthlessly hunted until recently and affected by habitat loss, its slow recovery has been aided by the introduced camphor laurel, the fruits of which now form a significant part of its diet. It favours coastal forest between north-eastern QLD and the VIC–NSW border.

► Brown cuckoo-dove

Macropygia amboinensis

Length: 42cm

This pigeon's dignified bearing matches its sombre colouring. Its length rivals that of our largest pigeons, but it has a more slender form. Named for its fancied resemblance to some cuckoos, it ranges from Cape York Peninsula to southern NSW, favouring wet coastal and hinterland forests. Unlike many other fruit pigeons, it can digest seeds and therefore obtain nutrients from poorer-quality fruits.





Chestnut-quilled rock pigeon ▶

Petrophassa rufipennis

Length: 31cm

This is a stone-country bird that ranges across the western Arnhem Land escarpment. A ground feeder, it likes to gather in small groups around water sources and areas of plentiful food. Birds will disappear from one locality to appear at another just a few kilometres away. The species has adapted to the fierce heat of the stone country by nesting in crevices where sunlight cannot reach.



nutritious curd-like substance ensures the blind youngsters grow quickly. They can swallow large food without difficulty within days of hatching.

My own birds belong to the Szeged highflyer breed. At just 50mm long and about a week old, the ‘squeakers’ – as the young are known – can swallow whole corn kernels. Three weeks to a month of feeding by both parents sees them fledged. This rapid early growth is why city dwellers rarely see a live baby pigeon. To the untrained, youngsters and adults are indistinguishable.

Another reason for their success lies in the way they drink, which is different from most other birds. Immersing its beak, a pigeon sucks up water in the same way a mammal does. This allows it to get its fill quickly, making it less vulnerable to predators.

Some species are called ‘rattlewings’ for the sound – perhaps an alarm – they make when launching into full flight. When taking off, the introduced spotted turtledove rattles its wings and flicks its tail from side to side, probably to confuse birds of prey.

Racing pigeons are known for their amazing feats of endurance. And anyone who has watched a common bronzewing hurtle through a jarrah forest at 60km/h, in Western Australia’s south-west, cannot fail to be amazed by its speed and agility. This stamina is due in part to an unusual respiratory system designed to keep the bird’s body charged with oxygen for maximum performance.

In the new book *Pigeons and Doves in Australia* – from which William Cooper’s stunning illustrations on these pages are taken – Joseph Forshaw writes that although illegal hunting has largely ceased, habitat decline is of ongoing great concern. In particular, grazing, mining and fire regime changes have caused dramatic alterations to many habitats. Species that nest on offshore islands are disadvantaged by alteration to rainforest feeding grounds along mainland coasts.

Conversely, many species, including the topknot and wompoo, have included the fruit of the introduced camphor laurel tree in their diets. This has enabled a recovery in numbers and

provides the added advantage of rendering the birds inedible by people and some predators. Others have taken to eating the fruits of weeds such as lantana, while the crested bronzewing (*Columba lophotes*) is now among Australia’s most successful birds. Its numbers, Joseph writes, have “increased spectacularly in most parts of their expanding range”.

Keep an eye out for our pigeons. You’ll find them nesting in street trees, in parks and gardens and on our older buildings in the hearts of our CBDs. Walking in rainforest or among native figs in the Illawarra, listen for the crashing sounds of topknot pigeons moving among the branches. Be grateful they are still with us. AG



Pigeons and Doves in Australia (CSIRO Publishing, 2015), written by ornithologist Joseph Forshaw and illustrated by William T. Cooper, is available

now for \$185. Turn to page 39 to read more about the life and work of William T. Cooper, who sadly passed away earlier this year.

Wonga pigeon ▶

Leucosarcia melanoleuca Length: 44cm

Heavily built, this long-legged pigeon can be found in coastal and hinterland forests from about Rockhampton, QLD, to Gippsland, VIC. When threatened, it turns its back on the source of danger and sits immobile, head down and looking back towards the threat. The raised tail displays barred patterns on the lower flanks and under-tail, effective camouflage in the dappled sunlight of its forest home. An Aboriginal story from the Illawarra, NSW, tells of how a dying wonga stained a white waratah red with her blood in gratitude for its help in a struggle with a goshawk.



◀ Pied imperial pigeon

Ducula bicolor Length: 38cm

Imperial is a very apt description for this majestic bird, which is found across northern Australia, including offshore islands, from about Derby, WA, to Rockhampton, QLD. Its bulk and striking colour pattern make it appear even larger than it is. This species is often found in mangrove forests and in the vine forests of the Kimberley, particularly those rich in figs. The species was heavily hunted – both legally and illegally – until the 1960s, when the slaughter of 1000 birds on the Brook Islands prompted public outrage.

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Byron blast. As lightning rips across an angry sky, Cape Byron Lighthouse projects a more reassuring glow. Every 15 seconds Australia's eastern-most point casts a single white flash 40km out to sea to guide ships safely past its sharp, rocky bluffs.



The light on the hill

For two centuries, lighthouses have stood as sentinels along the jagged perimeter of Australia; here they have not only sent out their warnings, but also harboured a fascinating history of their own.

STORY BY QUENTIN CHESTER
PHOTOGRAPHY BY ANDREW GREGORY



ON A GREY AUTUMN evening nearly 20 years ago, I was sailing with friends off the wild south coast of Tasmania. The only flicker of civilisation along this 300km shoreline was behind the boat to the far west. Every 30 seconds, two brief pulses of light winked at us across the ocean from Maatsuyker Island.

Emanating from Australia's most southerly lighthouse, this signal became our sole companion as our 12m yacht speared into the gathering dusk. Nearing South East Cape, the beam grew faint. Half an hour later it was gone and we were alone in the Southern Ocean's implacable darkness.

Like the Maatsuyker light itself, this nocturnal sail was a glimpse into another world – of lives lived in the sway of the ocean swell, with the rush of unseen waves breaking astern and any number of hazards waiting in the blackness. Two centuries ago, such gloom was all-encompassing for ships struggling to navigate Australia's night-time shores. Apart from the chance of sighting a coastal campfire or wild blaze, the only light was the faint glow of a coal-burning brazier hoisted on Signal Hill above Sydney's South Head.

By 1818 the Macquarie Lighthouse, Australia's first, was on this same site. Its classical 26m-high tower housed oil lanterns and reflectors that punched a strong beam seawards. So began the remarkable project to secure Australia's 35,880km maritime perimeter. Lighthouse construction picked up from the mid-1840s as new settlements along the underside of the continent scrambled to ensure the safe passage of ships to their ports.

ALTHOUGH OFTEN DISTANT from the public gaze, these structures were among Australia's grittiest 19th-century engineering feats. Teams of stonemasons battled isolation and storms to erect sturdy towers, typically hewn from cliff-top stone.

For colonies wholly dependent on maritime trade, the lighthouses were indispensable. As well as their practical role, they stood as resolute symbols of order in a chaotic new world ruled by the Southern Ocean's mood swings.

With Federation came the *Lighthouses Act 1911*. By then most of the key lighthouses in southern waters were up and shining. Responsibility for this network of state-run landfall and coastal beacons eventually passed to the federal government, and July 2015 marked 100 years since the Commonwealth Lighthouse Service formally took on the role.

Yorkshire-born civil engineer Joshua Ramsbotham was its first director; appropriately tall and imperious, he oversaw the construction of more than 40 additional lighthouses during his 11-year term. Over its 100-year history, the service not only expanded its coverage, it also kept up a push to modernise light and lens technology.

Inseparable from these waves of technological change was the march to automation. By 1991 operational duties ➤

Coast guards

Until 1915 the lighthouses of each state were managed by different bodies, so their designs vary widely.

ILLUSTRATIONS BY ANTHONY CALVERT



Cape Wickham,
TAS (1861)

Bass Strait icon soaring above the feared northern shores of King Island. Completed in 1861, 11 flights of stairs ascend this 48m-high structure, which is the tallest lighthouse tower in the Southern Hemisphere.



Cape Leeuwin,
WA (1895)

For 120 years this beacon has been an imperious presence on the continent's south-western tip. This 186-step, wind-battered tower was fashioned from rough-hewn limestone quarried nearby.



Macquarie,
NSW (1818)

After the original stonework started to crumble, Australia's first proper lighthouse was rebuilt in 1883, replicating colonial architect Francis Greenway's original design with spacious quarters added below.



Cape Byron,
NSW (1901)

More than 1 million visitors a year make the pilgrimage to Australia's eastern-most headland. Here one of the last lighthouses to be built in the James Barnet style overlooks spectacular Byron Bay.



Cape Otway,
VIC (1848)

Our oldest intact lighthouse was lit to mark the north-western entrance to Bass Strait. Seventy men built the tower in 10 months using stone transported 5km from the Parker River.



Smoky Cape,
NSW (1891)

An elegant James Barnet design, which was constructed from concrete using octagonal formwork. It's topped by voussoir blocks supported on moulded granite cantilevers and also features ornate staircases.



Cape Borda,
SA (1858)

This unusual 10m-tall stone square tower was erected in 1858 atop 150m-high cliffs on the remote north-western tip of SA's Kangaroo Island. It still retains its historic Deville lantern room.



Wollongong Head,
NSW (1936)

Completed in 1936 to help guide vessels into Port Kembla, the reinforced concrete tower on Flagstaff Hill features an unusual fluted column design. It was Australia's first fully automatic electric lighthouse.



Mersey Bluff,
TAS (1889)

This squat white lighthouse – sited near the mouth of Devonport's Mersey River – was made even more distinctive with the addition of four vertical red stripes on the tower's seaward side in 1929.



Split Point,
VIC (1891)

An eye-catching landmark on Victoria's Great Ocean Road, the 34m-tall Split Point Lighthouse dates from 1891 and is best known for its starring role in ABC television show *Round the Twist*.



North Reef,
QLD (1878)

The keepers lived in the base of this iron-clad, timber-framed structure on a lonely coral reef 100km north-east of Gladstone – a sand island has now formed around it.



Maatsuyker
Island, TAS (1891)

Australia's most southerly lighthouse was completed in 1891 at a cost of £8500 (about \$2 million today) and features a rendered-and-painted, red-brick cavity wall, plus slate floors from Mintaro in SA.



Point Malcolm,
SA (1878)

Australia's only inland lighthouse was constructed on a headland of Poltalloch Station to guide boats through Lake Alexandrina on their passage to Lake Albert, or upstream to the River Murray.



Point Charles,
NT (1893)

An unusual 32m-tall lighthouse featuring a slender cast-iron tower with a spiral staircase that's braced by an external steel frame. Completed in 1893, it was the first lighthouse in the NT.



Point Hicks,
VIC (1890)

First lit in 1890, this imposing tower on the remote Victorian coast of East Gippsland was one of Australia's first concrete lighthouses and boasts a cast-iron staircase cantilevered from the walls.

So ended a 178-year tradition of lightkeeping, a poignant time for all who'd known this exceptional life of service.

shifted to the Canberra-based Australian Maritime Safety Authority (AMSA). One by one Australia's lighthouses were mechanised and unmanned. That transition was completed on 22 August 1996 when Chris Richter – the nation's last head keeper – and his wife, Ailsa, switched off the light in Maatsuyker Island's historic lighthouse, built in 1891. It was replaced by a smaller, solar-powered beacon nearby.

So ended an extraordinary 178-year tradition of lightkeeping; a poignant time for all who'd known this exceptional life of vocation and service. No longer was there a reassuring human presence in these far-flung outposts – the guardian families who kept lanterns burning tracked our weather and wildlife and reached out to seafarers during moments of distress or tragic shipwreck.

TODAY, IN AN AGE when satellites can track our every move and ships are directed by pinpoint navigation systems, lighthouses can seem no more than quaint markers of a bygone age. Yet they remain a vital strand in our maritime safety net.

AMSA continues to operate more than 350 lights and beacons around our shores. In its own way, technology has made it possible to sustain this effort. Supremely efficient and low-maintenance LED lights now deliver the message from more than 75 per cent of our navigational aids.

For larger ships threading through narrow seaways and yachts, fishing boats and vessels of every stripe, these visual references are invaluable insurance. Compared with the abstract glow of instrument panels and computer screens, lighthouses are tangible, rock-solid landmarks. And on a night of squalls and thumping seas there is no more consoling vision than a beam of guiding light.

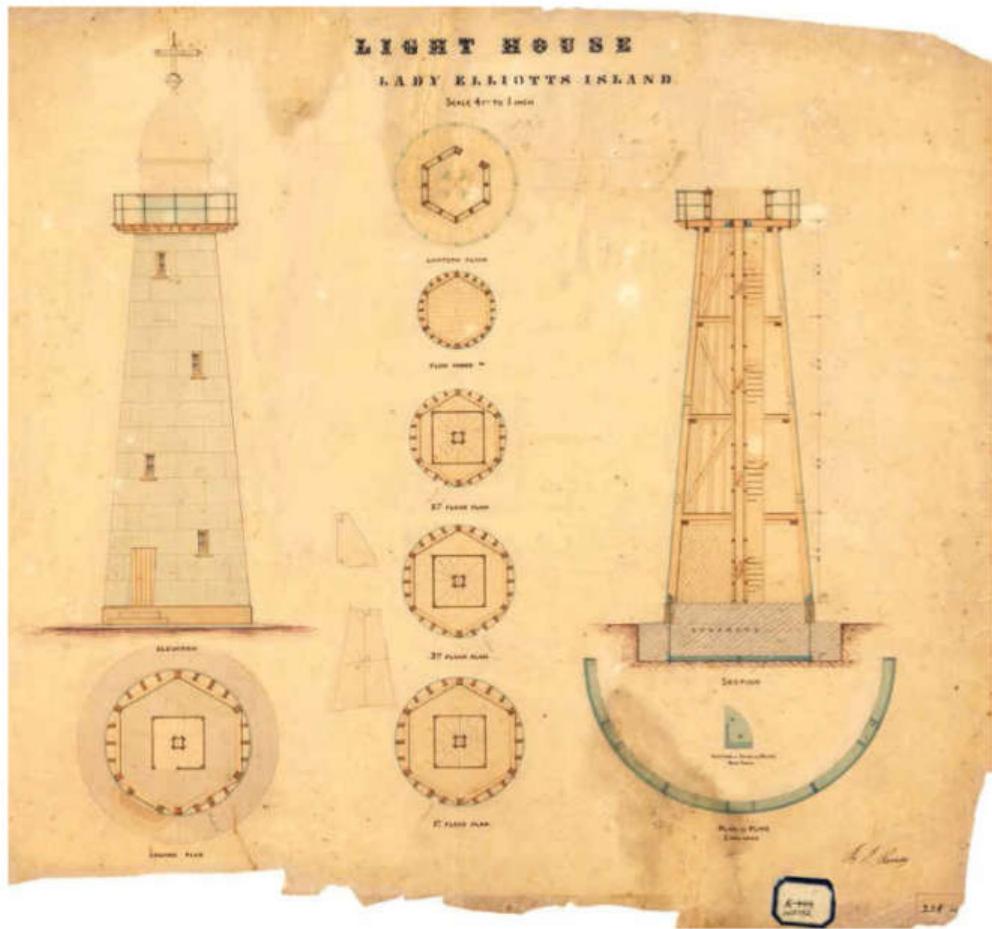
This emphatic presence – on mainland shores, distant islands and reefs – also offers the rest of us a compelling course to navigate the past. There's nothing like a lighthouse for tightening our grip on the reality of life at sea.

Visiting their locations can be a deeply humbling experience – such as sailing in Tasman Island's haunting shadow after leaving Hobart's Storm Bay, or approaching Deal Island, where a stout 22m-high white tower beckons from a cliff 305m above *Continued page 56*



South-west outpost. Towering above an apron of wave-washed granite, Cape Leeuwin's lighthouse (above and below), in WA, is at the junction of the Indian and Southern oceans. Operational since 1895, its 39m-tall tower once housed one of the world's largest kerosene-wick lanterns, with a range of nearly 40km. A later vaporised-kerosene lamp was finally replaced in the early 1980s by a 1000-watt electric light, which increased its power to 1 million candelas (units of luminous intensity). Fully automated since 1992, it remains a popular landmark at Australia's most south-westerly point. Here it rewards the many visitors who climb its 186 steps with coastal outstanding panoramas.

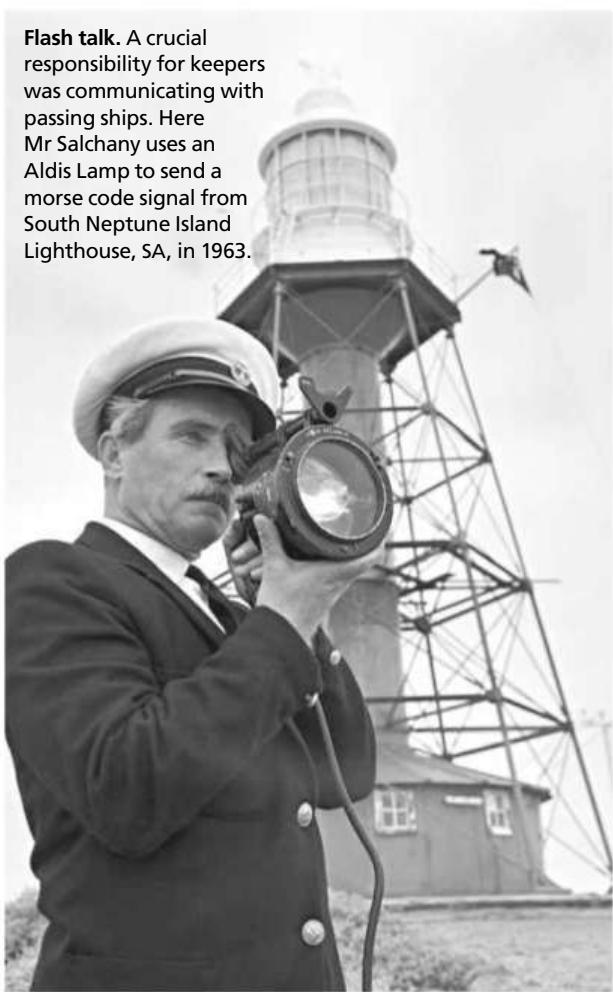




Iron maiden. Perched on the southern-most coral cay of the Great Barrier Reef, the Lady Elliot Island Lighthouse – northeast of Bundaberg – was completed in 1873. Its economical design pioneered the use of wrought-iron cladding over a sturdy pre-fabricated timber frame. By the mid-1990s the light was obscured by the regrowth of the island's casuarina trees, and was replaced by an automated light atop a taller scaffolding tower.



Flash talk. A crucial responsibility for keepers was communicating with passing ships. Here Mr Salchany uses an Aldis Lamp to send a morse code signal from South Neptune Island Lighthouse, SA, in 1963.



Light-footed. East Gippsland's renowned Point Hicks Lighthouse, VIC (above), was first lit in 1890. To reach the lantern room its keepers had to plod up 162 steps. Made of cast iron, the tower's unusual spiral staircase is cantilevered from the walls. By contrast, the modest 13m-tall Shark Island Lighthouse (left) off Point Piper in Sydney Harbour, boasts a pylon landing and short external ladders.

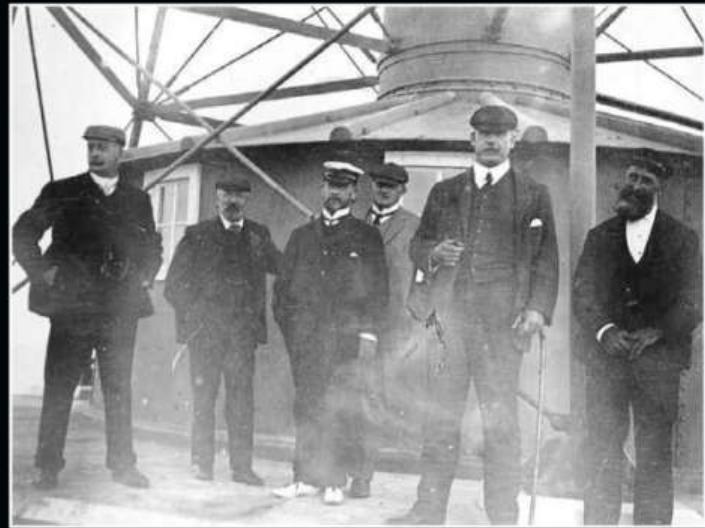


Fairy light. Glowering Southern Ocean skies set the mood for the Griffiths Island Lighthouse (above) on Victoria's notorious western coast. For 155 years it has ushered passing vessels and a local fishing fleet to the sanctuary of the Moyne River at Port Fairy. Now connected to the township by a causeway, this island's low stature makes this one of our most exposed onshore lighthouses – in big seas the tower is lashed by surging waves.

Going Strait. On the western doorstep to Bass Strait, King Island's Cape Wickham Lighthouse (seen here with its keeper in 1983) was for many ships the first glimpse of Australia after a 12,000-nautical-mile voyage from the UK. Completed in 1861, early keepers had much to contend with. As an 1873 report noted: "*Certain lawless men who have taken up their residence on the island... make a practice of annoying the Superintendent in every possible way, destroying his cattle, pulling down the fences... I much fear it will end in some serious injury to the station or perhaps to the light itself.*"



PANORAMIC: BRUCE HOOD/Flickr; HISTORICAL: NAA



Lens men. Keepers lived frontier lives at every extreme of climate and the compass – from tropical outposts such as Cape Don's lighthouse on the NT's remote Cobourg Peninsula (left), to tiny isles such as South Neptune Island (above) off Port Lincoln, SA. Visitors were a big event and this 1909 party included, L-R: Captain J.H. Gibbon, Harbour master I.W. Forbes, Arthur Searcy, P.D. Haggart, F.W. Vasey and head keeper G.G. Duthie.

This massive 48m-high structure includes 11 flights of stairs and walls 3.4m thick at the base... yet it wasn't enough.

Bass Strait's inky waters. This is the Southern Hemisphere's highest located lighthouse and was reportedly socked in by cloud 40 per cent of the time. Yet lightkeepers maintained their vigil on this lonely citadel until the light was finally decommissioned in 1992.

Parked at Bass Strait's eastern entrance since 1848, the Deal Island light was built as part of the race to protect ships 'threading the eye of the needle'. In the same year, Victoria's Cape Otway Lighthouse on the north-western entrance was lit for the first time. Although it was a welcome short cut for vessels making the 13,000-nautical-mile voyage from the UK, the strait had a fearsome reputation from day one.

More than 60 vessels were wrecked on King Island alone, including the *Cataraqui* in 1845. It is among Australia's worst maritime disasters – of the 410 on board, only nine survived.

By 1861 Cape Wickham at the island's northern tip boasted Australia's tallest lighthouse. This massive 48m-high structure includes 11 flights of stairs and walls 3.4m thick at the base. Yet, incredibly, even this lofty warning beam wasn't enough. Several mistook this for the Cape Otway light and, sailing on to the south, slammed into the island's west coast. The confusion finally ended when the island's second lighthouse was built at Currie Harbour in 1880.

Further west, South Australia's first lighthouse fired up in 1852 atop the granite bluffs of Cape Willoughby. On the eastern nubbin of Kangaroo Island, it marks the entrance to Backstairs Passage, the skinny, 13km gap separating the island from the mainland. Reefs and strong currents notwithstanding, this is the main shipping channel for vessels heading to Port Adelaide from the east.

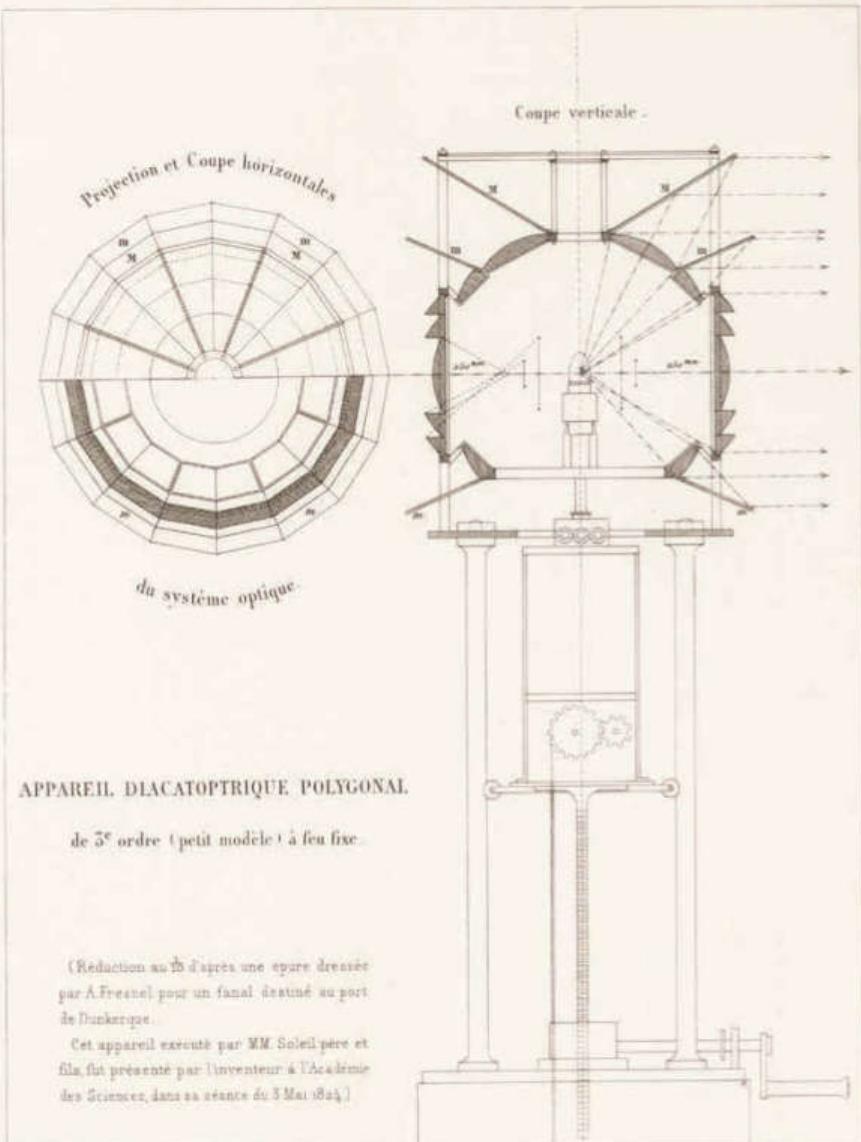
MY FIRST SIGHT of Cape Willoughby was in 1971, while I was on holiday on Kangaroo Island with my dad. As our car swooped down the rough limestone track to the Cape, the tower popped into view. Although that vision made a big impression on my schoolboy imagination, there was no inkling that 40 years later I would be living nearby and working at the lighthouse as a guide.

Continued page 61 ▶



High beams. Completed in 1896, the Wadjemup Lighthouse (above) on Rottnest Island, WA, was the first Australian beacon to feature a rotating beam; at 38.7m it's almost twice the height of the first tower built here in 1851. The 140m-high Smoky Cape Lighthouse (below) at South West Rocks, NSW, is the state's loftiest. It overlooks the splendour of Hat Head NP and helps to mark the entrance to the Macleay River, as well as guide shipping traffic plying the east coast. With an elegant octagonal tower and pavilion entrance – plus spiral staircase and gunmetal balustrade – it's among the last creations of James Barnet, the most revered lighthouse architect of the colonial era.





Bright thinking. The genius of 19th-century French physicist Augustin-Jean Fresnel is clear in designs for a Third Order polygonal reflecting lens (above). His understanding of optics and diffraction is revealed in the First Order lens atop Victoria's Point Hicks Lighthouse (left) and the all-conquering loom of Cape Byron's mighty Fresnel Lens (below) – Australia's most powerful.



Making light of it



WHILE THE CRUCIAL function of lighthouses is unchanged, the means of delivering their guiding message has altered radically. In the early 19th century, the light source was typically groups of small, oil-burning lanterns backed by parabolic reflectors. As well as whale and seal oil, these lanterns – with their large circular wicks – also used vegetable-based oils, which were smoky and unreliable.

During the next 100 years, the advent of pressurised kerosene lights and elaborate lenses transformed lighthouse technology. A brilliant invention of French engineer and physicist Augustin-Jean Fresnel involved a combination of glass prisms to concentrate and magnify a light source. First Order lenses – the biggest of these designs – were used in more than 50 of Australia's key lighthouses.

Mostly constructed by Chance Bros., a family company based in Birmingham, England, these powerful instruments produced shafts of light reaching more than 40km out to sea. The most potent lighthouse in Australia is at Cape Byron, on Australia's eastern-most point; its light is rated at 2.2 million candela (candela are units of luminous intensity, and one is approximately equivalent to the glow of a single candle).

In the early 20th century acetylene-powered lanterns controlled by ingenious

sun valves were widely used to automate smaller offshore light beacons. Meanwhile, electrification and 1000-watt incandescent bulbs became the standard for our First Order lighthouses. Over recent decades it's the arrival of efficient LED globes, light sensors and solar panels that has allowed lighthouse automation to proceed apace – thus ensuring a bright future for our vast and historic network of night-time beacons.



WATCH
Use the free *viewa* app to scan this page and watch a film on lighthouses. You can also see it on our website.



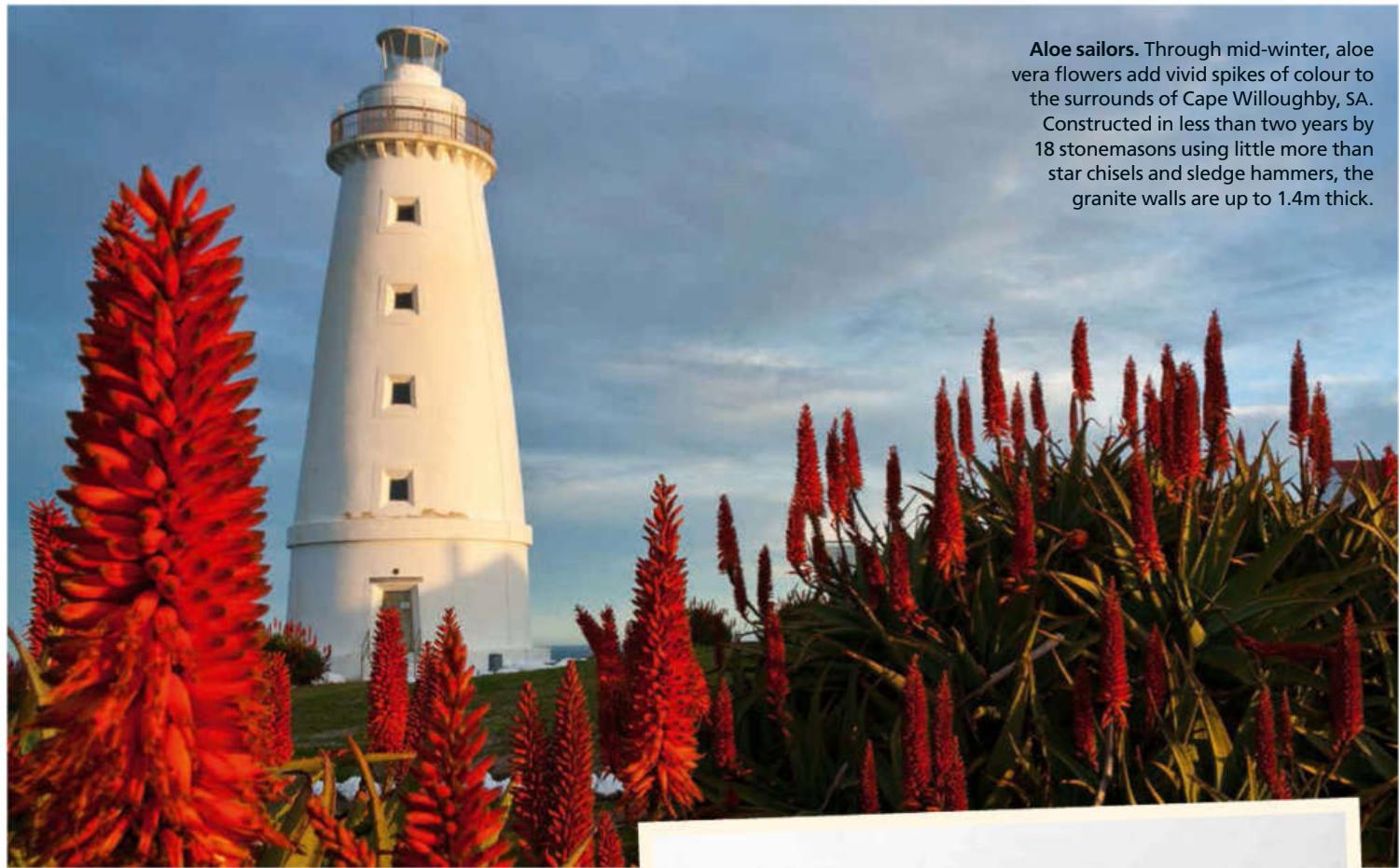


PANORAMA: PETER BELLINGHAM;
HISTORICAL NAIA; GABO ISLAND: AG



Red tower. The distinctively hued Cape Banks Lighthouse (above) guides vessels along the treacherous coastline near the small fishing village of Carpenter Rocks in south-eastern SA. First lit in 1883 and raised to its current height of 15m in 1928, its 14-sided Deville lantern room (formerly from the old MacDonnell Light at nearby Cape Northumberland) is one of only three surviving examples of this classic lighthouse top.

Calm scene. From atop Australia's second-tallest lighthouse on Gabo Island (far left), VIC, the view north extends to Cape Howe and Howe Hill on the mainland. The foreground vista of keepers' cottages and placid seas belie the region's reputation for unruly weather, which is well known to sailors in the Sydney to Hobart yacht race, who hit the boisterous waters of Bass Strait here. Although barely 500m off the mainland and 15km from the township of Mallacoota, Gabo was a challenging outpost for its lightkeeping families (left), one of which is pictured here in 1978. Operational since 1862, Gabo is one of Australia's most attractive lighthouses with a red granite tower.



Aloe sailors. Through mid-winter, aloe vera flowers add vivid spikes of colour to the surrounds of Cape Willoughby, SA. Constructed in less than two years by 18 stonemasons using little more than star chisels and sledge hammers, the granite walls are up to 1.4m thick.

The crash of the Kona



ON A BRIGHT, BLUSTERY February morning in 1917, a four-masted American schooner was charging towards Cape Willoughby in South Australia. Seventy-three days out from San Francisco, USA, the *Kona* was bound for Port Adelaide with a 45-tonne cargo of California redwood. Sailing at 18 knots in a stiff south-easterly gale, the ship was tracking a straight downwind path into Backstairs Passage.

The lightkeepers realised that, by doing so, the *Kona* was aiming to sail over Scraper Shoal, a long sandbar that pokes into the passage. They also knew it was a record low tide with less than 2m of water atop the reef, so they hoisted a red-and-white signal flag warning the ship it was running into danger.

But the *Kona*'s crew ignored the advice and kept ploughing on. It was the keepers' worst nightmare as they watched the ship slam headlong into the shoal at full speed.



The ship came to a shuddering, gut-wrenching halt and started breaking up almost immediately. One of the lifeboats was flung 5m into the air and smashed into matchwood. Mercifully, the crew managed to patch up the other boat with scraps of old sail and all 11 on board rowed around Cape St Albans to the shelter of Antechamber Bay.



Drift wood. The same raging winds that helped bring the *Kona* undone also cast its remains far and wide. The bow section was blown 100km north-west to Port Moorowie on the foot of Yorke Peninsula, while the deckhouse landed to the west at Cape Spencer. Meanwhile the 45-tonne cargo of planks and shelving littered beaches throughout the region.

Just minutes after they left the ship it began sinking. With that, its cargo – as much as 850,000 linear feet of timber – was cast adrift in the passage. It would remain a significant hazard to shipping for many months to come, and was a pointed reminder of the perils of ignoring a lightkeeper's watchful warning.



Cape crusaders. Since 1858 Cape Borda's distinctive 'sentry box' lighthouse and Deville lantern room (above) have shone from the north-western bluff of Kangaroo Island, SA – seen here with two of the local subspecies of western grey kangaroo. Despite being hoisted 155m above Investigator Strait, several ships missed this light at the western entrance to Gulf St Vincent. In the wake of the tragic *Loch Sloy* and *Loch Vennachar* shipwrecks on the island's rugged western shores, in 1899 and 1905, respectively, the handsome Cape de Couedic Lighthouse (below) was added in 1909 to Kangaroo Island's remote south-western tip.



TOP AND BOTTOM: QC / *Macropus fuliginosus*

I moved to Kangaroo Island in 2009 and began work at the lighthouse in 2011. With this job there's no such thing as bad weather. In fact, wild days make my job a breeze. When the ocean is a blur of spray and whitecaps and the waves are slamming into the cliffs below, no visitor ever asks, "Why do we need a lighthouse?" And likewise, after we step onto the tower balcony into thundering rain and the untamed force of a howling southerly, there's never any doubt about the dedication of those who spent their nights alone at the top.

The official line here is that it's a little lighthouse doing duty night after night. In the tower's 163-year history, many thousands of ships have slipped safely by, en route to Gulf St Vincent. It's a mission-accomplished message of trade and engineering flair: its light went from 15 lanterns burning whale and seal oil, to a mighty First Order Fresnel lens – and now a halo of LED light blinking 19km out to sea.

But behind the nuts-and-bolts practicalities, there's an uplifting human tale of handmade, castaway lives. These sites were places of community. In keeping with the British model, major lightstations (such as Cape Willoughby) were once manned by three families, living and working together. Food and supplies came by ship only once every three months.

Between ships, the inhabitants had to grow their own vegies, catch fish and cook up wallaby stews. Not to mention be self-sufficient in everything from building maintenance and homeschooling to childbirth and emergency medical care. But for all the accounts of hardship and loss, the isolation could also be liberating. It was an elemental place where many families had the time of their lives.

The good news is that these backstories – and our lighthouses – are now more accessible than ever. Some, such as those at Cape Byron or Split Point at Aireys Inlet, maintain a stately presence on local seaside headlands. But to tap into the essence of what makes these eyries special, make the trek to towers at Cape Leeuwin in south-western WA, or East Gippsland's Point Hicks, or Sandy Cape on the far-northern tip of Fraser Island. Better still, go and spend a night or two in the telling seclusion of the keepers' cottages at sites such as Wilsons Promontory, Montague Island or my treasured Cape Willoughby.

It's there, on the soulful, windswept edges, that our heroic beacons really come alive. They shine their light back to a time of stoic struggle, when the safety of every boat warranted our best, big-hearted efforts.

There's a feeling at these sites that goes beyond matter-of-fact navigation – a glint of the unspoken bond of trust that tethered those alone at sea with our selfless keepers of the flame. AG

FIND more stories about, and images of, lighthouses online: www.australiageographic.com.au/issue128

Winged bliss. With a view east to St Bees and Scawfell islands, blue tiger and glasswing butterflies sup on grass-tree nectar at Keswick Island's Langton Point.



ISLAND FANTASY

Down the coast from the Whitsundays are the South Cumberland Islands – nine low peaks once connected to the mainland but now set adrift amid the waters of the Coral Sea.

STORY BY ASHLEY HAY PHOTOGRAPHY BY ANDREW GREGORY



WE WERE CROSSING the hillside when we saw the picture-postcard koala tucked into the nook of a wild prune tree, a metre or so above us. It was late March and a southerly wind dulled the still-harsh autumnal sun as it shone down upon St Bees, an 1100ha island, 30km north-east of Mackay, on the Queensland coast.

We had bush-bashed up from Honeymoon Bay, on the island's south-west, to find these docile marsupials. This was a particular sort of Australian landscape: home to the endemic best of sinuous eucalypts and figs, but also the introduced worst of prickly pear and lantana. Looking down from the koala's hill, we were greeted by a fairytale landscape of soft green grasses and dark green hoop pines.

The island is bordered by the deep blue expanse of the 650m-wide Egremont Passage, and beyond that the sculptured velveteen shapes of Keswick Island rise from the sea like a nest of slumbering prehistoric creatures. Mainland Australia appears further westwards, its hazy lavender coastline merging into an even hazier purple escarpment.

The koala opened its eyes, regarded our cameras and stretched into a new pose. The experience was magical, but koala-spotting is only a small part of what's possible and wonderful here. St Bees, Keswick, Scawfell and Cockermouth are among the nine South Cumberland Islands. They lie south of the better-known Whitsundays and are protected within South Cumberland Islands National Park.

Adding to St Bees' fairytale aura, the air was thick with butterflies. More than 40 species, including the ubiquitous blue tiger, have been recorded across these islands. There are also shorebirds, curlews, bats and owls. Whales swim into the Egremont Passage between here and Keswick from June to October, some already with young, others to give birth. And there are striking coral communities, too – a trip in a glass-bottomed boat reveals vast staghorn forests, brilliant iridescent corals and myriad fishes, including species of rabbitfish, angelfish and damselfish.

"Turtles, sharks, whales, schools of fish; you see everything here," explained Brett Curd, Keswick Island's operations officer. He is employed by Keswick Developments to oversee everything from construction and landscaping to running the local shop and island's runway. "We've had black-tipped and white-tipped reef sharks, leopard rays, dolphins and even manta rays. Three of them were playing in close one day, just flipping around in the water."

"There's a turtle," Brett added – and there was, its head bobbing out of the water as it swam by his waterside verandah.

WE'D COME TO EXPLORE the islands in the off-season, at the unreliable tail end of the cyclone season. Temperatures were peaking around 30°C by day, the water wasn't much cooler at about 26°C, and by a stroke of luck we seemed to have these tropical paradises to ourselves.

These islands, however, are far more than simply coconut-palm-fringed getaways. In biogeographic terms, St Bees and Keswick have been fantastic field laboratories for exploring how resident species interact with each other and with flora and fauna on neighbouring islands.

The koalas are a case in point. They were relocated from Proserpine, 125km north of Mackay, to St Bees in the 1930s, when the island was leased and grazed. Despite being free from predation and diseases ravaging mainland populations, they've maintained a relatively stable colony size.

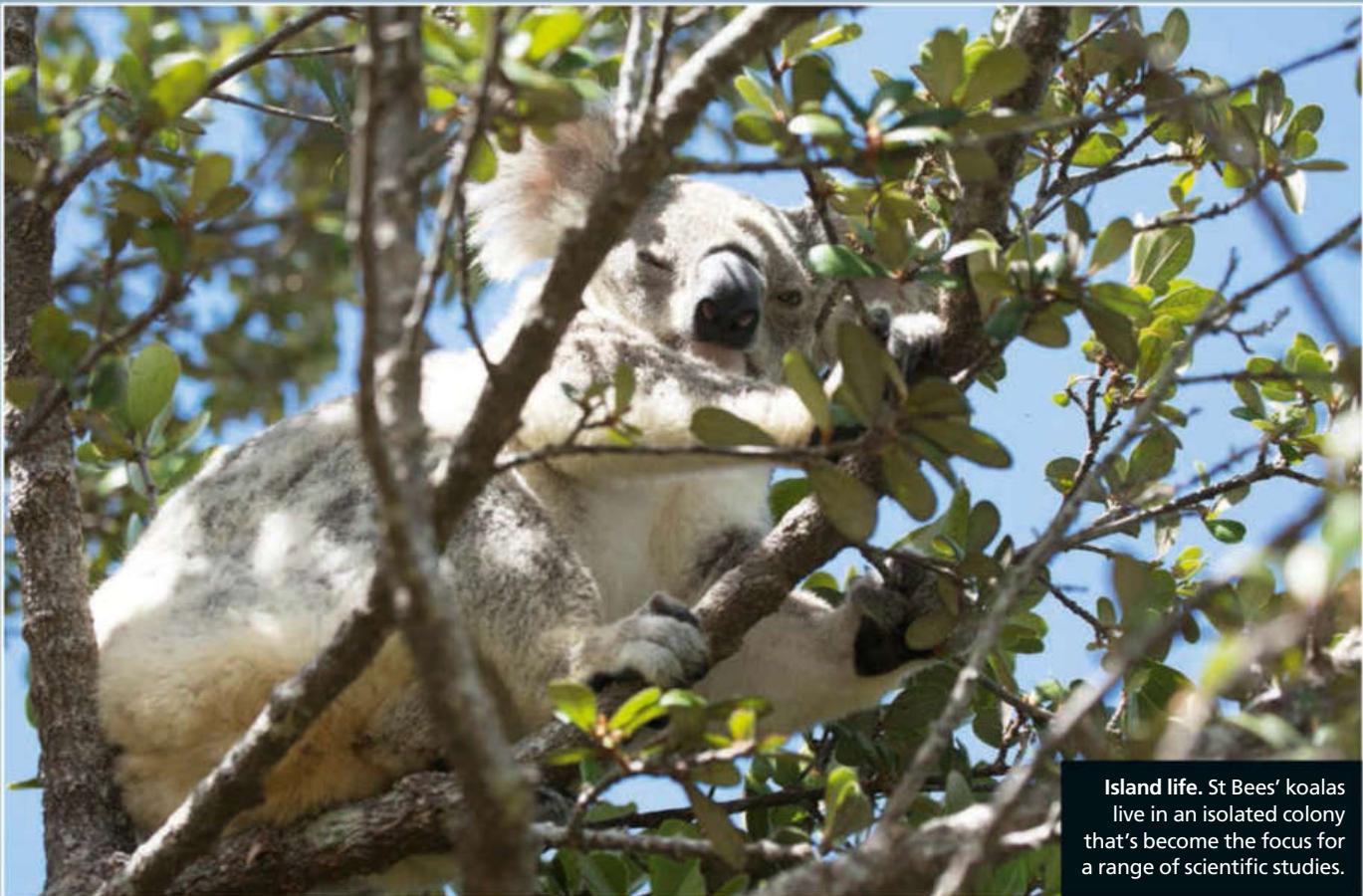
To scientists, this stability is an ongoing conundrum that's continuing to be investigated. Other island populations tend to thrive to the point that they multiply exponentially, ultimately perishing after eating themselves out of house and home; or they fail to thrive, and quietly disappear.

The puzzle first attracted scientific attention in the late 1990s and remains unexplained, says Dr Alistair Melzer, a Central Queensland University ecologist. The bacterial disease chlamydia ravages many other koala populations, causing high rates of infertility, but although it's been detected in a few St Bees' koalas, it doesn't seem to be impacting numbers.

Also, although most adult females here give birth each year, the population isn't increasing. "Something happens to the joeys around the point of weaning, and a lot of them just disappear," Alistair explains. "They're too small to tag, so we've got no way of ▶

Ashley Hay is a Brisbane-based writer whose novel *The Railwayman's Wife* was awarded the Colin Roderick Prize for "the best book published in 2013 reflecting Australian life". Her last AG story was about Sydney's Opera House (AG 116).

Andrew Gregory is an award-winning photographer who specialises in landscapes. He's also an adventurer, long-time AG contributor and past AG Society Spirit of Adventure awardee. His last story was about drone photography in AG 125.



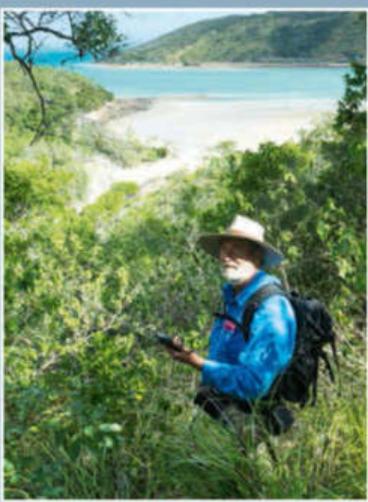
Island life. St Bees' koalas live in an isolated colony that's become the focus for a range of scientific studies.



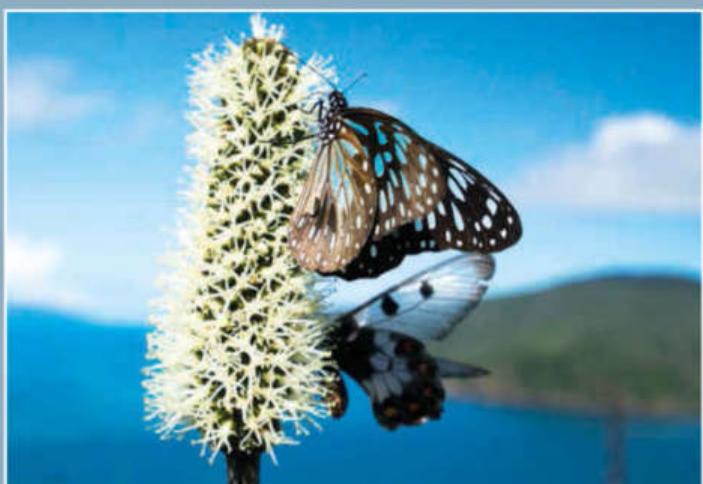
Tropical paradise. Connie Bay's white sands and coral reefs are pretty features of Keswick's northern shore.



WATCH Use the free **viewa** app to scan this page and see a film about the St Bees koalas.



The koalas...were relocated from Proserpine, 125km north of Mackay, to St Bees in the 1930s.



In the field. Dr Alistair Melzer navigates in bush above Beverley Bay, St Bees, during a koala survey. Using a GPS device to track his route, he counts the animals he passes.

Feeding time. The blue tiger, top, and clearwing swallowtail are just two of the 40-plus butterfly species found on the South Cumberland Islands.

SOUTH CUMBERLAND ISLANDS NATIONAL PARK

- Sealed road
- Unsealed road
- Walking track
- Camping area
- Lookout
- Shipwreck
- National park



WHEN TO GO

The dry season for Queensland's tropical north is May–October, with maximum temperatures ranging from the mid- to high-20s, with similar water temperatures. The wet season (November–April) brings the potential for cyclones.

GETTING THERE

Reach Keswick by plane (the journey takes 12 minutes) or boat (one hour). Check for freight/luggage allowances if you're travelling with food or sporting equipment. There are six boat moorings off Keswick in the Egremont Passage. Cockermouth, Scawfell and St Bees islands are only accessible by private boat.

WHERE TO STAY

Holiday homes and cabins are available to rent on Keswick, the only island to offer this. There are two national park camping grounds: Victor Bay (up to six people) and Singapore Bay (12 people). A new private camping ground at Basil Bay has toilets, showers and cooking facilities, and can be booked by calling Keswick Developments on 1300 889 290. Other spots to camp on the islands



Sky scape. An aerial view of St Bees, right, and Keswick, left, reveals the drowned nature of this island group's landscapes.

include Turtle Beach on St Bees (24 people), and one camping ground each on Cockermouth, Penrith and Scawfell islands (12 people each). None of these sites have facilities. Permits are required. Book online at parks.nprsr.qld.gov.au/ or by calling 13 74 68.

THINGS TO DO

Popular walks on Keswick Island include hikes to Langton Point headland, Connie Bay, Arthur Bay or the beehives. On St Bees you

can climb from Honeymoon Bay to see the koalas. Snorkel at the Coral Gardens or Basil Bay on Keswick or dive the shipwrecks of the *Singapore* (1877), *Llewellyn* (1919), and *Cremer* (1943), off both Keswick and St Bees.

POINTS OF INTEREST

- 1 Bushy Islet
- 2 Refuge Bay camping ground
- 3 Cockermouth's pleistocene-era reef (visible at low tide)
- 4 Turtle Bay camping ground
- 5 Connie Bay
- 6 Langton Point headland
- 7 Keswick Island beehives
- 8 Whale-watching in the Egremont Passage
- 9 Basil Bay
- 10 Honeymoon Bay

MORE INFORMATION

www.nprsr.qld.gov.au/parks/south-cumberland-islands
www.keswickisland.com.au
www.mackayregion.com
www.megaforcecharters.com.au



High point. The view from above Kingwell Point on Keswick Island encompasses the Coral Gardens, and both Homestead and Honeymoon bays on St Bees.

The island's isolation and pristine nature have attracted a wide range of scientific work.

tracking them. It's hard to know their fate. The animals that have disappeared seem to be absolutely fine one day and gone the next."

Just two people live permanently on St Bees and the island's isolation and pristine nature have made it attractive for a wide range of other scientific work. This includes a project funded by conservation body Earthwatch. The group is about to begin teasing out the reasons behind what Alistair calls "big biome shifts" which are taking place across these islands. Grasslands are being replaced by woodlands and woodlands are being replaced by rainforests.

"There are climate shifts occurring," Alistair says, adding that there are also changes to historical grazing and fire regimes. Using altitudinal plots, weather sensors and historical data, he hopes that St Bees will become the case study for understanding ecosystem changes across the islands for the entire region.

TROPICAL ISLANDS HAVE long been the stuff of fantasies, and Keswick has a smattering of permanent residents who have settled in to live the dream. Among them are Rodger Murry, who came in 2001 on what he jokingly describes as

"a life sentence with no parole", and Ron and Marion Brooks, who settled here permanently in 2008. The island is just 530ha and only 20 or so houses line Keswick's streets. But there have been plots sold for dozens more. The seasonal visitors begin arriving after Easter and leave in November with the last of the whales, and, in the off-season, Keswick's population comprises about a dozen people.

A much more abundant population of another kind exists on the island's northern side. On the high section of the track that runs north from Keswick's settlement to Connie Bay sits an installation of miscellaneous containers. Some look like letterboxes or archive containers. Others are like drawers from filing cabinets. But they're none of those things. They're beehives, the first few of which were brought to Keswick from Innisfail, south of Cairns, in 1985.

The hives were – and still are – free from any major diseases. The man charged with obtaining these bees in 1986 was Clive Covey, an apiarist from Queensland's Sunshine Coast. His sons, Des and John, maintain the hives today, and it's hard to over-estimate the importance of these disease-free stocks. ▶



On the web. Northern golden orb weavers, such as this one on St Bees Island, can create expansive silken insect traps that reach up to 2m in diameter.

propagated, and the nursery now holds Keswick's flora in miniature: from native ginger and beach cherry to cycads, lomandra, cotton trees and grass trees. All are ready to be dug in at the island's public spaces or into gardens of residents. "They're my little babies, those plants," says Marion, who does the majority of the nursery's work these days. "I love it."

Planting work often falls to WWOOFers – World Wide Opportunities on Organic Farms volunteers, who hail from around the globe. "Italians, Germans, Swedes, French, Americans, English, Belgians, Welsh, Irish – we've had them from everywhere," says Brett. "They help us with weeding, mulching, planting, tree care, and a bit of work in the nursery."

All other landscaping and maintenance is taken care of by Brett and his two staff – including Rodger – as well as whichever of Brett's eight children happen to be around. "Anything that happens on this island, I have to be across it," Brett says. "I'm the council, the mayor, the labour and the manager."

And while more than 80 per cent of Keswick is designated national park, the area covered by Keswick Development's lease is not prettified or manicured, but rather simply well-kept. It sits in the foreground against the kind of lush Australian bush that spans the full gamut of greens and glows like stained glass when lit by sunlight.

An exploration of the island reveals just how special Keswick is. As I sat at Basil Bay, watching the tide turn, a concerto of crickets called; a cloud of bats rose up as two eagles circled overhead; two oyster-catchers with crayon-orange beaks picked along the shore; and a ray chased a shoal of baitfish across the water. As Brett says, "Look long enough and something will come past."

But it's not just the natural attractions of a place such as this that make it feel somehow removed from the rest of the world. There's also its self-sufficiency. Keswick has no natural springs; rather, rain fills the tanks that supply its water. Power is solar, and wastes, including black water, are processed on-site, with only the hardest rubbish shipped back to the mainland.

"It makes me laugh when people talk about this 'new' ecotourism and sustainability," Brett says. "We've been doing it here for years."

IN THE 1890s, William Saville-Kent, Queensland's then commissioner of fisheries, travelled north along the state's coast. En route he passed over kilometres of spectacular corals until, as he recorded, he reached "the Percy, the Northumberland, the Cumberland and the Whitsunday islands...a linear series of island groups...composed of igneous or metamorphic rock, identical in character to those of ▶"

While diseases such as chalkbrood (which appeared in Queensland in 1993) and the varroa mite (which hasn't yet reached Australia) have ravaged hives and led to the collapse of colonies elsewhere, queens from Keswick have been posted across Australia and beyond, to ensure the survival of healthy new generations. It's not an enormous trade – John estimates just short of two dozen clean queens have been despatched from Keswick in the last two years – but it's an important one.

The queens can't remedy existing diseases, but they can introduce infection-free generations of pollinators. And the honey they make here is spectacular. Flavoured by nectar from the local grass trees and other distinct blooms, it has a deep, dark-red colour and tastes like malted caramel.

Then there are the plants themselves. While St Bees has delivered at least three new species to Australia's botanical records – sumac or wedding bush (*Rhus taitensis*), orange annona (*Fitzalanía heteropetala*), and tick clover (*Desmodium gangeticum*) – Keswick has its own group of particular botanicals.

The island's development lease was granted to Keswick Developments more than eight years ago. When Brett Curd became its operations officer four years later, the plan was to regenerate its community spaces with plants imported from the mainland. "Then we discovered we had our own horticulturalist and off sider," says Brett, referring to Ron and Marion Brooks. "They took on running the nursery. If they can't grow it, we don't plant it."

Seeds from the island have been collected and



Head space.
Dr Alistair Melzer, above, inspects a St Bees' koala skull he has found, looking for clues to the mortality patterns of this isolated population.



Reigning queen.
Apiarist Des Covey points to a Keswick queen, right; disease-free bees have been bred on the island for almost 30 years and introduced to mainland hives.

Propagation patch.
Regeneration and landscaping of Keswick's public spaces uses endemic plants struck from locally collected seed, below.



WATCH
Use the free *viewa* app to scan this page and watch a video on South Cumberland Islands NP.



Keswick Island honey has a deep, dark-red colour and tastes like malted caramel.

Master beekeeper.
Des maintains hives of Caucasian honey bees first established on Keswick Island by his father in 1986.



Rite of passage. The South Cumberland group's main islands – Keswick, top left, and St Bees – are separated by the Egremont Channel, a 25m-deep crossing created by a drowned river valley.



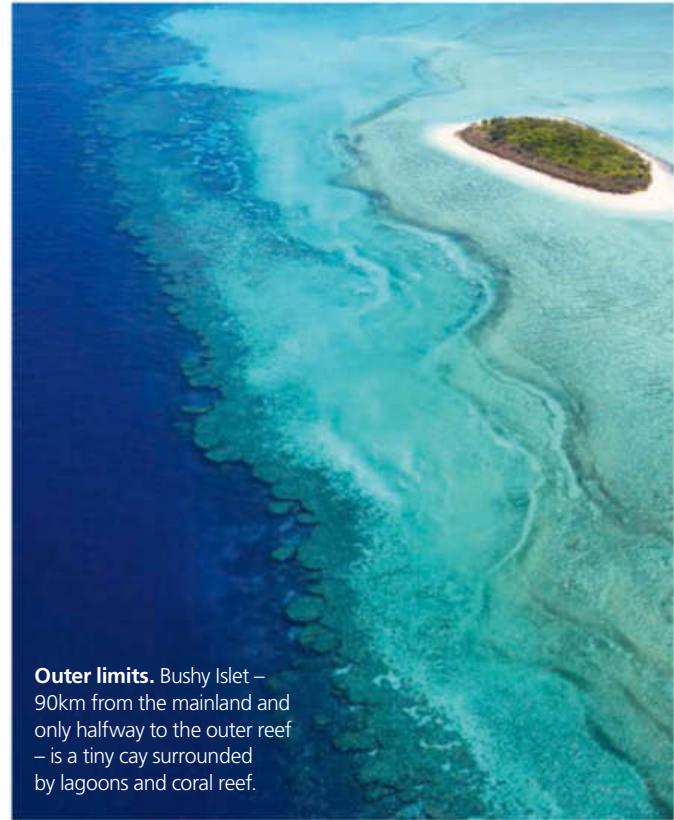
which the foundations of the mainland are made."

Of the Cumberlands he noted particularly the high peaks and the "rocky cliffs and hillsides...for the most part, covered with a dense growth of a handsome species of pine". When viewed from the deck of a steamer, he wrote in *The Great Barrier Reef of Australia: Its Products and Potentialities*, the effect was "picturesque, almost Scandinavian".

The way to think of these islands is not as individual protrusions from the ocean, but rather as the remains of otherwise drowned landscapes from a time – about 19,000 years ago – when the coastline was 140km east of where it is today. The climate warmed, oceans rose, and 10,000–6000 years ago, the coast was inundated, creating the islands that exist today.

Because of their historic connectedness, many of these ancient hills support similar ecological communities, but they also have their differences – for example, Keswick has no natural water source, but St Bees has 14 springs. These have supported a wide range of livestock from the early 1900s, including cattle, sheep and horses.

And, as well as the koalas, there's an expanding population of swamp wallabies, which were introduced at about the same time, and the last stragglers of introduced goats.



Outer limits. Bushy Islet – 90km from the mainland and only halfway to the outer reef – is a tiny cay surrounded by lagoons and coral reef.



To Darren Larcombe, a senior ranger with Queensland Parks and Wildlife Service (QPWS), the South Cumberland Islands are “significantly different from the Whitsundays”, which begin just 80km to the north. For one thing they’re drier, which means that the rainforest takeover of grasslands, observed on other islands, hasn’t happened as quickly here.

Traditional fire regimes were also intact until as recently as the 1930s, and QPWS hopes that reintroducing fire on St Bees and on Brampton Island to the north might ensure the preservation of these grasslands.

His favourite location within the South Cumberland group is Bushy Islet, which is due east of Keswick, out on the edge of the reef. Not only is it the GBR’s highest cay, at 12m above sea level, it’s also the only wooded cay along the reef’s 900km central stretch. “It supports a unique pisonia forest and an amazing migratory bird population,” he says, “as well as the most northerly loggerhead turtle nests. We’re talking high conservation value.”

But despite this surplus of extraordinary biodiversity, these islands remain little visited. Darren estimates the number of tourists coming across to the South Cumberland’s six designated QPWS campsites fluctuates, but may total between 60 and 85 people a year.

For me, it was a landscape that revealed itself best from up high. On an afternoon light-plane flight over Keswick and its surrounding islands, Glenn Leigh-Smith, managing director and chief pilot of the Island Air charter service that runs from Mackay, says that his favourite run is also out to Bushy. Once, he saw schools of reef and bronze whaler sharks swimming from lagoon to lagoon, ahead of the shadow of his plane.

From the air above Keswick, the archipelago shimmers and settles: Aspatria and Scawfell islands to the east; Cockermouth, Brampton and Carlisle islands to the north, with the Whitsundays unspooling beyond that.

Glenn turned his eight-seater Airvan towards the mainland before the run back to Keswick. Across that strip of the Coral Sea, behind Mackay, the Clarke Range loomed. From this height and distance it looked as if its mountains could be skipping towards the coast, wishing that they, too, could leap out and join this island playground. AG

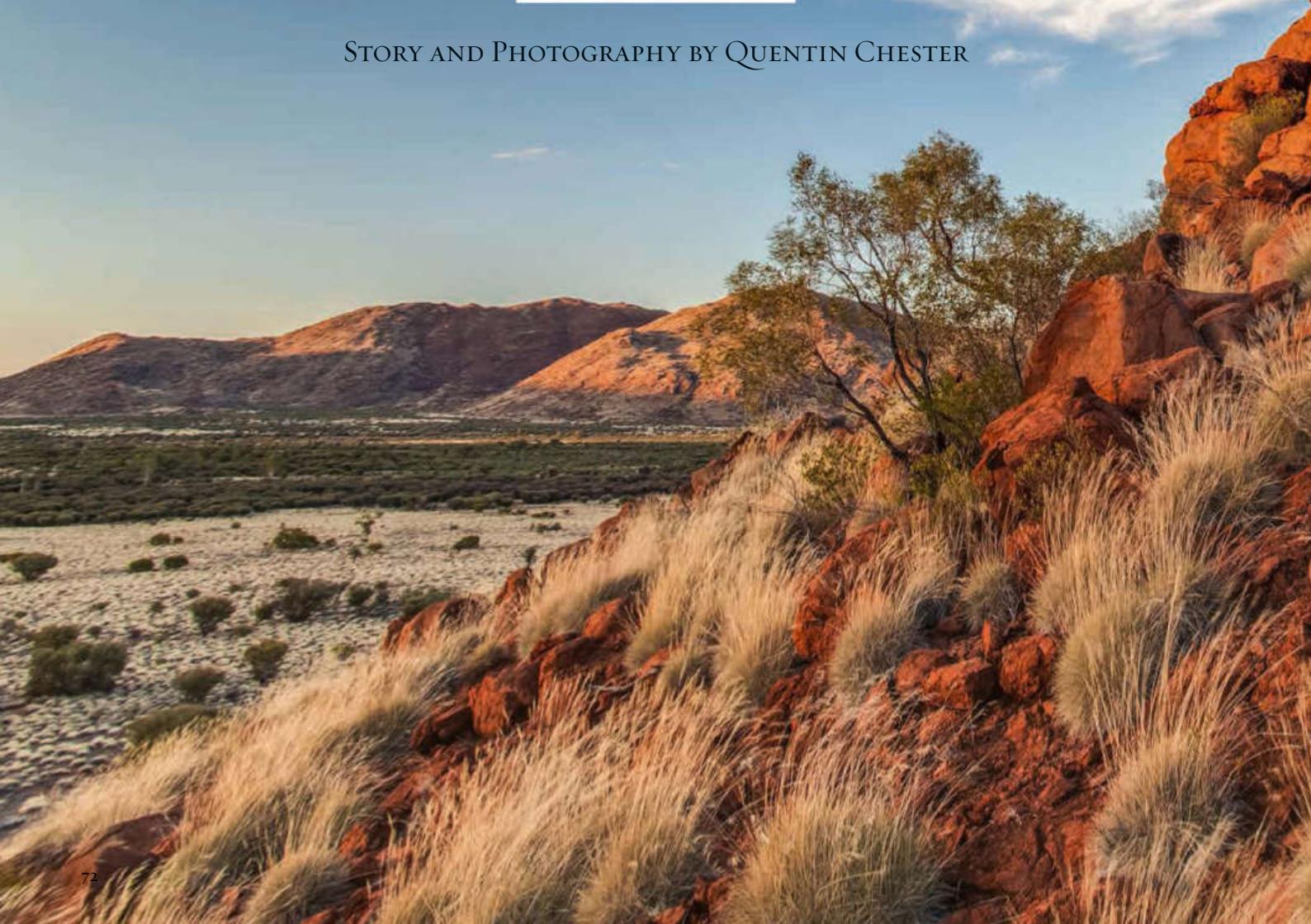
AUSTRALIAN GEOGRAPHIC thanks Keswick Developments for help with getting to these islands.

FIND more spectacular island imagery online at:
www.australiangeographic.com.au/issue128

IN THE
LAND
OF THE
ANANGU

Come on a privileged journey into a remote part of Australia where few outsiders have ever stepped.

STORY AND PHOTOGRAPHY BY QUENTIN CHESTER





Craggy kingdom. North of Pukatja, a constellation of ancient granite peaks is the major APY Lands stronghold for the Warru, or black-footed rock-wallaby.

Jacob Mackenzie and Bronson Bennett are walking out towards the setting sun.

There's a spring in their step as we stride across an open plain near the community of Pipalyatjara. This is South Australia's far north-west, and the borders with Western Australia and the Northern Territory are each less than 20km away. Out here, however, such boundaries seem arbitrary.

Jacob and Bronson are taking me to a special place – a marker considerably older than any line on a map. A few hundred metres off the road we approach an arrangement of dark stones standing in red sand, their tops arching skywards from the blond grass. They're small and burnished with a strong creature-like presence.

"We got Dreaming story here," says Jacob, arms outstretched. "This is Warru Tjukurpa. Dream them here. If we touch him and talk to him we get more Warru." Jacob pauses and then, with a long wave of his right hand, he gestures to distant Dulgunja Hill and beyond. "That population there and all the others – their spirits are all here," he says.

The Warru is the black-footed rock-wallaby, one of SA's most endangered species. For the Anangu people, the Warru is a lively embodiment of place and spirit. Occupying less than 10 per cent of their former range, today only 200–300 Warru survive across the Anangu, Pitjantjatjara and Yankunytjatjara (APY) Lands (Pitjantjatjara and Yankunytjatjara are two of the tribal groups that make up the Anangu people, whose lands cover much of the Red Centre). This precarious state is driving a push to ensure the Warru's survival, using a strategy combining 'whitefella science' with millennia of Anangu insight and bush skills.

The recovery program is more than a wildlife protection exercise. It echoes Tjukurpa – a body of traditional law, knowledge and song. From one perspective, daily life in the APY Lands can appear muddled, even baffling. Behind the scenes, however, the sacred power of the Tjukurpa functions as a sinewy binding force. As such, there's perhaps no better emblem for these lands and their associated culture than the startling, vivid and elusive Warru. A tenacious survivor, its homeland is a labyrinth – a world rocked by change but patterned with promise.

LOOMING ABOVE Pipalyatjara, Dulgunja Hill stands on the threshold to this labyrinth as the western outpost of the Warru. From its spinifex and rock-strewn slopes, the horizon is cut by the Tomkinson Ranges. Further east lie the Mann Ranges. Beyond that lot there's the Musgrave Ranges with their craggy ridgelines, while 350km to the south-east the Everard Ranges straddle the skyline in a tumble of domes and monoliths.

The region unfolds as one of Australia's most remarkable highland provinces with 24 of SA's loftiest summits. Yet to the outside world these mountains and their wider realm are virtually unknown.



Big-sky country. Viewed from the lower flanks of Dulgunja Hill, clouds float across a dusty sky above the western outliers of the Mann Ranges.

The reason is partly due to scale and isolation. Covering 103,000sq.km, the APY Lands occupy an area larger than Tasmania, but with a human population of just 3000 or so. Residents are scattered among seven far-flung communities and a constellation of smaller settlements. Adelaide is 1200km away, and access to the lands for outsiders requires a permit. This seclusion stemmed from the *Pitjantjatjara Land Rights Act 1981*, which granted the Anangu title over their homelands.

This trailblazing legislation recognised the traditions of the Anangu and their enduring ties to country. In practical terms it was built on pioneering work begun by Charles Duguid at the Ernabella Mission in the 1930s. With land rights came the schools, housing, health clinics and art centres that have underpinned community life for more than 30 years. Along the way, however, the task of administering such a vast estate as a single entity has grown increasingly troubled. The APY Lands have ▶



Warru warriors. Jacob Mackenzie (left) and Bronson Bennett, near Pipalyatjara – two of 15 rangers working to protect black-footed rock-wallabies. The showy parakeelya (above), a ubiquitous succulent herb in central Australia, is a traditional Anangu food source.

Bountiful boulders. The Everard Ranges (right) are granite hills thought to be more than 20 million years old. Lee Brady (below) tells of his days spent trekking solo across country with camels in his late teens.



Among the people and their stories, there's far more to this place than problems.

had eight general managers in the past five years. Meanwhile, allegations of sloppy governance have become a staple of media reporting. When lumped together with documented cases of abuse, family violence and social disadvantage, it's no surprise that the region is often portrayed through a lens of political frustration and despair.

But out here among the people and their stories, there's far more to this place than problems. Amata (Musgrave Park) sits at the Musgrave Ranges' western end – a former outstation that's now a 400-strong Anangu community overlooked by a citadel of peaks. On a good day you can gaze north from the highest – 1285m Mt Morris – and spot the inimitable profile of Uluru, 86km to the north. More than a landmark, it's a fulcrum of Anangu spiritual life. The reality of the Tjukurpa narratives reaches far beyond the APY Lands' nominal borders. The connections criss-cross inland Australia, travelling deep into the NT, and south and west through the Great Victoria Desert: part of a supple ancestral culture steeped in journey-making.



Watch out below. Walakara IPA coordinator Kate Homes, at right, joins Stizler and Sam Milera to set up a protective fence that straddles Pupu Rockhole to keep out wild camels.

IT'S ANOTHER BLUE-SKY Sunday afternoon in Amata. Lee Brady is out the front of his house working on his car. He and I had an idea to climb Mt Morris in the morning, but family matters trumped that plan. Instead we're on the street changing the shockies on his Falcon. Apart from the occasional passing car, it's quiet in town. Kids and dogs wander the streets and ripples of conversation in Pitjantjatjara filter across from neighbours gathered in front yards or on verandahs.

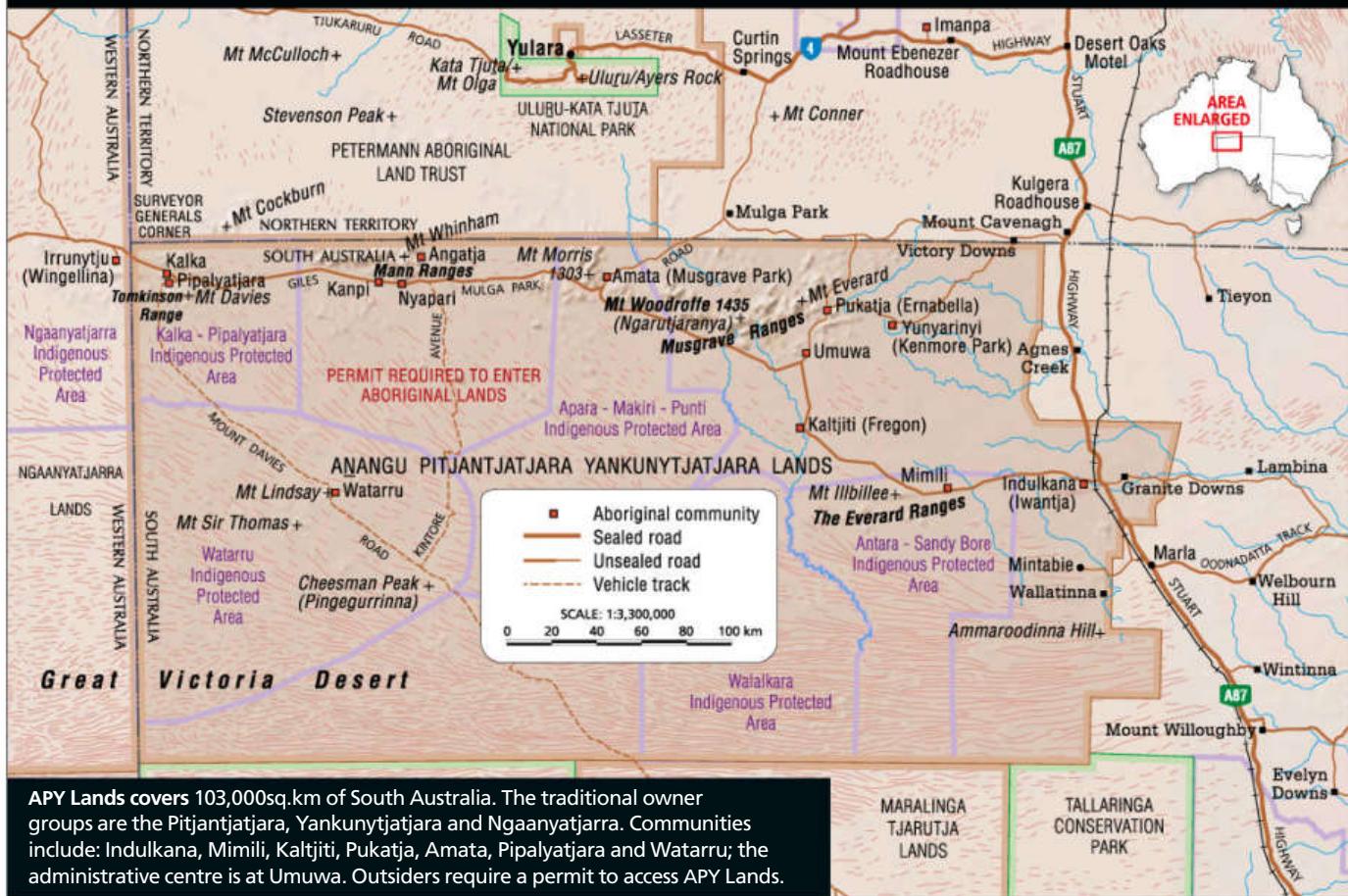
A burly bloke with dreads and a grey goatee, Lee is a dab hand as a mechanic. He needs to be. Keeping vehicles going is a non-stop challenge for locals who regularly rumble across hundreds of kilometres of dirt roads. We wrestle with spanners and springs as he reflects on his early life.

Born in Leigh Creek in the northern Flinders Ranges, he arrived with his dad and brothers here in his grandmother's country in his late teens. Lee embraced the traditional life, trekked alone with camels in the desert and became engaged with community work. An energetic cultural advocate, his ties are to the ▶

Buffer zoning. Travis Lewis takes part in a strategic burn near Wardulkha Rockhole to protect Warru habitats from the ravages of wildfires.



ANANGU, PITJANTJATJARA AND YANKUNYTJATJARA (APY) LANDS





Noisy neighbour. Mobs of spiny-cheeked honeyeaters are busy songsters throughout arid woodland habitats.

Tjala (honey ant) songline, the creation story for this area. "Without that history nothing is sacred," he says. "Our ancestors left us these stories to uphold the law and maintain country."

Art has bloomed as a potent means to reinforce this legacy, both with new generations of locals and to a wider audience. Just down the street from Lee's place is Tjala Arts, one of seven flourishing Anangu-owned arts centres across the Lands. Tjala represents more than 40 celebrated local artists, including a cohort of senior law-men and women on a quest to help instil tradition through painting, weaving and carving.

"The young fellas are the young tree branches with green leaves," says artist Hector Burton. "We teach our young fellas through the family tree to understand and be at home with their Dreamings and their lands." In 2014 Hector won the Red Ochre Prize, Australia's most prestigious peer-reviewed award for an Aboriginal artist. Two years earlier Barbara Moore, another Anangu artist, won the painting prize in the Telstra National Aboriginal and Torres Strait Islander Art Award.

"When the news came back to town here...my two children very proud," Barbara says in her soft voice as we chat outside Tjala Arts. She began painting in 2003 and was quickly recognised for her swirling brushstroke compositions. She's an Anamatyerre woman from the Ti Tree region, 200km north of Alice Springs, and, like Lee, arrived in the 1970s to be with family. Now a health worker in town, she's deeply entwined with the families of Amata. Painting is an extension of these ties for Barbara, and her life is nourished by shared stories.

For all its glow and verve, art is just one strand in the Anangu

mission to protect heritage. Caring for country – the living topography through which the Tjukurpa pulses – is at the heart of the culture. Havoc wrought by weeds, feral animals and wild-fire is keenly felt both for the environmental damage and spiritual harm.

OVER THE RANGE west of Amata lies Apara Springs, a secluded valley with a terraced creek of permanent water-holes. It's an idyllic oasis of green. But in 2013 it became a mass grave when about 300 desperate camels died here.

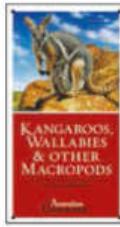
"It's heatstroke that killed them," explains Lee Brady. "They drink too quick when they're hot, then black out and fall to the ground and can't get up." He spent two weeks with a LandCruiser and snatch straps on the gruesome task of hauling dead camels from the springs.

"I did it out of my heart," says Lee. "I'm part Afghan and that place also runs a bit close to the Ngintaka [perentie lizard] sacred song, so I had to protect the site. But the work and smell really mucked me up – my family didn't want me in the house for a couple of months."

The Ngintaka songline reverberates across the breadth of the Lands, from the granite ranges to the sand country of the south. A vast rolling sprawl of the APY Lands is dominated by the rhythms of the Great Victoria Desert. It's a deceptively abundant, life-giving world. In Anangu lore this sea of dunes and scrubland is signposted with rock holes, soaks and sentinel-like outcrops on the horizon. Family survival and spiritual wellbeing demands an intimacy with this habitat-come-larder



Scaly fella. Lungkata, the unmistakeable blue-tongued skink, figures in one of Uluru's best-known Tjukurpa stories.



Learn all about Australia's kangaroos and other macropods, in our poster-guide that's FREE to subscribers along with this issue!

A whole-landscape effort watches over cultural sites, livestock, mining activities and biodiversity.

BLACK-FOOTED ROCK-WALLABY

THE WARRU is one of South Australia's most endangered mammals. Although total wild numbers are unknown, Warru are spread patchily across central Australia in the NT, WA and SA, and on several WA islands. In 2007 fears that the species would soon become extinct in SA led to the formation of the Warru Recovery Team, made up of traditional owners, conservationists and scientists. With the support of the local people, joeys have been taken to Monarto Zoo, south-east of Adelaide. Here, cross-fostering (see AG 127) is used to raise them with yellow-footed rock-wallaby foster mothers. In 2010 a 100ha predator-proof enclosure was created near the APY Lands' Musgrave Ranges, which is now home to about 25 Warru that are protected from cats and foxes.

FACTS

WEIGHT:
2.3–5.5kg

There are 3 subspecies of Warru.

200–300

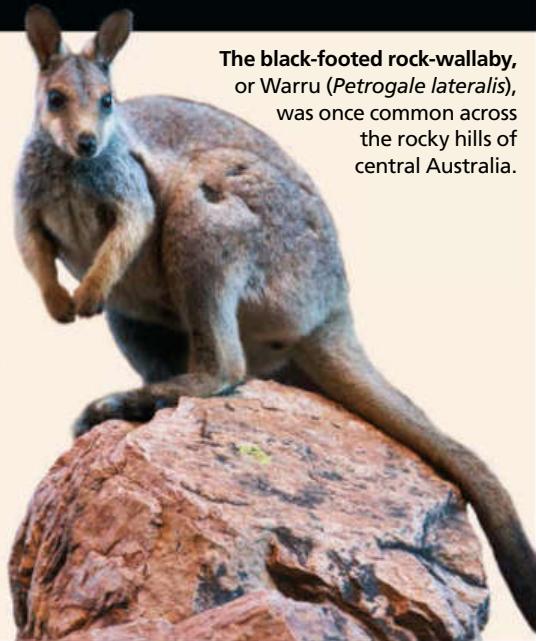
Warru are found on the APY Lands.

11

Warru wallabies have been successfully cross-fostered.

DESCRIPTION:

This small nocturnal wallaby is found amid rocky outcrops. It is generally greyish-brown with a paler belly and chest, a dark stripe running from its head down its spine, and it has a dark tail and feet.



The black-footed rock-wallaby, or Warru (*Petrogale lateralis*), was once common across the rocky hills of central Australia.

– from the maps in song, down to every faint shading, scent on the breeze or granular detail underfoot.

The late Tjilpi Robin Kankapankatja lived and breathed this knowledge. In 2000 some 7000sq.km of his ancestral land centred on Walalkara was declared as an Indigenous Protected Area (IPA) – the first of five IPAs now declared in the APY Lands. For decades, Tjilpi Robin worked with ecologists to help them grasp the particulars of this place – including habits of the desert's most vulnerable creatures, from the Tjakura (great desert skink) and Nganamara (malleefowl) to the enigmatic Itjaritjari (southern marsupial mole).

To scientists, the intuitive awareness of the Anangu is a revelation – not just for locating plants and animals, but also for subtleties such as discerning at a glance, amid a patch of active lizard burrows, which one is occupied.

Walalkara IPA coordinator Kate Holmes embraces the work with Tjilpi Robin's family, including senior women such as his wife, Antjala, and her sister Iwana. For this Adelaide-born field biologist, it's a rare opportunity to share in a legacy of

stewardship. At one level this is an alliance of western science and traditional ways.

That means everything from safeguarding waterholes and traditional burning methods, to using motion-detecting cameras to monitor a malleefowl nest. But being immersed in landscape and language also creates deeper ties. "They are the most wonderful people to be with," says Kate. "I feel like I'm being accepted into their world, and so readily accepted too – it's very special."

This collaborative spirit guides APY Land Management, the team that oversees the Anangu agenda for their country. It's a whole-landscape effort to watch over cultural sites, livestock, mining activities and biodiversity projects. In such an expansive region, no challenge is more daunting than controlling the spread of buffel grass, which was believed to have first come to Australia with camels in the 1860s and was encouraged during the 1980s to help keep dust down around communities.

It's now the biggest ecological menace. Fast-growing and highly flammable, buffel grass promotes hotter, faster and more frequent bushfires, placing communities at risk and



All smiles.
Dentist Simon Wooley and assistant Ange Caufield in Nganampa Health's mobile dental clinic at Pipalyatjara. Here for treatment are Leston Hatches-Parker (at rear), Seona Martin, Daelanah Cooley and Duncan Chamberlain.

devastating native vegetation. That, in turn, tears at the cultural fabric of country – the plant communities that sustain the Tjukurpa and species such as the Warru.

The most significant refuge for these rock-wallabies is in the eastern Musgrave Ranges, among the boulder-studded peaks north of Pukatja (Ernabella). As well a decade of predator control, a captive-breeding program (see previous page) sees pouch-young Warru raised by foster-mother yellow-footed rock-wallabies at Monarto Zoo near Adelaide, freeing up Warru mums in the wild to keep breeding. At the same time, the Anangu women who help direct the Warru work have created a contemporary Tjukurpa for the project. So it's cutting-edge science with spiritual clout.

This imprimatur also adds impetus to crucial fieldwork. Tasks include an annual trapping program and patchwork burning to limit the risk of intense wildfires wiping out the animal's grazing areas. For Warru Rangers such as Ethan Dagg, these jobs are another welcome chance to go bush. A keen motocross rider, he's like a lot of young Anangu blokes who enjoy hunting and the rough and tumble of their ancestral lands.

"I used to come out here on the bike to get away from everything," says Ethan. "Now with Warru work I still get to come out here and I get paid for it."

WANDERING THE WARRU havens it's not hard to see the appeal of ranger life on the IPA. I'm at Alalka, a gorge and waterhole hideaway about 15km north of Pukatja. Scrambling to the ridgeline the views sweep out across open plains to an entire archipelago of granite-flanked hills. There's a delicious feeling of space and freedom.

Compared with the challenges of community life – the fitful progress of a proud traditional culture battling to make its way in a world obsessed with money and deadlines – the simplicity of country is like a balm.

Alalka is a favourite place for Simon Wooley, a roving dentist in the APY Lands with the Nganampa Health Council since the late 1980s. Lanky and loose-limbed, his disarming, easygoing manner masks a steadfast resolve.

As well as two conventional clinics, Simon has an Isuzu truck kitted out with a dental surgery that he drives to outlying communities. He's also had to invent and adapt dentistry skills to suit this remote setting. With about 1200 patient-visits a year, the program has seen a marked improvement in oral health, especially in school-age children.

I catch up with Simon during one of his visits to Pipalyatjara. It had been another bone-shaking 350km drive from Pukatja. The autoclave unit that sterilises his instruments didn't survive the journey. It's another frustration that Simon takes in his stride. As someone who's lived the daily turmoil of delivering health care to isolated communities, he remains philosophical.

With the mobile clinic trouble-shooting out of the way, Simon and I take an afternoon ramble up Maku Gorge, a deep ravine on the eastern face of Dulgunjia Hill. It's a site of rugged splendour and a known Warru hideout. For Simon it brings the immersion in terrain that recharges his connection to place and people. In the face of dire challenges across the APY Lands, he's continually moved by the respect and compassion of the people he serves.

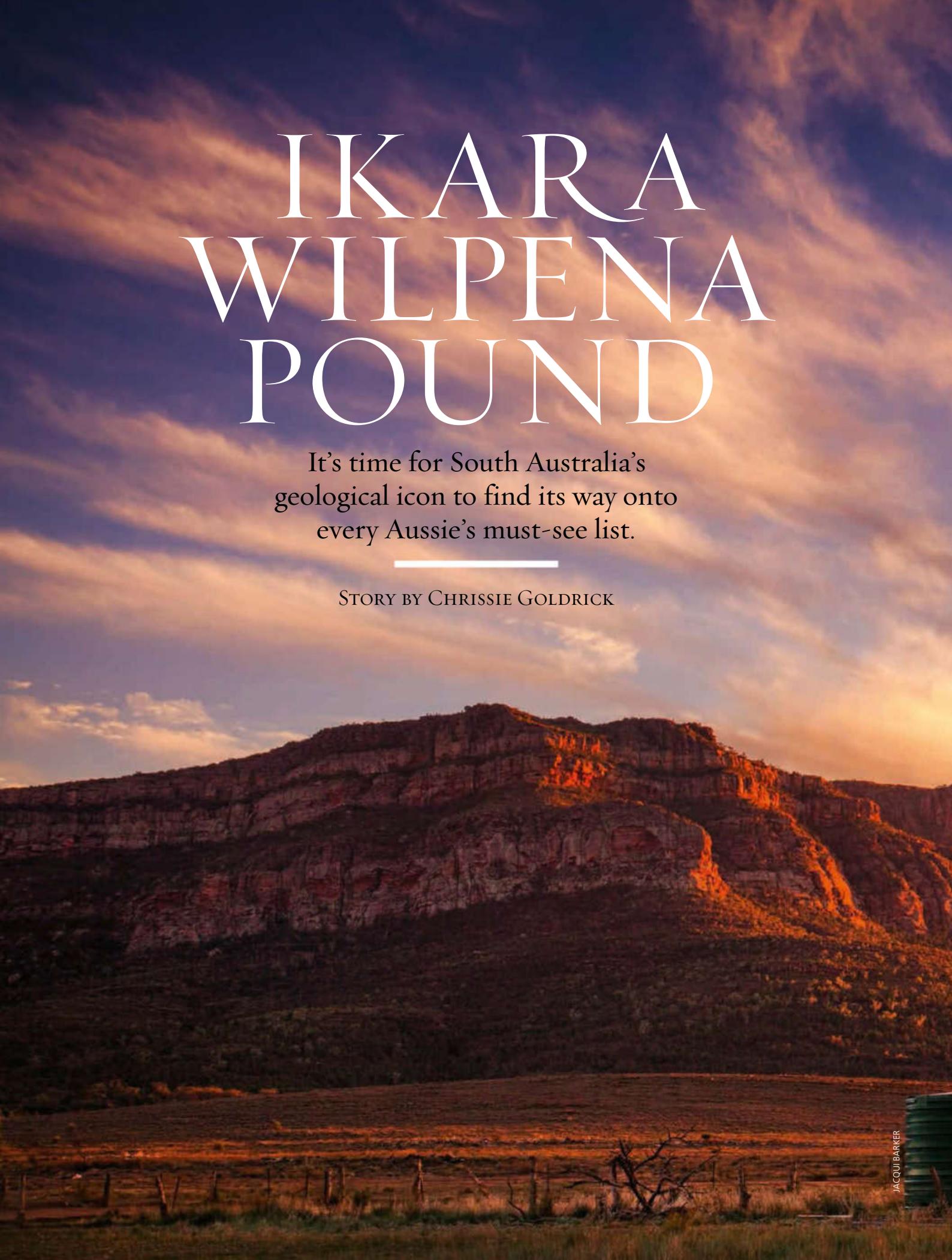
"You see the spiritual energy with the things that really matter to the people. You see it in the art, the Tjukurpa and going for bush tucker," says Simon, as we sit looking east from a stack of dark ironstone blocks into a dusty sky. "To be exposed to these powerful and privileged experiences – the culture, the country – that's what keeps me coming back. There's a whole world of magical things out here." **AG**

Sacred waters. Aliwanyiwanyinya Rockhole, resplendent on the southern flanks of the Musgrave Ranges.



A site of rugged splendour...it brings
the immersion in terrain that recharges
his connection to place and people.

IKARA WILPENA POUND



It's time for South Australia's geological icon to find its way onto every Aussie's must-see list.

STORY BY CHRISSIE GOLDRICK



Run for the hills. Towering Rawnsley Bluff (948m), Wilpena Pound's southern peak, rises majestically into view for approaching visitors.



IF AUSTRALIA HAD its own seven wonders of the natural world, Wilpena Pound would surely be near the top of the list. It would vie with such luminaries as Kata Tjuta, the Twelve Apostles and of course Uluru, which, astonishingly, would fit within Wilpena's walls six times over. But it's surprising how many Australians have never heard of, let alone visited, this unique geological spectacle in South Australia's Flinders Ranges National Park.

In fact, visitor numbers to the region have fallen since they peaked in the 1970s, but the Flinders still hold a special place in the hearts of South Australians. Holiday-makers first began coming to Wilpena Pound after it was declared a National Pleasure Resort in 1945. Over subsequent decades, a family camping trip, school excursion or holiday break at 'The Chalet', now part of Wilpena Pound Resort, became an annual rite of passage for many.

I first set eyes on the Pound back in 1999, when I was organising photos for AUSTRALIAN GEOGRAPHIC's guide book to the Flinders Ranges. Initially I thought I was looking at aerial images of a massive meteorite crater – the scene of some ancient cataclysm, the indelible imprint of which aeons of weathering had failed to erase. But the origins of this natural amphitheatre were a less violent and much more drawn-out affair.

Geologists describe the feature as a 'remnant elevated synclinal basin', and it was once enclosed by far higher mountains. Its steep walls and shallow inner bowl are made of thick layers of super-hard quartzite that have been squeezed along both east-west and north-south axes, forcing the strata upwards

Long before Europeans arrived, Wilpena Pound had profound cultural and spiritual significance.

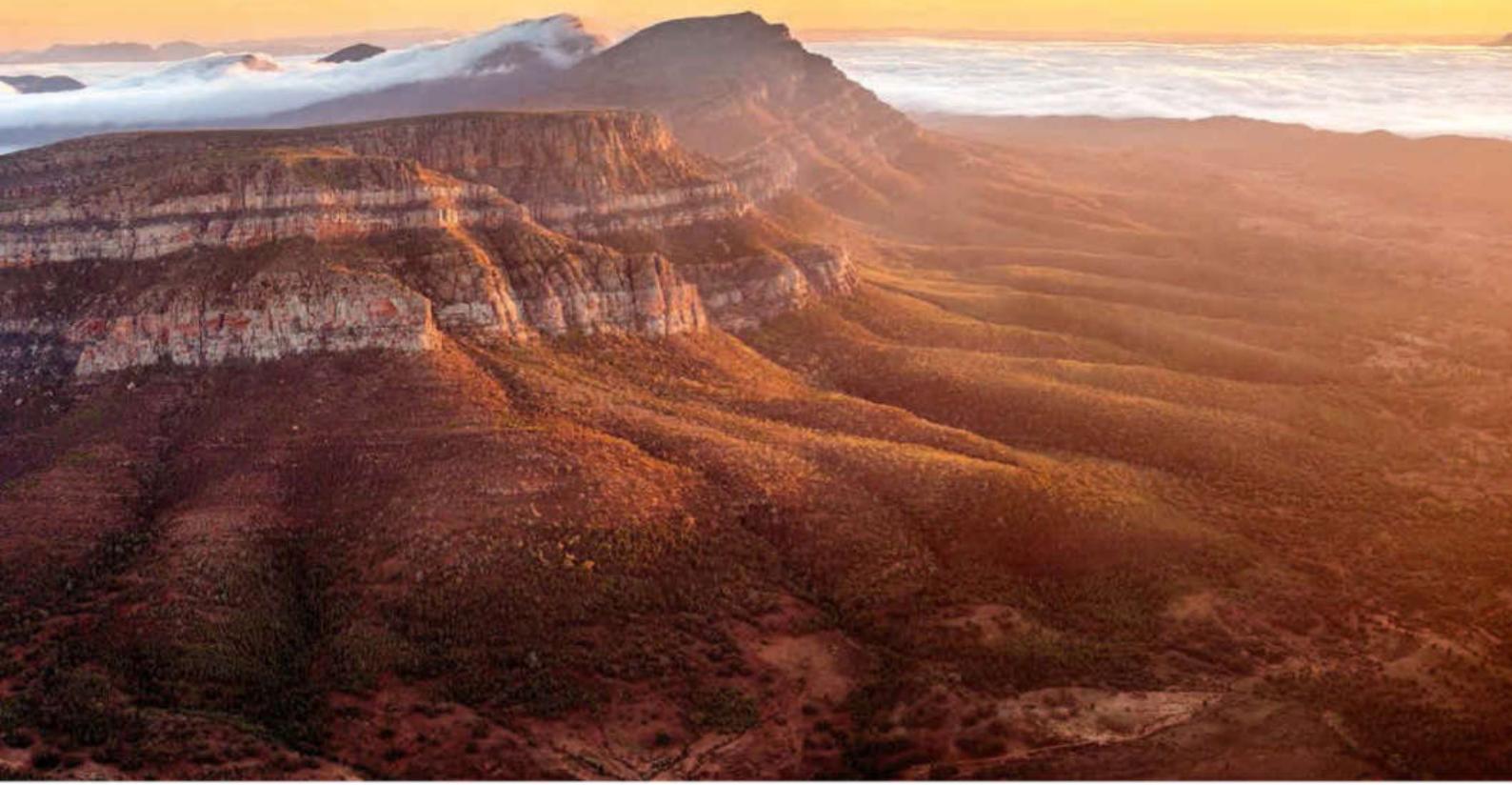
and creating the teardrop-shaped 17 x 7km structure. Although time has whittled away several thousand metres from the top of those rippled ramparts, the Pound is the highest section of the Flinders Ranges.

The broader Flinders landscape is the result of uneven weathering of alternately hard and soft sections of rocks, with quartzite forming the high peaks and hogback ridges, while softer materials, such as mudstone, siltstone and shale, have been worn away to form valleys and gorges.

In between stand limestone hills striped with darker bands of hard dolomite. Iron oxide lends the rocks a pinkish glow in the half-light of dusk or dawn, and the vegetation here emits terpenes, plant compounds that combine with ozone in the atmosphere to give a blueish tinge to distant vistas.

This vibrant palette of form and colour endows the Flinders with a beauty and splendour that's drawn generations of photographers and painters, most notably artist Hans Heysen and photographer Harold Cazneaux (see *Spirit of Endurance*, AG 127).

Deep within. Viewed from the air, the basin-like structure of Wilpena Pound comes clearly into focus.



Rock record. Stories of the Adnyamathanha are recorded on Arkaroo Rock, a massive boulder at the Pound's base.

LONG BEFORE EUROPEANS arrived, Wilpena Pound, or Ikara (meeting place), had profound cultural and spiritual significance to the Adnyamathanha people, who have inhabited the region for at least 15,000 years. The serpent of their Dreamtime stories, Akurra, is creator and guardian of all permanent waterholes in the Flinders and is said to form part of the Pound's walls.

In 2011 the SA government entered into partnership with the Adnyamathanha (pronounced ad-na-mut-na) traditional owners for the co-management of Flinders Ranges NP. It's a priority for their stories to be told alongside pastoral and natural histories.

Senior cultural ranger Arthur Coulthard was born under a Flinders river red gum and has worked in the park since the 1980s. Four years on, he believes the co-management is paying off.

"People have a better understanding now and I thank my people for doing that, otherwise we would be back in the dark ages," says Arthur. "Visitors to Wilpena have opened their eyes and are really taking on the Aboriginal perspective. This area is a significant place for Adnyamathanha because it's a Dreaming story. We don't just see the beauty of it, it is a part of us."

Wilpena's modern story began when stockman William Chace 'discovered' it in 1850, while prospecting for pastoral land on behalf of doctors W.J. and J.H. Browne. The pioneering pastoralists took up a number of leases the following year, and, while they enjoyed great success running sheep, later attempts to grow wheat in the area fell foul of the boom-and-bust cycles that define the lands north of Goyder's famous line (AG 96).

In 1920 the leases expired and the government bought back the Pound and registered it as forest reserve. Remnants of two farms are now part of the national park here. Picturesque Old Wilpena Station is close to the airstrip and contains restored farm buildings, including an 1864 pug-and-pine blacksmith's cottage. The Hills family homestead lies inside the Pound and is reached via Wilpena Creek.

This watercourse pierces the encircling walls of the Pound and drains two-thirds of the basin, which acts as a gigantic rainwater collector. Huge, uprooted river red gums lining the creek provide a clue to past deluges, but mostly it just bubbles peacefully along.

Continued page 89

WILPENA POUND



Rest stop. A walker takes in the view at Wangara Lookout.

EXPERIENCING WILPENA POUND

A series of trails allows visitors to get out and experience the beauty of this geological marvel.

GETTING THERE

The Pound is located 433km north of Adelaide in the southern Flinders Ranges. It takes about five hours to get there from Adelaide, depending on your route.

CLIMATE

Mild temperatures from April to October make this period the most comfortable for walking. During the summer months, temperatures range from 30°C to 45°C. Some tracks may be closed on days of extreme fire danger.

WALKS

- ① St Mary Peak Hike
- ② Malloga Falls Hike
- ③ Wangara Lookout Hike
- ④ Living with Land Walk
- ⑤ Mt Ohlsson Bagge Hike
- ⑥ Boom and Bust Hike
- ⑦ Hills Homestead Walk
- ⑧ The Heysen Trail
- ⑨ Bridle Gap Hike
- ⑩ The Mawson Trail

PLACES TO STAY

Cooinda Camp

A camping ground within Wilpena Pound, accessible to St Mary Peak and Malloga Falls hikers. Gas or liquid fuel stoves only. No water or toilet facilities are available.

Wilpena Park Camping Ground

www.wilpenapound.com.au/campground/

Wilpena Resort

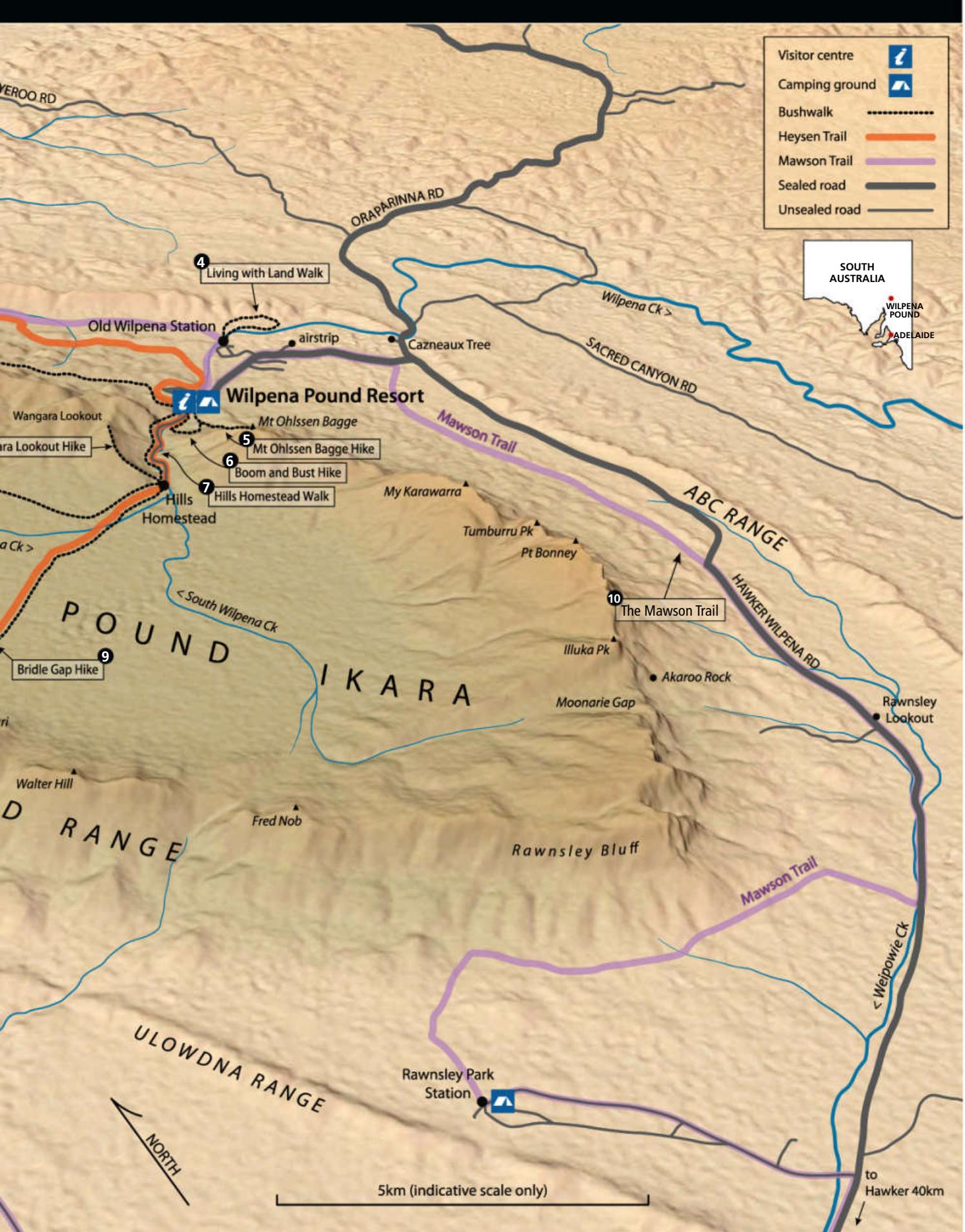
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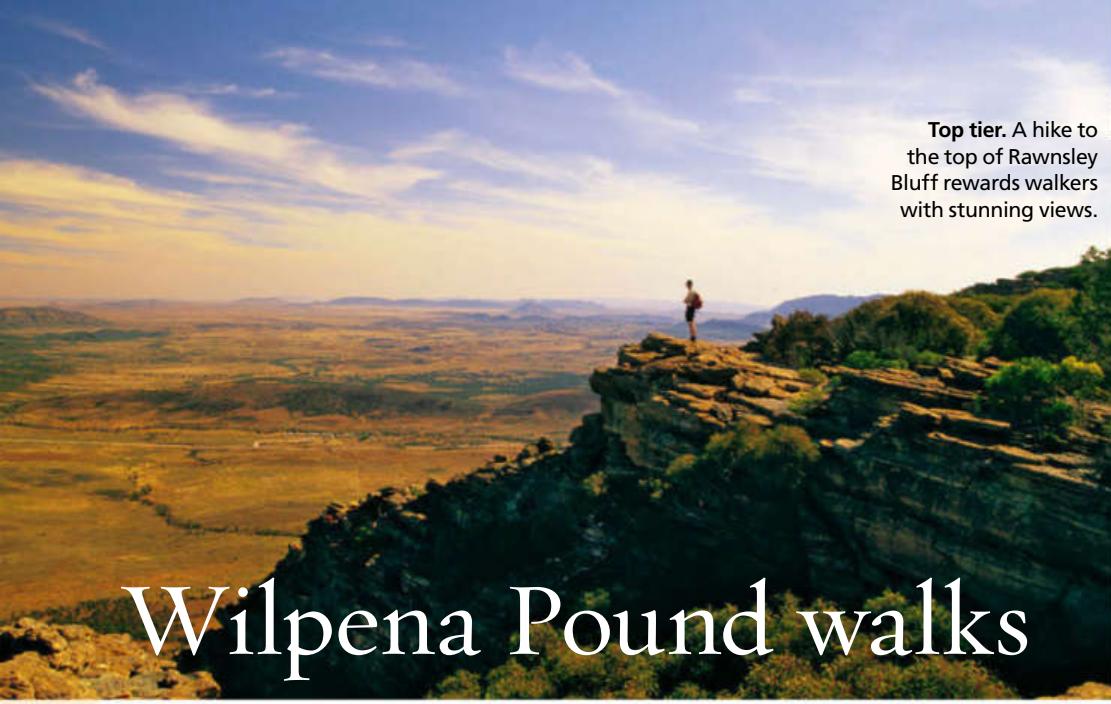
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Wilpena Pound walks

HILLS HOMESTEAD WALK

2 hrs, 6.6km return

Follow Wilpena Creek and encounter relics and reminders of pioneering life inside Wilpena Pound. Signs titled 'If the walls could talk' tell the story of Jessie Hill, daughter of the first pioneer family to live in the homestead. A shuttle bus is available to shorten the walk.

Access: begins from the bushwalking trailhead at the Wilpena Visitor Centre complex.

LIVING WITH LAND WALK

2 hrs, 1km return

Aboriginal people, European settlers and their descendants share the pastoral heritage of the Flinders Ranges. This self-guided walk discovers the themes of self-sufficiency, improvisation and survival in the remote and isolated pastoral settlements of the Flinders Ranges.

Access: Old Wilpena Station. Fee applies.

WANGARA LOOKOUT HIKE

Lower lookout: 3 hrs, 7.2km return; **Upper lookout:** 3.5 hrs, 7.8km return

Follow Wilpena Creek through towering river red gums, cypress pines, scented wattles and a seasonal array of wildflowers for spectacular panoramic views. The lower lookout is 300m on from Hills Homestead. Continue

for 300m to the upper lookout. A shuttle bus is available to shorten the walk.

Access: begins from the bushwalking trailhead at the Wilpena Visitor Centre complex.

BOOM AND BUST HIKE

1.5 hrs, 2km return

Discover how plants survive water shortages in arid conditions. This short hike features a seasonal array of wildflowers.

Access: begins from the bushwalking trailhead at the Wilpena Visitor Centre complex.

MT OHLSEN BAGGE HIKE

4 hrs, 6.4km return

Steep rocky inclines followed by rewarding views of Wilpena Pound and the surrounding area. This hike takes in excellent reptile habitat.

Access: begins from the bushwalking trailhead at the Wilpena Visitor Centre complex.

BRIDLE GAP HIKE HILLS HOMESTEAD WALK

6 hrs, 18.8km return

The track, which forms part of the famous Heysen Trail, bisects the floor of Wilpena Pound. A variety of mallee, cypress pine and heath habitats provide excellent opportunities for keen naturalists to observe local birds, including wrens, robins, parrots and raptors.

Top tier. A hike to the top of Rawnsley Bluff rewards walkers with stunning views.

on this hike no later than 9am (or 10am during daylight saving hours).

MALLOGA FALLS HIKE

9 hrs, 23.2km return

A long flat track traversing the floor of Wilpena Pound to the spectacular rock faces of Edeowie Gorge and the stunning Malloga Falls. Beyond Cooinda Camp, bushwalkers need to be experienced and possess navigational skills. Prior to commencing this hike, bushwalkers must discuss their route with the Wilpena Visitor Centre staff and fill in a Let Us Know Before You Go trip intention form.

Access: begins from the bushwalking trailhead at the Wilpena Visitor Centre complex.

THE HEYSEN TRAIL

The entire walk takes 60 days, 1200km

This long-distance walking track traverses the state's principal mountain ranges between Cape Jervis, on the tip of the Fleurieu Peninsula in the south, to Parachilna Gorge in the Flinders Ranges in the north. It passes through some of the most spectacular areas in Flinders Ranges NP. Many of the walking tracks within the park utilise parts of this long-distance route.

THE MAWSON TRAIL

900km cycling track

This challenging off-road bike route starts just north of Adelaide and ends at Blinman, looping around Wilpena Pound.



Spoilt for choice. Wilpena Pound offers a variety of tracks that range in elevation.



Centre stage. Looking south across the interior of the pound.



Historic markers. Old Wilpena Station (below left) became part of the national park in 1985; prior to that it had been a working sheep station for 135 years. This modern sculpture (below) at Hill Homestead depicts Adnyamathanha hunters and points the way along the Wangara Lookout Track.



"All areas of the Flinders are beautiful, but there are some that feel almost spiritual."

THERE ARE NUMEROUS ways to enjoy Wilpena Pound, but to be truly immersed in this extraordinary landscape you should walk into its very heart, following the creek and its shady red gums.

"All areas of the Flinders are beautiful, but there are some places that feel almost spiritual...and Wilpena is certainly one of them," says local guide Tim Tyler. The opportunity to engage with the traditional owners here has also enhanced the visitor experience, he says. "We now have Adnyamathanha guides and staff in the Wilpena Visitor Centre. They greet our guests, who love to talk to the people whose country this is."

I ascended the rocky track to the higher of two lookouts on the popular 7.8km Wangara track on a stifling 32°C February afternoon. The thrill of the panoramic view across the Pound's interior was tempered by an unexpected sensation of peace and tranquillity. The eerie stillness that seemed to permeate the vast enclosure may have been the result of the sultry conditions, but I could identify with those who claim a spiritual response.

There are a number of official walking tracks, including a section of the 1200km Heysen Trail (see opposite); all are well-marked and vary in length and difficulty. The toughest is the St Mary Peak Hike. At 1171m, St Mary's is the highest mountain in the Flinders Ranges and is significant in the Adnyamathanha creation stories. For this reason they request walkers finish their hike at Tanderra Saddle rather than continue to the summit. The full walk varies between 14.6 and 21.5km depending on the route taken. Other tracks lead up onto the rim to peaks such as Mt Ohlssen Bagge, or to the floor of the Pound with its varied animal and plant communities.

In contrast to these close encounters, a scenic flight is almost mandatory, in order to see Wilpena in its eye-popping entirety. These take off regularly from the airstrip near Old Wilpena Station and the pilots are experts at avoiding the big red kangaroos and emus that regularly invade the landing strip. Seeing this country from the air helps to make some sense of its complex geology, but the jagged backbones of the mountain ranges that writhe through the landscape more readily invoke the Akurras, those fearsome serpents of the Adnyamathanha creation. AG

AUSTRALIAN GEOGRAPHIC thanks SA Tourism Commission, Wilpena Pound Resort, Jill Collins and Barking Owl Communications for assistance.

► **FIND** more images and stories about the Flinders Ranges online: www.australiageographic.com.au/issue128



Promise of dawn. The view south to Mt Lidgbird and Mt Gower, the site of some of Lord Howe Island's most challenging and rewarding bushwalks and nature experiences.

Join us next issue

Set sail with us to the spectacular speck in the Pacific that is the legendary **Lord Howe Island**. Also this issue, we visit the NT's **Tennant Creek** – source of wild stories and one of the most remote towns in outback Australia; we uncover the history behind the shipwreck of the **Sydney Cove**, among the first merchant ships to Port Jackson, which was dashed on rocks near Flinders Island in 1797; and we go on a kayak adventure like none other, in the penguin-rich seas of subantarctic **South Georgia Island**. Out early December.

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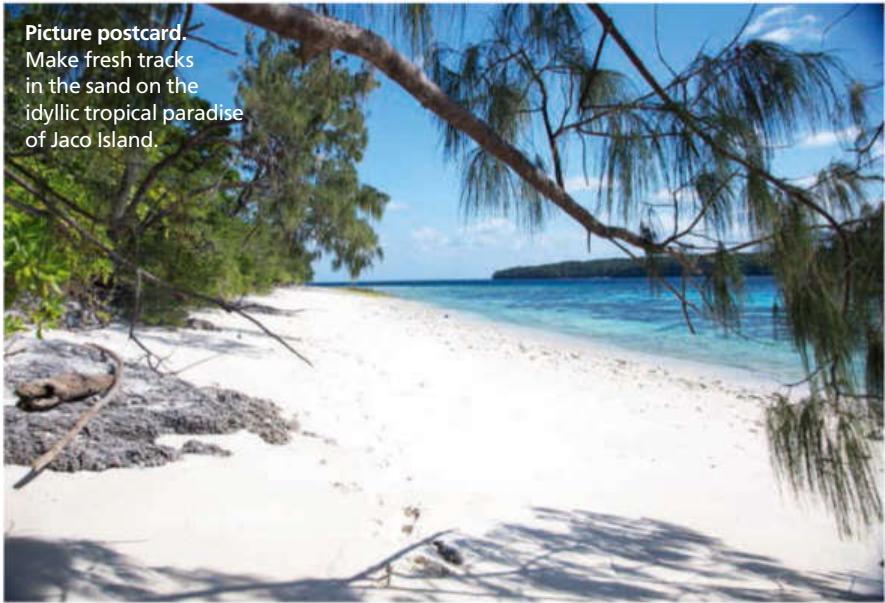
REWIND

Life's hard work on one of our biggest cattle stations.

OUT BACK

TRAVEL & DESTINATIONS, YOUR SOCIETY, YOUR AG

Picture postcard.
Make fresh tracks in the sand on the idyllic tropical paradise of Jaco Island.



DESTINATION HIGHLIGHT: TIMOR-LESTE

Northern neighbour

A place of undiscovered culture and natural wilderness.

IT'S GETTING HARDER and harder to find places that holidaymakers are yet to discover. Timor-Leste (East Timor), however, is just one such hidden gem. Just eight degrees south of the equator and less than 700km north-west of Darwin across the Timor Sea, Timor-Leste is a tropical paradise that's currently off most travellers' radars. It's a place full of cultural and natural surprises where you won't see buses full of camera-happy tourists or be hassled on street corners to buy local wares. Instead, you will be treated to an honest and genuine Timorese experience that will warm your heart and open your eyes.

Delving deep into the culture, shaped by a rich and sometimes turbulent history, provides countless rewards and will

give you a new perspective on life, happiness and freedom. The Timorese people will quickly take you in, make you laugh and remind you that the future is yet to be written.

For lovers of nature, Timor-Leste offers plenty in the form of lush, rugged mountains, sensational coastlines and spectacular coral reefs rippling with life. Exploration is easy here if you have an adventurous spirit, and there are endless opportunities for trekking, biking, kayaking, diving and snorkelling.

So, if you are the type of person who likes to make footprints on untrodden beaches, to be the only westerner in town and to eat seafood fresh from the ocean, then Timor-Leste may be the place for you.

S OF THE BEST

TIMOR-LESTE SIGHTS

1 ATAURO ISLAND

Hook up with a local dive operator to reach Atauro. Stay a few nights in humble accommodation and immerse yourself in the abundant marine life for which Timor-Leste is famous.



2 MT RAMELAU

From the small town of Hatubuilico you can take a three-hour trek to the top of the 2963m-high Foho Tatamailau (Mt Ramelau), Timor-Leste's highest peak. There's an open-air church at 2700m and a statue of the Virgin Mary at the top.

3 JACO ISLAND

This tiny uninhabited island off Timor-Leste's east coast has white sandy beaches, palm trees, traditional dugout canoes and coral reefs in crystal-clear waters. Expect to have it mostly to yourself.

4 DILI

A bustling city of colour and energy, you'll find traditional weaving, market stalls full of fresh produce, locally cooked foods and, of course, Timorese hospitality.



5 BACAU

A Portuguese-era colonial town with a bustling historic marketplace stacked with local produce.



WATCH

Use the free **viewa** app to scan this page and watch a trailer for our brand-new documentary about Timor-Leste. See the whole film on our website.

TIMOR-LESTE

A NATION OF NEW BEGINNINGS

Blessed with spectacular natural riches, Timor-Leste is moving on from its struggle for freedom, and is emerging as a tropical destination with much to offer intrepid travellers.

STORY AND PHOTOGRAPHY BY DEAN MILLER

Spectacular sands. Mountains meet the waters of the Banda Sea Cristo Rei Beach (also known as Doloquan Beach) just a 10-minute drive from the capital of Dili.

City life. Dili provides a vibrant insight into the traditional ways of the Timorese. You'll find fishermen (below) selling the catch of the day, every day, at the local fish markets alongside skilled artisans plying ancient crafts, such as the creation of tais. This traditional handwoven fabric (bottom) is an integral part of the local cultural heritage.



WHEN I decided to travel to Timor-Leste – or East Timor – I wasn't quite sure what to expect. Similar to most Australians, much of what I knew about this South-East Asian neighbour had come from news reports and the picture painted was not one of an idyllic destination. It goes without saying that Timor-Leste has had a turbulent history, which has shaped its culture for hundreds of years. But today – since achieving independence

in 2002, and having enjoyed a number of years of peace and stability – the people of Timor-Leste are planning for a much brighter future.

Just a 90-minute flight across the Timor Sea from Darwin, Timor-Leste is one of Australia's closest neighbours. The island of Timor is the largest of the Lesser Sunda Islands, with the western half belonging to Indonesia and the eastern half to Timor. It is mountainous and thickly vegetated, with relief from the rugged terrain provided only by the magnificent coastline, where white sandy beaches meet crystal-clear waters fringed by tropical coral reefs. As I fly over this scenery on my way to the capital Dili, it dawns on me that any preconceptions I might have had about Timor-Leste are probably not accurate and I am filled with

excitement about the adventure ahead.

Upon landing I meet my driver for this expedition, a young Timorese man named Joal, who speaks in broken but clear English. This is fortunate because my Portuguese and Tetum (major languages spoken here) leave much to be desired. He welcomes me warmly and is brimming with pride for his country.

We weave through the streets of Dili, a city of more than 200,000, just as it awakens under the rising intensity of the equatorial sun. It's an eclectic mix of modern Western-style blocks, extravagant embassies, basic dwellings puffing smoke from cooking fires, and bustling market stalls. There are cars, trucks and scooters everywhere. All this colour and activity creates an energy and vibrancy that are testament to the nation's new beginnings.

Dr Dean Miller is a filmmaker and marine biologist who travels the world to research and film animals in remote, inhospitable and interesting corners of the planet. His last story was *Northern exposure* (AG 121), about an AGS-sponsored expedition to Greenland.



Welcome to paradise. The copper statue (left) Cristo Rei – Portuguese for ‘Christ the King’ – watches over the capital. Timor-Leste offers world-class diving among pristine coral reefs (below) and deep-ocean drop-offs. But it’s the Timorese people, such as these children playing on Dili’s Areia Branca Beach, that make Timor-Leste such a stunning experience for visitors.



AS I WANDER the streets and take in the sights I discover a city that is full of surprises. It is hard to ignore what has happened in Timor-Leste in the past. Reminders of occupation, war and resistance are scattered throughout the capital. Statues of leaders and religious icons, monuments to the massacred, World War II sites and ruins of prisons and forts can all be explored and help to explain some of this rich, varied and often violent history.

I begin by visiting the Chega Museum, set in a former Indonesian prison in the heart of Dili. The word chega roughly translates in Portuguese to the emotive statement “No more. Stop. Enough!” A walk through this ominous building and its grounds, with its graphic photographs and descriptive accounts, clearly conveys the kind

of human-rights violations that occurred here during the most recent Indonesian occupation.

While at the prison I am fortunate enough to meet with Gregorio Saldanha, a humble and softly spoken man who, in 1991, was imprisoned for helping organise the Santa Cruz pro-independence demonstrations. These were intended to be peaceful protests organised by students to object to the occupation of their country by the Indonesian government, but quickly turned into a tragedy when the Indonesian army shot hundreds of unarmed demonstrators. It became known as the Santa Cruz Massacre and Gregorio lost many friends that day.

As we walk, he describes his time behind bars here and the treatment he was subjected to before being

transported to various jails around Indonesia for much of the ensuing decade. His story is one of bravery and intense fear for his and his family's lives, but his willingness to continue to battle for the freedom of his country and its people is inspirational.

“Our fight for independence has been won at a heavy cost,” he says. “But it is now time for the Timorese people to move forward and create the country we want for our future, for our children.” From what I have seen of the country so far, I know he is right.

A visit to this island is not complete without taking the scenic coastal drive out to Cristo Rei of Dili, a 27m-high statue of Jesus atop a globe that overlooks the ocean and the country's capital. Made of copper and constructed in 1996 to mark the 20th anniversary of Indonesia's

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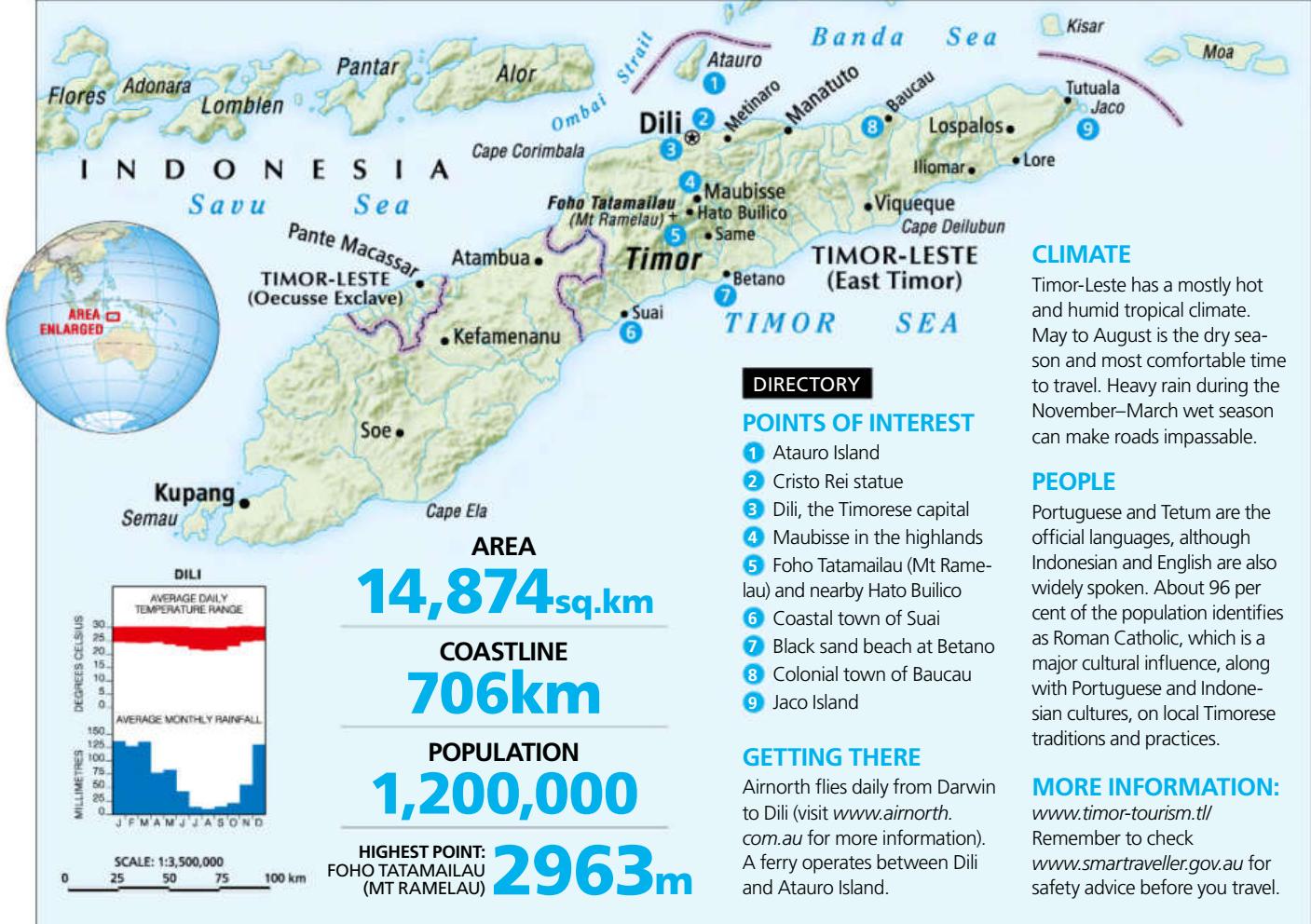
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TIMOR-LESTE



colonisation of Timor-Leste, it is a spectacular symbol of the country's Catholic influences. Although Cristo Rei is the country's most famous tourist attraction, the locals also love this icon. On weekends it is visited by thousands of Timorese who come to pray, give thanks, and enjoy the sensational views.

The connection of the people here with the sea is evident on every street corner, with makeshift fish markets and stalls operating directly from the kerbs, footpaths and even the backs of motorbikes. Everything from large pelagic tuna and mackerel to small tuna and mackerel schoolfish and squid is sold in a simple yet chaotic drive-by system that somehow seems to work. The fish are caught fresh every day and on every beach

fishermen in dugout outrigger canoes tend to nets and lines.

And that is just Dili. It soon becomes clear to me that to see the real Timor-Leste, its way of life and natural wonders it contains, I will have to travel far and wide.

ON ADVICE FROM anyone who has ever been there, it is clear I have to make the trek out to Jaco, a small and uninhabited island off the most easterly coast. I set aside three days: although it's less than 200km away, it will require a full day of driving along rough sealed roads and dirt tracks. On my way I pass through countless villages, some on the coast, others nestled high in the mountains. Regardless of the location of the settlements, the reaction of the

locals to me is the same – smiling, happy people yelling "hello mister" and children running alongside the car cheering as we whizz by. It is moments like these that make travelling in this country such a pleasure: you are made to feel very welcome.

After an eight-hour drive we arrive at the 900m stretch of water separating the main island of Timor from Jaco. Instantly I appreciate why everyone insisted I come here. The beautiful beaches of white sand and sparkling blue waters are deliciously inviting. For about US\$10 I get a return ride in a dugout to Jaco and I'm able to enjoy this paradise to myself. I dive beneath the waves and the rest of the world seems to melt away. The beauty and simplicity of this place overwhelms me.



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Water views. Thatch huts on Atauro Island provide a base for visitors seeking a unique scuba-diving experience.

Having experienced the most idyllic beach along the coastline, it's time to discover what's further below the surface. Timor is in the 'coral triangle' – a region of marine ecosystems that also span the waters of Indonesia, Malaysia, Papua New Guinea, the Philippines and the Solomon Islands. Within it are found an immense variety of hard and soft corals, fish, marine mammals and molluscs.

ONE PLACE TO experience these riches is Atauro Island, 27km north of Dili. The water between Timor and Atauro is more than 3300m deep and passing currents bring clear, nutrient-rich waters to the surface, which results in fantastic visibility for divers. They also bring life: this channel is frequented by large pods of cetaceans, including Fraser's and spinner dolphins and humpback and sperm whales.

After a two-hour boat ride from Dili, I arrive at the small village of Adara on Atauro's west coast and meet up with Tony Crean, an Aussie expat living here. He runs a humble diving operation and 'eco-camp' that

The experience is spectacular, with corals of a kind that I have never seen before anywhere.

offers accommodation in 12 small tents under basic thatched structures on the beach. Together with the villagers, he has created a unique diving and snorkelling experience.

"This is an off-the-beaten-track adventure, with a touch of style and comfort in the form of the camp," Tony says, as we look across the fringing reef just metres from the tents. "We work directly with the local community and this provides them with a steady income. Over the five years we have been working together they have managed to send six of their children to university. In return we are privileged to stay in their community and this gives our visitors a unique and authentic Timorese experience."

On top of this, the diving is incredible. Kitted out with a scuba tank, mask and fins, I slip beneath the waves and I'm greeted by thousands of colourful reef fish, sticking close to the hard corals. Predatory mackerel patrol the reef edges for an easy meal and schools of parrotfish and surgeonfish mow down patches of algae. The shells of

beautifully ornamented cowries glide over the substrate, shining in dappled sunlight. Small squid dart backwards and stare at me, while a green turtle hovers in the background.

The experience is spectacular, with corals of a kind I have never seen before anywhere. The water is warm and clear and, as I follow Tony along the fringing reef, the water's blue colour deepens and I peer over a drop-off that rapidly falls away to an ocean floor 600m below.

As a marine scientist and nature lover I am awed by the spectacle of the diversity and abundance of life on this reef. And although it is here that I find my strongest connection with magnificent Timor-Leste, it is the people and their warm hearts that will bring me back again and again. AG

AUSTRALIAN GEOGRAPHIC and Dean Miller thank Wayne Lovel, Costa Cristian De Jesusu, Airnorth, RentLo and the Beachside Hotel for assistance with this story.

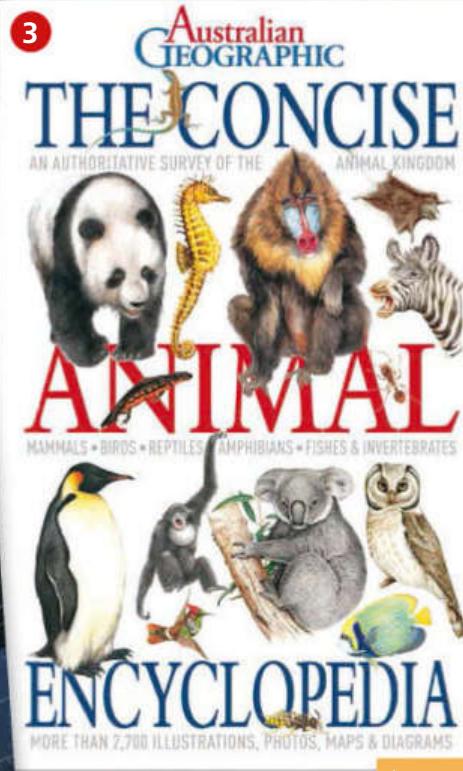
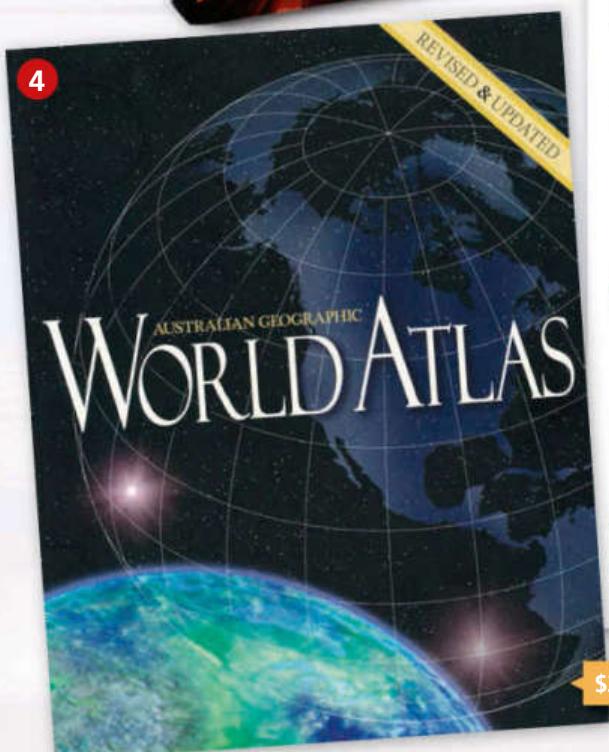
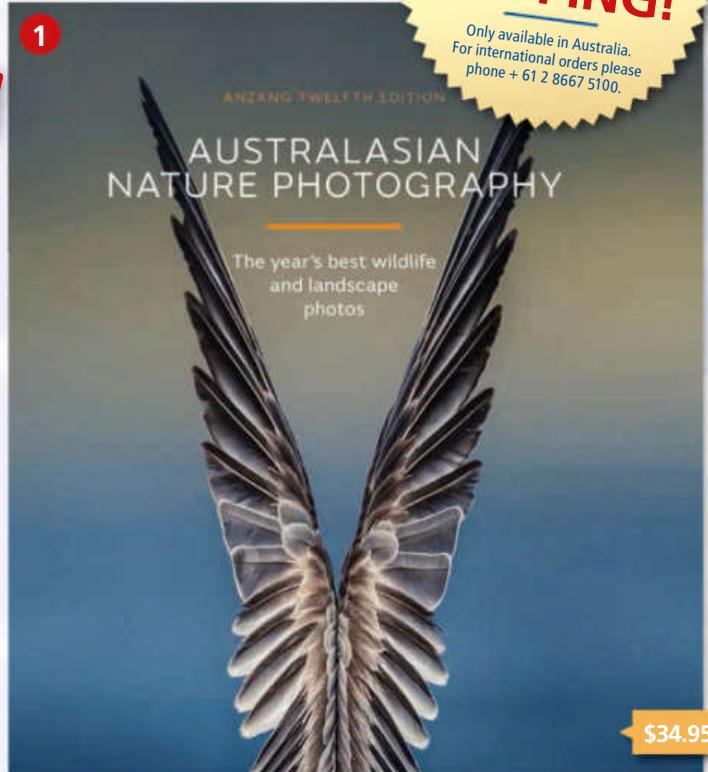
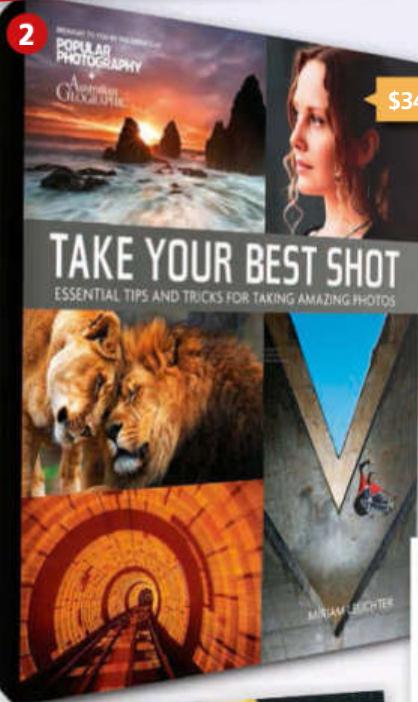
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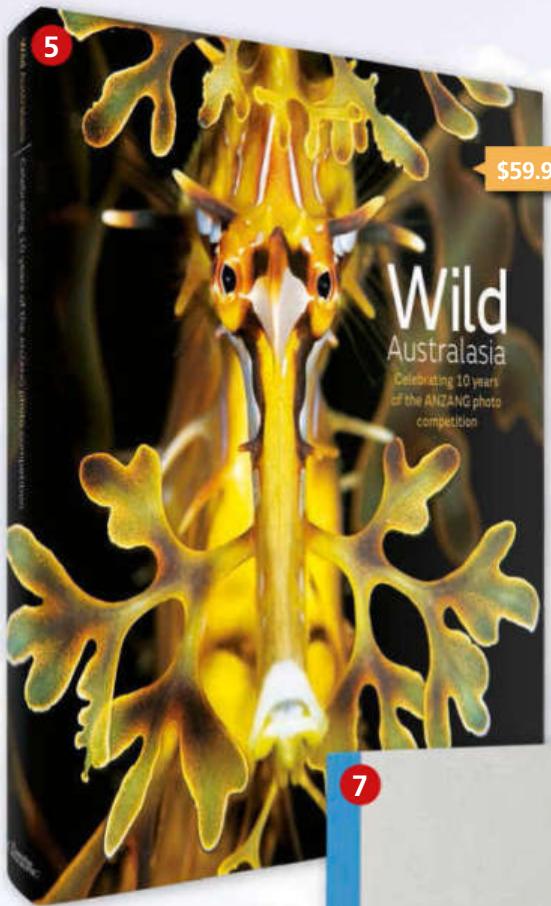
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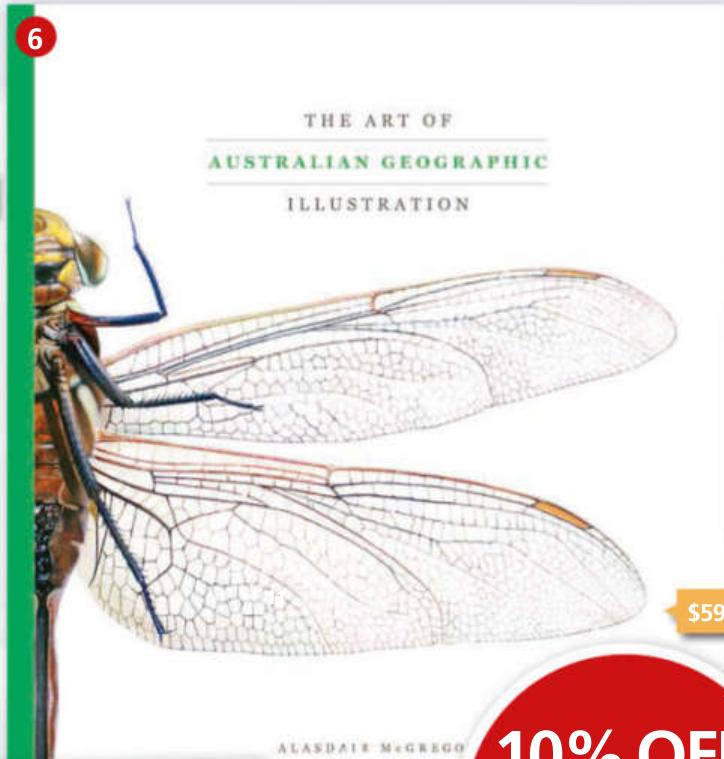
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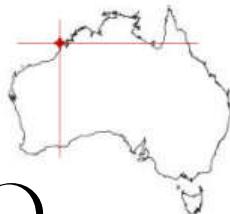
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CABLE BEACH POLO

For one weekend each year, the camels on Broome's famed Cable Beach make way for thundering teams of men on horseback, swinging long-handled mallets.

STORY AND PHOTOGRAPHY BY **CATHY FINCH**

IT SHOULD PROBABLY come as no surprise to find an international polo tournament underway on the beach at Broome. After all, this far-flung West Australian town has been a place for eclectic experiences ever since it was founded in the 1880s as a port for pearl lugger.

Broome was populated in those early days by a multicultural mix of Japanese, Malay, Filipinos, Europeans and local Aboriginals all hoping to make their fortunes from the trade in lustrous local pearls. More than a century later, Broome's vibrant mix of culture and promise remains strong, contributing to the town's exotic and unpredictable air.

The Cable Beach Polo was instigated in 2010 by Marilynne Paspaley – the daughter of Nicholas Paspaley, the founder of Paspaley Pearls, one of the world's leading producers of cultured pearls. Each year in May, famous polo players and their well-heeled followers make the trek to this remote location for two days of horseplay on the sand.

Cable – with its stunning 22.5km of white sand lapped by turquoise waves – certainly ranks among the world's most beautiful beaches, and this tourist drawcard is undoubtedly a major attraction.

The tournament is accompanied by a schedule of social events and community initiatives such as the Kimberley Challenge, during which Aboriginal stockmen get the chance to showcase their horsemanship skills by competing in the sport. In 2015 two young indigenous stockmen were offered scholarships to develop their skills in polo at a training camp in New Zealand – a once-in-a-lifetime opportunity to demonstrate Aboriginal horsemanship.

"This event has something for everyone, [from] the breathtaking spectacle of international and local polo players battling it out on the sand, to the barefoot fun and club atmosphere of our Kimberley Beach Polo Lounge," says Marilynne. "You check your shoes in on entry and collect them when you leave."

The tournament has also become a showcase for Broome's 'Kimberley Girl', a group of young Aboriginal women who model clothes for the event.

By the book. During the Cable Beach Polo games, each team consists of three players and each game is normally made up of four periods, known as chukkas.



Local talent. 'Kimberley Girl' models Katina Coffin, left, Shona Coffin and Marlukka Perdrisat soak up the sun.





Hooves plenty. Broome has long been famous for its stunning Cable Beach (below), the site for a weekend of international polo events (left) since 2010.



Seaside shenanigans. For many spectators and players alike, the Beach Polo is a cherished annual event. Jack Archibald, above, from NSW, readies himself for a match.



Victory lap. Winners of the Paspaley International Beach Polo Cup II Final, Paul Webb, left, Ross Ainsley and Sam Hopkinson, celebrate at dusk on Cable Beach.

"Broome isn't just all about Cable Beach and beautiful resorts," says Kira Fong, founder of Kimberley Girl. "The hidden heart of Broome really is its cultural side."

Kira is based at Goolarri Media Enterprises, which helps to develop Aboriginal communications in the Kimberley and also supports local musicians. Kimberley Girl began as a positive representation of Aboriginal women with the intent of instilling confidence in the local girls, she says.

"They were so beautiful but didn't seem to be proud of themselves. We now run five weeks of workshops over six communities within the Pilbara and Kimberley region, and cover everything from professional development and work-readiness, to how to be a success and overcome adversities."

Kira says she is proud to see her girls mingling at and modelling for the tournament: "If you look around you have Aboriginal stockmen learning to play polo and Aboriginal models walking among the crowd."

Marlikka Perdrisat, one of the models and a young Nyikina woman, is just as enthusiastic. "It's the mixed diversity of Broome that does it for me," she says. "I have travelled all around Australia and [nowhere else] has this unique mix of Asian, Aboriginal and European people... It's just a lovely place, and being involved in the polo has been so much fun."

BEARINGS: BROOME

Where: 2250km north of Perth

Population: 16,000, but can swell to 60,000 in tourist season

Postcode: 6725

Beach Polo: The only polo event of its kind in Australia, held annually in May (next event 21–22 May 2016). Free to watch from the sand or buy a ticket to the Cable Beach Polo VIP Marquee

More information:

www.cablebeachpolo.com.au

Out on the sand another important match is about to be fought and students from Broome Primary School are scurrying in with gloved hands and brushes to clear horse dung from the sand. "We're the official pooper-scoopers," schoolteacher Lorelle Giesen says. "We actually like to call ourselves 'dung-removal technicians'. It sounds so much more official."

Lorelle is overseeing 15 kids from years six and seven who are fundraising for school camp. "This weekend I've loved watching the kids interacting with the horses," she says.

But the highlight is about to come for these kids. Barry Southgate, a star from the television show *The X Factor*, is about to perform, and has asked the kids to join him on stage.

The music stops as the next polo match gets underway, and bikini-clad spectators wander down to line the safety barriers along the beach. Sam Hopkinson, one of New Zealand's top-ranked players, delights the crowd, along with champion players from Colombia, and homegrown talent such as Jack Archibald.

And as a giant red sun begins sinking below the horizon, the sounds of galloping horses mix with yells of encouragement from the swelling crowd.

"This town is truly unique," says local Sue Luketina. "Where else can you sit on the beach in barefoot elegance watching the glamour of a polo match? And the thing is, you can sit here in a marquee and have such a range of people around you. A cruise boat owner sits next to a jeweller, who might be sitting next to a judge or someone unemployed. I really like that." AG



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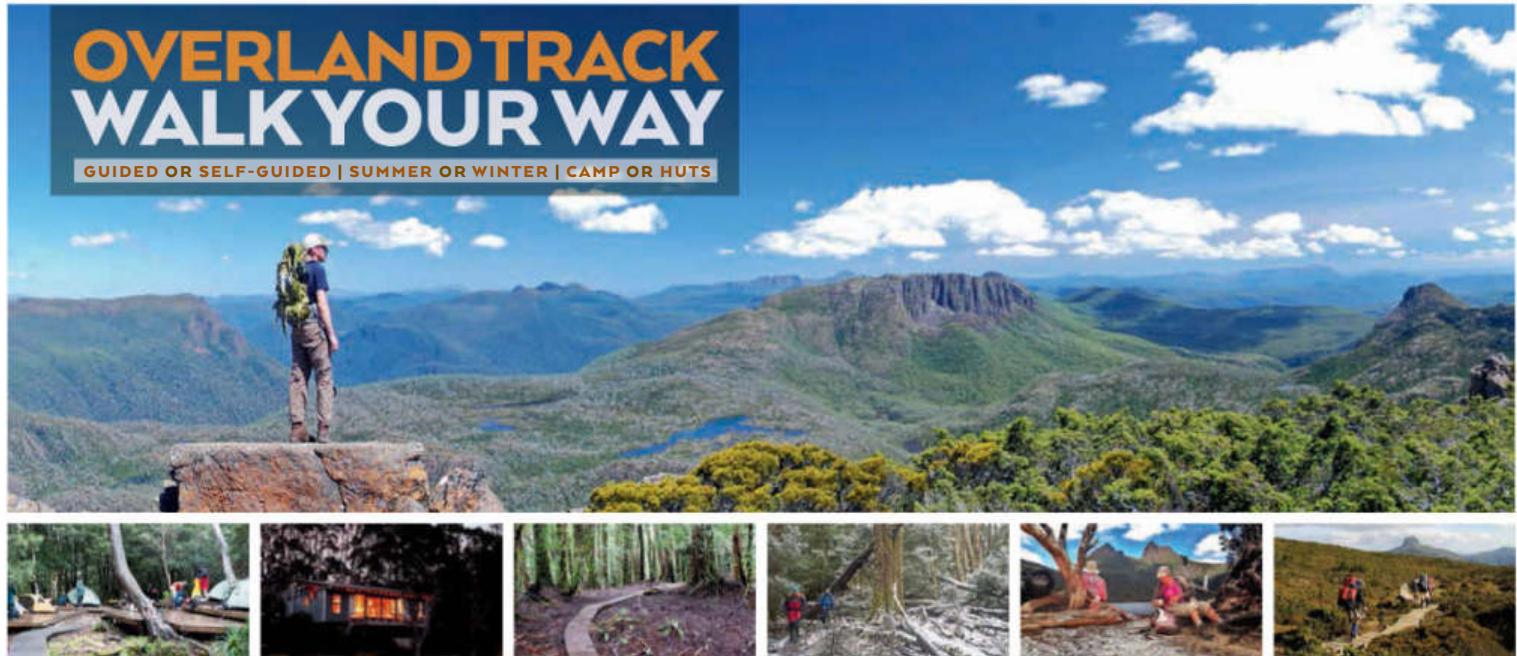
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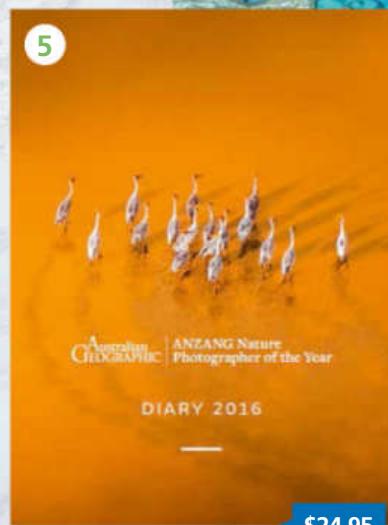
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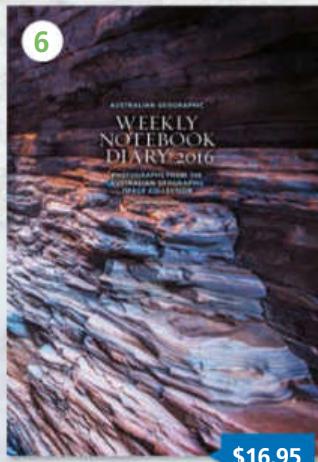
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1. ART CALENDAR 2016

This beautifully illustrated large-format calendar features 13 works of art by Australian wildlife artists. These photo-real impressions of our wildlife will look amazing on any wall - and make sure you keep every date!

CODE: AGR123

4. 2016 LANDSCAPE CALENDAR

Never miss a date again with this beautiful calendar! Featuring stunning images of Australian scenery, this calendar contains big, clear grids and lists all Australian school and public holidays.

CODE: LAND2016

2. 2016 WILDFLOWER CALENDAR

Never miss a date again with this beautiful calendar! Featuring stunning wildflower photography, this calendar contains big, clear grids, and lists all Australian school and public holidays.

CODE: FLOR2016

3. 2016 FAMILY ORGANISER

Get the whole household organised with our clever planning calendar! A column each for up to five family or household members makes sure that no one will miss a date.

CODE: AGR165

5. 2016 ANZANG DESK DIARY

Large-format, hard-cover, wire-bound desk diary with fifty-two beautiful images from the latest ANZANG competition entries. With a week-to-a-page layout this desk diary is certain to make sure you never miss a date!

CODE: AGR120

6. 2016 WEEKLY NOTEBOOK DIARY

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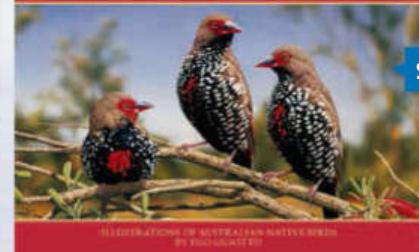


BY KEN DUNCAN

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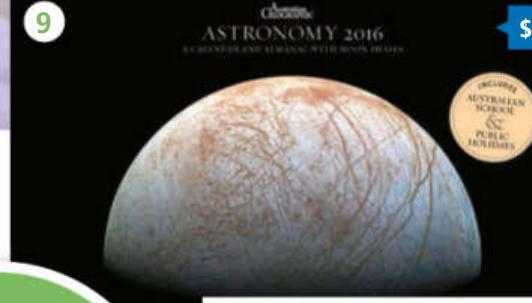
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ribbon marker to make it easier to find the week - it is sure to keep everything organised, all in the one place. Scattered throughout the diary are spectacular images from the Australian Geographic image collection.

CODE: AGR166

7. 2016 PANORAMA CALENDAR

These stunning wide-format panoramas by photographer Ken Duncan showcase the natural beauty of Australia.

CODE: PAN2016

8. BIRD DESK CALENDAR

With a clever freestanding design, this little calendar fits

neatly on your desk or sideboard. Featuring beautiful Australian bird illustrations, this stylish- yet compact - desk diary is certain to make sure you never miss a date!

CODE: AGR163

9. 2016 ASTRONOMY CALENDAR

Stargazers will love our 2015 Astronomy Calendar with its almanac of more than 200 astronomical events visible in Australia and moon phases for every night of the year.

CODE: AGR164

10. 2016 WILDLIFE CALENDAR

Never miss a date again with this

beautiful calendar! Featuring stunning photography of Australia's unique wildlife, this calendar contains big, clear grids, and lists all Australian school and public holidays.

CODE: WILD2016

11. PERPETUAL BIRTHDAY CALENDAR

Never miss a birthday or anniversary date again with this stunning perpetual calendar! With large clear grids dates, and filled with 12 spectacular images from the Australian Geographic image collection – this calendar makes it easy to record yearly events.

CODE: AGR132

11

Australian
GEOGRAPHIC
BIRTHDAY
CALENDAR



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PERPETUAL

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Attend the awards for your chance to win our raffle and take home an APT holiday for two to the Kimberley!
See page 3 for details.

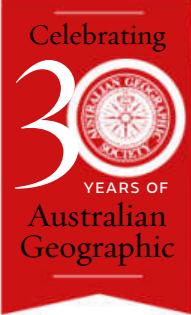


Night of nights. Guests enjoying the 2014 Gala Awards dinner. Right, from top: Catriona Rowntree, Bindi Irwin, Dick Smith with Greg Mortimer, and HRH Prince Harry.

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AG SOCIETY 2015 GALA AWARDS



Join us!

DATE: Wednesday,
28 October 2015

TIME: 6.30pm arrival for sit down at 7pm

LOCATION: Doltone House
Hyde Park, 181 Elizabeth
Street, Sydney NSW 2000

TICKET PRICE: \$190
AG MEMBERS' PRICE: \$165

You are cordially invited to the AG Society's annual get-together to honour the highest achievers in the fields of adventure and conservation, and, in the process, raise vital funds for AGS projects. It's always an inspiring night filled with thrilling stories, stirring speakers, and superb wine and food in an elegant setting. To book your ticket and for more information, visit: www.australiangeographic.com.au/awards2015



112

WOMBATS ARE GO
Conservation success for northern species.

113

KEEP IT QUOLL-ITY!
Donate to help this marsupial carnivore.

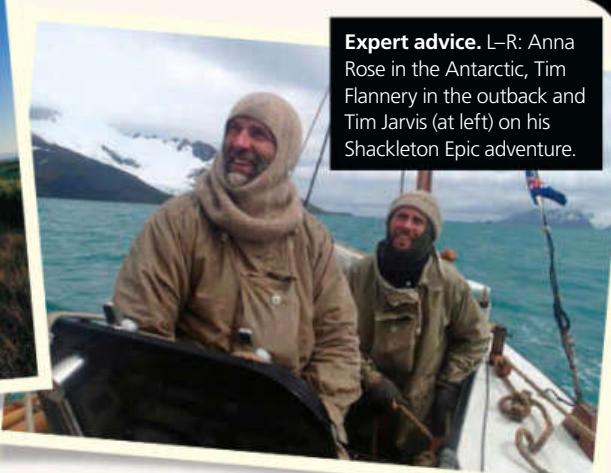
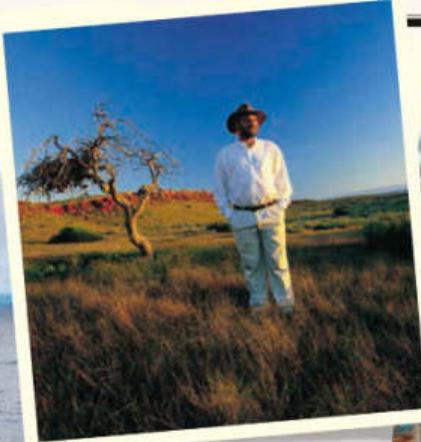
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UPCOMING EXPEDITIONS
Explore far and wide with the AGS.

YOUR SOCIETY



AUSTRALIAN GEOGRAPHIC SOCIETY NEWS & INITIATIVES



Expert advice. L-R: Anna Rose in the Antarctic, Tim Flannery in the outback and Tim Jarvis (at left) on his Shackleton Epic adventure.

World of knowledge

We are pleased to introduce our new AGS expert advisory panel.



AS THE NEWLY appointed chair of the Australian Geographic Society, I write my first letter to you with excitement and anticipation for the year ahead. On behalf of the AGS advisory committee and our members, I'd like to say a huge thanks to outgoing chair, Gregg Haythorpe, who has helped build the foundations of a bright future for the Society. Gregg remains part of the AG family and will be in touch whenever he's not out bush!

Over the next 12 months, the AGS will be returning to basics: dispersing funds to projects that align with our core values in the fields of adventure, science and conservation.

Each year the funds you help to raise by subscribing to this journal, donating to campaigns through the AG retail stores or buying one of our books are distributed through twice-yearly sponsorship rounds.

Applicants submit their grant proposals via our website, and our various subcommittees then decide where the funds are best placed. I'm pleased to announce several new appointments to these teams.

On our science and conservation committees we have the honour of being joined by two new expert advisers. One is last year's AGS Conservationist of the Year, Anna Rose, who is national manager of the WWF's Earth Hour Australia, as well as a successful author and the co-founder of the Australian Youth Climate Coalition. We are also delighted to welcome acclaimed scientist, explorer, conservationist and former Australian of the Year Professor Tim Flannery.

On our adventure committee we are excited to announce that the specialist advisors will be 2013 Adventurer of the Year and seasoned polar explorer Tim Jarvis, AM, and photographer and former AGS Spirit

of Adventure awardee Chris Bray.

As we head towards AUSTRALIAN GEOGRAPHIC's 30th birthday in January 2016, we would like to assure our valued members that the vital funds you help raise will be put to the best possible use under the expert guidance of our new advisers.

Thank you once again for your ongoing support and we look forward to seeing you at the Australian Geographic Society Awards night on 28 October (see opposite).

JO RUNCIMAN

Patron: Dick Smith Advisory Council: Ian Connellan, Chrissie Goldrick, Adrian Goss, Tim Jarvis, John Leece, Anna Rose, Todd Tai Chairperson: Jo Runciman AGS Administrator: Nicola Conti

AGS MAJOR SPONSORS





Back from the brink. The main population of northern hairy-nosed wombats is at Epping Forest NP in central QLD, where this mother and joey were recently snapped by a camera trap.



CONSERVATION SUCCESS

Hairy-nosed wombats slowly bouncing back

The northern hairy-nosed wombat has inched back from the precipice of extinction, giving AGS-supported researchers a chance to breathe after a decade of intense work.

NOTHING MOVES very fast for the northern hairy-nosed wombat. It's naturally slow to breed, move and adapt, so it should come as no surprise that the fight to save the species from extinction has been progressing at a measured pace. However, we're pleased to report that, after a decade of hard work, the species' population has almost doubled. This success is due largely to the work of Dr Alan Horsup and his team in the Queensland government's Threatened Species Unit.

In 2003 the total wild population of the northern hairy-nosed wombat numbered just 113 (see *Saving the northern hairy-nosed wombat*, AG 72). After we reported on the wombat's plight, an AGS campaign raised \$24,456 to help save the species. Today, the entire population is estimated to be about 220. It may still seem like a low

number, but "for a wombat this has happened relatively quickly", Alan says. The funds donated by members were divided among several programs to improve the species' wellbeing. This included setting remote cameras to monitor activity and a 2006 trapping-and-research program.

A call-out also resulted in the recruitment of volunteer caretakers, after the researchers stressed, in a 2008 report, that the local community could help make a major contribution to the recovery. The northern hairy-nosed wombat is extremely vulnerable to human impact, Alan says. "We've done this to them...it's our responsibility to turn it around."

Since 2003, Alan's team has become adept at matchmaking, and has successfully established a small second population of wombats to safeguard the species against disease

or a natural disaster wiping out the primary group, found at Epping Forest National Park in central Queensland. "It was all about trialling and testing," he explains. "We're now confident that we could get things right in a third, larger population."

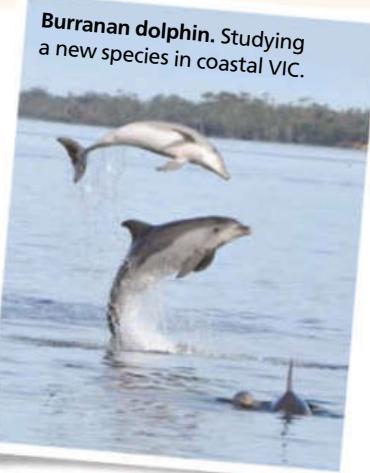
Alan estimates that in five years the total population could be 300–350 individuals, the peak capacity of the initial area reserved for these animals. "That means the pressure is on to find the third site," he says, "but it's a slow process – finding funds and doing paperwork."

Alan, however, is finally feeling a little more relaxed about the future of this rare and precious species.

"As long as we keep doing what we're doing, it'll be alright," he told AUSTRALIAN GEOGRAPHIC. "Hopefully in 10 years we can sit back and say, 'We've achieved this.'"



Wild kids. Lloyd Godson's open-air Nature School.



Burrunan dolphin. Studying a new species in coastal VIC.

Funding far and wide

Twice a year we give grants to support adventure and conservation nationwide. Here's the latest crop of recipients.

RECIPIENTS OF Society funds in 2015 include long-time AGS adventurer Lloyd Godson, who is aiming to provide opportunities for unstructured outdoor play through his Nature School pilot program in the bush of coastal New South Wales.

We are also funding the NSW Wildlife Information Rescue and Education Service (WIRES) to build a flight aviary for injured or orphaned birds of prey. And we're supporting filmmakers Edward Saltau and Daniel Hunter, who are getting behind the lens and on the trail of the cassowary, one of Australia's biggest birds.

Rebecca Wellard from the Centre for Marine Science and Technology at Curtin University in Western Australia is getting the funds she needs to study orcas in Bremer Bay, while Jack Tatler from the University of Adelaide is being supported to research dingo populations in remote northern South Australia.

Another natural-history project will help Dominic Lawler of Deakin University study newly discovered Burrunan dolphins at Port Phillip bay, Victoria. A smartphone app guide to the flora of south-western Australia, being created by John Charles Ryan at Edith Cowan University in Perth, WA, is another of the new projects,

and will be freely available to the public to download and use.

A series of creative, brave adventurers are also the recipients of AGS grants in this funding round. Kate Leeming will be the first to attempt to cross Antarctica on a bicycle – a 1850km journey, where she will negotiate virgin terrain and temperatures down to -40°C. Aussie pair Oliver Delprado and Che Gulus are attempting a 1000km-plus crossing of the European Alps, using a combination of paragliding and walking. Ian Vickers has received support from us in his epic unassisted crossing of the Simpson Desert, taking in 1100 sand dunes over more than 400km.

Following in the footsteps of Belinda Ritchie – our 2014 Young Adventurer of the Year (see AG 124) – are Alienor Le Gouvello and her three brumbies. She is completing a solo trek of the east coast's Bicentennial National Trail over a period of 8–10 months in 2015.

Last, but certainly not least, is AGS expert adviser Tim Jarvis's '25zero' project, which will see the environmentalist climb all the equatorial mountains that still support glaciers, to highlight the impact of climate change (see AG 127).

SOCIETY FUNDRAISER

Keep it quoll-ity!

Struggling quoll populations need urgent support to survive.



AT ONE TIME, most of Australia was home to at least one of our four species of quoll. In the past few hundred years, however, the little carnivores have been reduced to fragmented populations on the edges of the mainland and Tasmania. Northern and spotted-tailed quolls are today endangered, while the western quoll is listed as vulnerable. By donating, you'll be helping the Australian Wildlife Conservancy (AWC), which is training northern quolls to avoid eating toxic cane toads. You'll also be supporting the Foundation for Australia's Most Endangered species (FAME); this conservation group helped to re-establish mainland populations of eastern quoll, using animals from Tasmania, after the species became extinct across much of the continent in the 1960s (see AG 82). FAME is now reintroducing western quolls to the Flinders Ranges National Park, in South Australia.



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Here are some of the special offers available quote your membership number.



KIMBERLEY COAST EXPEDITION

WHEN: May and June 2016

SAVE: Partners fly free to the Kimberley

BOOKINGS: auroraexpeditions.com.au

or 1800 637 688

Discover a different outback on a cruise along Western Australia's Kimberley coast! Book an Aurora Expeditions 'Kimberley Coast Package' before 31 October 2015 and your partner will fly free from any Australian capital city. Package includes Kimberley cruise, return airfares, two nights accommodation, tours in Broome and Darwin, and all transfers.



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WHO: Heritage Expeditions

SAVE: 10–25% on South Pacific and subantarctic expedition cruises this summer

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WHERE: Jamala Wildlife Lodge, Canberra

WHEN: Between 15 September 2015 and 31 March 2016

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WEBSITE: jamalawildlifelodge.com.au

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Upcoming expeditions

Head off with a group of like-minded travellers on one of these unforgettable experiences and you'll also be contributing vital funds to the AGS.



SOUTH-EAST ASIA ADVENTURE

WHO: APT Small Ship Expedition Cruise
COST: From \$14,440pp **WHEN:** June 2016;
 17 days **BOOKINGS:** 1300 278 278 or
www.aptouring.com.au/SoutheastAsia

A once-in-a-lifetime adventure awaits on this expedition cruise from Manila to Darwin. Explore the Philippines, Indonesia and Malaysian Borneo. Discover the unique ecosystem of Puerto Princesa, encounter Borneo orangutans and be intrigued by a fascinating overnight stay in Torajaland. On board, enjoy an all-inclusive lifestyle and the services of an expert expedition team.



HERON ISLAND RESORT

WHO: Heron Island Resort
COST: From \$2060pp
BOOKINGS: 1300 731 198 or go to
www.heronisland.com

Join the AG Society expedition to Heron Island in November 2015 and witness the spectacle of nesting turtles. Heron Island is famous for its spectacular coral reef and you'll learn about the crucial conservation efforts being made to protect green and loggerhead turtles, and assist with monitoring the health of the surrounding reef. With plenty of tours and guided bird walks, nature is at your fingertips.



MOUNTED NOMADS OF WESTERN MONGOLIA WITH TIM COPE

WHO: World Expeditions
COST: \$6470pp
BOOKINGS: 1300 720 000 or
www.worldexpeditions.com

Discover the ancient nomadic cultures of western Mongolia on this journey with Tim Cope. Travel from remote desert landscapes to glacier-capped peaks and one of the most isolated, yet vibrant, towns in Central Asia. Highlights include a three-day horse trek with nomads, and attendance at the annual eagle festival – the largest gathering of its kind.

AUSTRALIAN GEOGRAPHIC SOCIETY SCIENTIFIC EXPEDITION 2016

GOBI DESERT FOSSIL DIG

Join us in remote Mongolia to hunt for dinosaurs!



OME OF the world's most spectacular fossils come from the Gobi, but few people get to go there with professional palaeontologists to hunt for them. Join the AG Society on this special scientific expedition, run in collaboration with the Mongolian Academy of Sciences (MAS) and Odyssey Travel. Your hosts include John Pickrell, editor of AUSTRALIAN GEOGRAPHIC and dinosaur enthusiast; and Dr Tsogtbaatar Khishigjav, renowned dinosaur hunter and head of the Mongolian Palaeontology Centre. We will take 10–15 volunteers into the heart of the Gobi, where rocks are exposed from the early Cretaceous, a key period of dinosaur evolution. We'll travel in 4WDs to a series of sites to discover and excavate fossils. Evenings will be spent enjoying meals cooked by the field chef around the ger (yurt) at the centre of camp. Prior to eight nights camping in the desert, the expedition begins in Ulaanbaatar, where we'll visit museums and the Gandan Monastery. Find more exciting details in upcoming issues of AG.



DATES: 7–22 September 2016
COST: From \$11,995pp,
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 important work of the
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DISCOVER THE PUERTO PRINCESA SUBTERRANEAN RIVER

With APT Expedition Leader, Jane Wilson



Water wearing away limestone has created a spectacular subterranean river on the Philippine island of Palawan. APT expedition leader Jane Wilson explains.

"The Puerto Princesa subterranean river has been eroded in the porous limestone geology over the years.

"The river rises in the mountains like an above-ground river then flows along an 8-kilometre underground cave and out to sea.

"We take guests about one kilometre into the cave in outrigger canoes paddled by local guides.

"In the cave there are insects that can survive without the daylight. And we also use torchlight to show our guests the resident bats and small birds called swiftlets.

"Our guests find themselves floating in this unbelievably spectacular cave with stalactites hanging down. It really is something incredible.

"APT is able to take guests to destinations like this because of our small ship style of cruising.

"We don't need any extra infrastructure. The ship is like a floating wilderness lodge.

"So we can visit remote islands and communities. We're very much off the beaten tourism track."



THE SOCIETY SETS SAIL

UNFORGETTABLE SMALL SHIP ADVENTURE SOUTHEAST ASIA

In an exciting first, APT joins with the Australian Geographic Society to create an East Indies voyage especially for members.

What do you picture when you think of the East Indies? Unexplored archipelagos? Crystal waters lapping deserted beaches? Indigenous cultures and time-honoured traditions? Or exotic wildlife above and below the water?

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This graceful vessel restores gentility to the art of travel. Its understated restaurants and atmospheric staterooms strike an effortless balance between modern comfort and timeless charm.



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Come face-to-face with a Komodo dragon at the Komodo National Park.



APT



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Plus receive airfare credit of up to \$500* per couple**



APT is a proud supporter of the Society and delighted to host its expedition.

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\$3,000 pp is due by 31 October 2015. Final payment is due 100 days prior to departure. AIRFARE CREDIT OF UP TO \$500* PER COUPLE: Based on two people booking a Superior Suite (NOBCMD17) twin share. It cannot be redeemed for cash and is not transferable. Enquire for Solo Traveller offer. *Complimentary beverages are only served while onboard your cruise and do not include French Champagne, premium spirits or selected wines. Australian Pacific Touring Pty Ltd ABN 44 004 684 619, ATAS accreditation #A10825, APT2860.

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and phone number, to editorial@ausgeo.com.au or to Australian
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NSW 2001. Letters will
be edited for length and clarity.

Edited by Lauren Smith

YOUR AG

FEEDBACK, READER PHOTOS, BOOK REVIEWS & ASK AN EXPERT

YOUR PHOTOS

Shining through
by Silvia Li

A must-visit spot for photographers is Cathedral Rocks near Kiama, NSW. I was disappointed with the lack of water action, but the low tide exposed green algae-covered rocks, which added depth to the image.

Submit your photographs
for possible publication:
www.australian-geographic.com.au/yourpics



FLYING FRIENDS

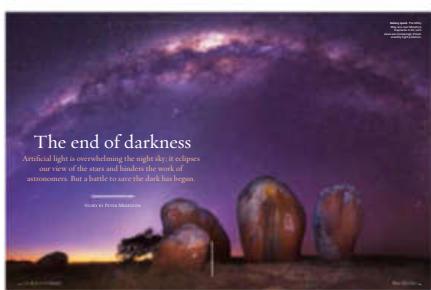
I enjoyed your picture of flying fish in AG 127 (page 67). As I sailed in big seas in the Gulf of Papua one morning after a storm, I was accompanied for more than an hour by a school of flying fish. Far from being disturbed by the boat, they appeared to be using the wind-flow around the vessel to assist them to fly in what a glider pilot would call wave-lift. They were not just gliding along the surface, either; they were in seemingly controlled



flight, at about 1m above the surface of the water, with each fish flying for long periods before briefly dipping back in. It was fascinating to watch! You don't need an engine or flapping wings to achieve flight – I've flown

for a few hours in gliders and I used to enjoy watching the hang-gliders flying in wave-lift off the cliffs of Newcastle. It's probably the most enjoyable way to fly.

PETER SCHAPER, BIGGENDEN, QLD



LIGHT POLLUTION

We have been subscribers since AG 1 and always enjoy the magazine. In AG 126 there are two articles that are intimately connected – *Take a stand for the poles* by Tim Jarvis and *The end of darkness* by Peter Meredith.

Most electricity is produced by burning fossil fuel. Reducing electricity consumption would reduce light pollution and also the rate at which we are filling the atmosphere with greenhouse gases, which are warming the planet and destroying the polar regions.

Pictures taken from space of Earth at night show how much light is being wasted. Most lights (and electronic equipment, such as computers) in cities and towns do not need to be on all night and a huge amount of electricity – and pollution – could be saved by simply turning them off.

We wonder when humans are going to realise that the amount of fossil fuel is finite and, therefore, not going to last forever.

VALERIE & DOUGLAS BROOKER, SYDNEY, NSW



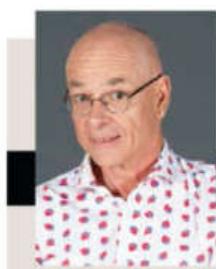
ECHIDNA SPOTTED

My family and I live in the Kimberley and were recently on the Gibb River Road, at Windjana

Gorge, when we spotted this freshwater crocodile eating what looked like an echidna. In light of your article *Lost and found* (AG 122) on the western long-beaked echidna, we thought this picture, above, may be of interest.

AARON MCSORLEY, THE KIMBERLEY, WA

Continued page 122



NEED TO KNOW

WITH **DR KARL KRUSZELNICKI**

POLYMER BANKNOTES

EVOLUTION happens not just in the field of biology, but also in the field of 'Money-ology', and Australia played a major role in the latest evolutionary step of the currencies.

Early on, durable metals such as copper, silver or gold were used as money. In early China, the units of exchange were copper coins – but a bunch of coins was heavy. So a pragmatic merchant might leave his coins with a trusted person, who would give him a slip of paper denoting the value of the coins. By the seventh century, this practice had evolved into actual paper money – but usable only in local areas, and with a limited lifespan. By 1274 AD, the Southern Song government made paper money the national currency – a world first. Marco Polo returned from Kublai Khan's court and described with astonishment how notes of paper money were treated as if "they were coins of pure gold". It took until 1666 for Swedish bank Stockholms Banco to issue the first paper money in Europe.

'Paper' in banknote terms usually means cotton paper, often mixed with linen or other textile fibres. But over the years, banknotes have been made from silk, leather, sealskin, wood, and even playing cards. Paper banknotes usually last only three years before they have deteriorated too much to be usable. Furthermore, with the advent of scanning and colour printing, the risk of counterfeiting has increased.

So fragility and counterfeiting kick-started the shift to polymer banknotes – made from biaxially oriented polypropylene (BOPP).



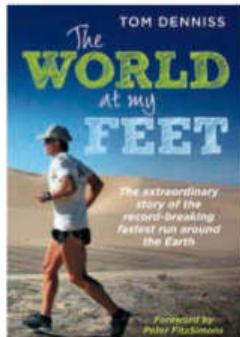
On the money. The first widely used polymer banknote was Australia's commemorative \$10 note, introduced in 1988.

They are tougher – more resistant to wear and tear, and can even survive a trip through your washing machine. Thanks to the polymer, and various security features (security threads, watermarks, hologram, etc.), they are very difficult to counterfeit.

The first prototype 'plastic' banknotes were introduced in the early 1980s. However, they weren't perfect – the plastic was fragile, and the ink smudged. It was Australia, in 1988, that issued the first widely used successful polymer banknote – the commemorative \$10 banknote. In 1996 we became the first country to have the complete set of circulating polymer banknotes in every denomination, from \$5 to \$100.

DR KARL is a prolific broadcaster, author and University of Sydney physicist. His new book, *House of Karls*, is published by Pan Macmillan. Follow him on Twitter at: twitter.com/DoctorKarl

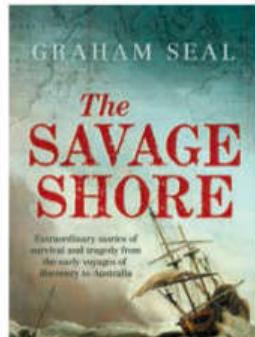
AG'S BOOKSHELF



The World at my Feet: The Extraordinary Story of the Record-Breaking Fastest Run Around the Earth

TOM DENNIS,
ALLEN & UNWIN, \$32.99

This is Australian runner Tom Denniss's firsthand account of his remarkable journey to become the fastest person to circumnavigate the world on foot. During his 622-day, 26,232km-long effort, Denniss tackled at least the equivalent of a marathon every day, and, along the way, encountered some hairy challenges as well as an immense variety of social, culinary and natural diversity. In the end he broke the world record by 40 days.



The Savage Shore

GRAHAM SEAL,
ALLEN & UNWIN, \$32.99

The settlement of Australia by the British was a turning point in this continent's history, but author Graham Seal argues that the Dutch played a far greater role in the discovery of Australia by Europeans than they are given credit for. Graham, a professor of folklore at Curtin University in Perth, also delivers insights into the maritime voyages of the Dutch, Spanish, Portuguese, French and Macassans, and tells colourful stories about the spirit of navigation and exploration, and of courageous and miserable adventures at sea.



Bees: An Up-Close Look at Pollinators Around the World

SAM DROEGE AND
LAURENCE PACKER,
VOYAGEUR PRESS, \$25

The delicate wings, hairy bodies and huge eyes of more than 100 bee species are given to us in a gloriously detailed macro-photography treatment. Biologists Sam Droege and Laurence Packer urge us to pay closer attention to these small pollinators that so often fly under the radar. The book has a global focus, but looks at a dozen important Australian families and includes detailed information about their behaviour, appearance and distribution.

Competition

We're giving away 10 copies of the BBC's *Wild Kingdom: The Great British Year*, thanks to Roadshow Entertainment. Follow the wildlife of the British Isles through changes in season and learn about the evolution of its plants and animals. New filming techniques expose forces of nature – both big and small – while time-lapse photography captures subtle landscape changes otherwise unseen.



You can enter by downloading the free **viewa** app and using your smartphone or tablet to scan this page, or by visiting: www.australiageographic.com.au/issue128



CANBERRA

FLORIADE

Go by day to see millions of tulips and annuals blooming beside Lake Burley Griffin, or by night for cutting-edge light installations. This iconic celebration of spring is in its 27th year.



When and where:

12 September–11 October, Commonwealth Park, ACT

More info: www.floriadeaustralia.com

DARWIN

DARWIN INTERNATIONAL FILM FESTIVAL

Enjoy the quintessential Top End experience, relaxing in a deckchair while watching alternative films. Outside of the films, enjoy workshops, talks and pop-up screenings.

When and where:

16–23 September, Darwin, NT

More info: www.darwinfilmfest.com.au

NATIONWIDE

BIRDLIFE AUSTRALIA'S AUSSIE BACKYARD BIRD COUNT

Take 20 minutes to record the bird species in your backyard, favourite park or 'green space' with the Aussie Bird Count app or website, and join thousands of other keen twitchers taking part across the nation.

When and where:

19–25 October, backyards around Australia

More info: www.aussiebirdcount.org.au

MELBOURNE

SOUTH-EAST ASIA FESTIVAL

Embrace Australia's multiculturalism with food, activities, music, cultural developments and more from 10 South-East Asian nations, including: Malaysia, Singapore, Myanmar, Thailand, Vietnam, Laos, Cambodia and Indonesia.

When and where:

3–4 October, Argyle Square, Carlton, VIC

More info: www.onlymelbourne.com.au

YOUR PHOTOS

**Flight of fancy
sacred kingfisher**
by Brodie James

This pair of juvenile sacred kingfishers in Queensland had only just left the nest a few hours before landing here. Both birds could only fly very slowly and would tire quickly at the time the photograph was taken.



© BRODIE JAMES

ANTARCTIC CRASH

I recently subscribed to AUSTRALIAN GEOGRAPHIC after reading old issues loaned to me. I have particularly appreciated your stories on the Antarctic and Macquarie Island, as I wintered at Davis in 1971 as a medical officer, and then went on to winter at Macquarie in 1972 (I was one of few Australians to do consecutive winters without returning to Australia). After retirement, in 2012 I joined a group run by adventure travel company White Desert, with the hope of getting to the South Pole via Russia's Novolazarevskaya (Novo) Station Airport, located on the Antarctic

mainland, directly south of Cape Town.

Weather conditions ruled out flights to the Pole in the DC-3s in which we were to travel, so a consolation flight to Holtanna Peak, south-west of the airport, was organised. After a magnificent day with perfect weather and amazing scenery, our DC-3 taxied to return to Novo base. Unfortunately, take-off did not go as planned – apparently, in part, because the chosen path was slightly uphill. With a lot of noise and rumbling, but no sensation of flight, I tightened my seatbelt. The aircraft hit some raised ice and was flung into the air without sufficient speed to maintain flight. The nose hit

first and then skewed around, with the impact leaving the nose bashed in and the landing gear/skis and propellers wiped off. There were only minor injuries. Six Iridium satellite phones were on hand to relay the news back to base. A companion DC-3 was flown across, and, after a delay for cloudy skies, we flew back to Novo. I thought your readers might be interested to see a picture (below left).

DR ROBBIN WATERHOUSE, TOWNSVILLE, QLD

POSTSCRIPT

In *Trekking the tropics* (AG 125), a photograph of Margaret and Arthur Thorsborne was wrongly captioned as being taken in 1992. The image was captured in 1990.

In *Ask An Expert* (AG 126), the image of an erupting volcano was incorrectly labelled as Big Ben, a volcano on Heard Island. The image is of Mt Etna, on the east coast of Sicily.

In *Dreaming of an island sea* (AG 126), the Dig Tree is incorrectly noted as being located at Thargominda. The Dig Tree is east of Innamincka near Nappa Merrie station in Queensland.



ASK AN EXPERT

GOT A
QUESTION FOR
AN EXPERT?

Email it to
editorial@ausgeo.com.au



Q Do wingsuit flyers and BASE-jumpers get tired arms from holding them out with enough force to keep the wings of their suits in place?

JOHN THWAITE, VIA EMAIL

A PAUL TOZER,
CAMERAMAN AND WINGSUIT FLYER, WHO ACCOMPANIED HEATHER SWAN
AND GLENN SINGLEMAN ACROSS THE GRAND CANYON (AG 127), SAYS:

We do a fair bit of specific stamina and strength training to fly – mainly back, arms, and, of course, shoulders. Having said that, however, the suits don't require a muscled flyer; they inflate via small inlet holes, creating a semi-rigid soft wing. They feel a little like a half-deflated air mattress. The speed of our flight keeps wind flowing into the suits, which keeps them inflated while we are in freefall. This is what allows us to fly for so long. On a training jump in California, we flew for more than six minutes before opening our chutes – that flight made the old shoulders burn a bit.

Q Why do kangaroos have such long eyelashes?
NATALIE SMART, PERTH, WA

A GUILLERMO J. AMADOR,
AT THE WOODRUFF SCHOOL OF MECHANICAL ENGINEERING
AT THE GEORGIA INSTITUTE OF TECHNOLOGY, SAYS:

Kangaroo eyelashes are not particularly long. They are about the same relative length as our own, at about one-third the width of the eye. But most people only have one row of eyelashes. However – similar to Elizabeth Taylor – kangaroos possess several rows, which make them appear fuller and more noticeable. By having a dense array of eyelashes, kangaroos, as well as other desert-dwelling animals, protect their eyes from arid and dusty environments. Making eyelashes denser protects eyes much better than making them longer. Scientists have found that eyelashes that are too long will funnel more air and dust into the eye.



Talkb@ck



You had lots to say on social media about the successful eastern quoll breeding program operating in the Blue Mountains, NSW.

They have been spotted in the Otways and are breeding at Serendip Sanctuary in Victoria. Go quolls.

TERRI COLLIVER

Wild dog and feral cat numbers will have to be controlled first if the quoll is to survive.

MAUREEN DONNELLY

Saw them a lot when we lived in Tassie – have never seen one up here on the mainland.

KARLENE BEAHAN

Mate, they are bloody hard to find in Tassie. I tried for two weeks! Devils too.

BRANDON PIKE

Lovely photo. They are supposed to be plentiful in Tasmania, but I haven't seen them in the area that I go to on the east coast for a long time. Once they were so plentiful they were living under the shack.

MARGARET GODFREY

Love these fascinating creatures!

TERRY TAYLOR OSBORNE



GET INVOLVED IN THE CONVERSATION
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INTO THE NIGHT

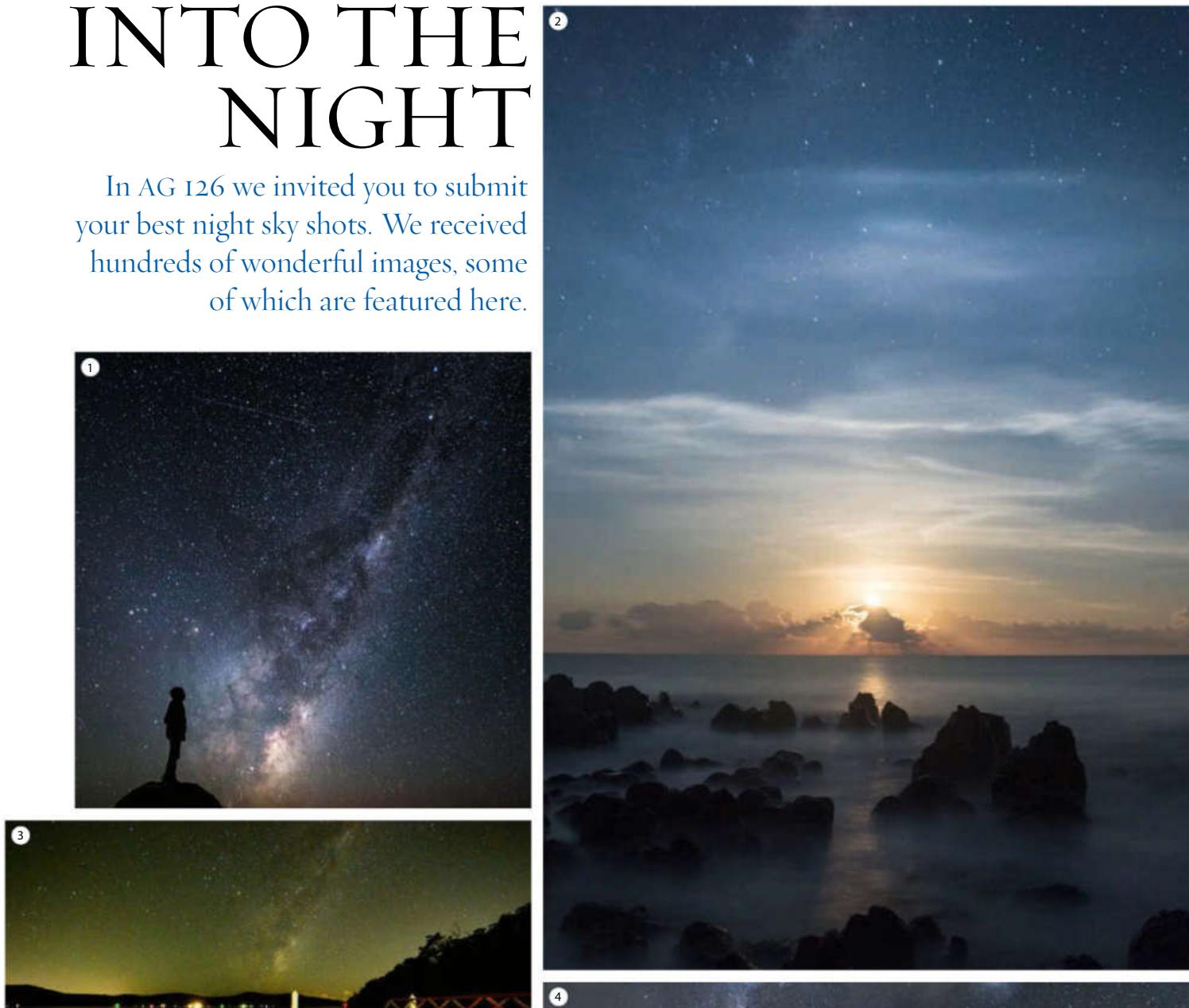
In AG 126 we invited you to submit your best night sky shots. We received hundreds of wonderful images, some of which are featured here.



1



3



2



4

1 Tom Jessett, WA
The skies above Cascade, WA, are so dark. On a clear night the Milky Way is mesmerising! I took this photo of myself gazing at the night sky using a remote timer. I'm standing atop a hay bale in one of our paddocks.

2 Ryan North, NSW
A surreal moonrise over the south coast of NSW. Cold wind and spray from the crashing waves ceased for a moment as the Moon's rays edged above the horizon.

3 Matt Barros, NSW
The night sky over the Hawkesbury River, NSW.

4 James Stone, TAS
Aurora behind gum trees, TAS.



6 Andrea Deegan, WA

The aurora australis seen from Albany, WA. It was quite exciting to view this at such a high latitude, and to have the weather cooperate at the same time!



6

5 Lachlan Manley, VIC

This was taken in Woongoolba, about 45 minutes south of Brisbane. It was clear at 9pm heading down there, but then some clouds rolled in to spoil the party! I had given up hope at this stage and had packed all my gear into my car, when I turned around and saw a break in the clouds. I quickly grabbed everything out again and snapped this photo.

WANT TO SEE MORE?

Find a much wider selection of your pictures online at www.australiangeographic.com.au/issue128



7



8



9 **Matthew Post, QLD**

The Milky Way rises over Gympie, QLD.

10 **Martin Au, VIC**

The Koo Wee Rup Lookout in Gippsland, VIC, was an excellent foreground addition when I shot this on a clear autumn night.

11 **Luke Tscharke, NSW**

The Milky Way – as seen from the Warrumbungle National Park, NSW.

12 **Dominic Ruefenacht, NSW**

This is the Milky Way over a nice campfire with friends in Penrose State Forest, in the NSW Southern Highlands. The sky was very clear, and I had to leave this spot around the campfire to get some photos.

13 **Arwen Dyer, TAS**

The southern sky over the Tarkine coast, TAS, 2014.

11



12



SHOOT FOR THE STARS

There are several factors to consider when photographing the night sky, says photographer Luke Tscharke, whose image of Mt Kosciuszko was featured on our May–June cover.



Location: Find an area with minimal light pollution, generally far from a big city.

Timing: The Milky Way is at its brightest around the time of the new Moon, during the middle of the year. Try an app or program such as Stellarium or Photopills to plan your shoot according to the position of the Milky Way on a particular day.

Weather: A clear night is best because there will be no clouds to obscure the stars.

Stability: Because the shutter of the camera will be open for a long time during the exposure, use a sturdy tripod and a shutter remote to avoid camera movement. The self-timer works too if you don't own a shutter remote.

Lens: Wide-angle lenses are generally best because they allow for longer exposure times before star trailing can be seen. They also fit more of the sky in the frame.

Camera: Use manual mode to control shutter speeds and aperture.

Exposure time: If the shutter is open too long the stars start to become blurry due to the Earth's movement. Begin with an exposure time of 30 seconds and reduce that if required until you get the best results.

ISO: Choose the maximum ISO value offering images with an acceptable level of noise. This is generally in the range of ISO 1600–3200.

Aperture: Choose the widest possible aperture (lowest F-stop value) to allow as much light to enter the camera as possible. This is generally between F/2.8 and F/4, depending on the lens.

Focus: Focusing can be difficult in the dark; essentially the focus should be set at infinity. This can be done by selecting 'infinity' on the focus scale of the lens, or sometimes focusing on the Moon or a bright object far in the distance. Trial and error may be required to get it right; don't forget to review your images after they are captured to confirm they are in focus.



10

13





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Nature-lover

SPRIGS OF HOPE

22

AWARD-WINNING natural history artist Heidi Willis (above) has an eye for detail, which is evident in this illustration of black cockatoos. Heidi created the paintings for our Nature Watch on Australian wattles, and says that gathering reference material and doing research are the first steps before she begins any job. "It is a time-consuming element...that is often overlooked when considering the final product," she says. "But this is an essential stage of observation, familiarisation and education." It can take many days to work and re-work even the smallest illustrations, and the wattles commission took Heidi weeks to complete. She uses all points of reference that she's able to source, but prefers live specimens and photographs. Specialising in illustrations of plants and birds, Heidi finds Australia's natural beauty to be a never-ending source of inspiration. "Its rich tapestries of colour and texture, of pure light and endless intricate worlds to discover, fill me with enthusiasm and the constant, overwhelming urge to explore it further."

HEIDI WILLIS: ANTHONY CREAM

The life aquatic

A NATION OF NEW BEGINNINGS

94

WITH THE INTENT to capture footage of the best diving sites in Timor-Leste, Dean Miller (below, at left) and filmmaker Clark Carter ventured to Atauro Island, 27km north of Dili. "Here we were filming under water, along a rock ledge that dropped down 160m," says Clark, part of the team behind our new travel documentary (and feature story) on the tropical nation. "A little further out, it drops down much deeper, so I had my fingers crossed that we'd see some creatures of the deep. We didn't run into any large mammals, but we did see hundreds of fishes and corals." The team used GoPro cameras under water, and on land their kit comprised a mix of gear, including a Canon C300 and a drone for aerial shots. "One of the biggest challenges of filming under water is lack of sound and not having as much stability or control," Clark says. But the fact that the water was warm enough for them to go diving in board shorts made up for any difficulties.





A hard day's yakka

PHOTOGRAPH BY DEAN SAFFRON AG 97, JAN–MAR 2010, OUT TAKE

IN APRIL 2009, PHOTOGRAPHER Dean Saffron spent a few weeks in the middle of the Northern Territory, capturing life for AUSTRALIAN GEOGRAPHIC on far-flung Brunette Downs. At 12,212sq.km, it is one of Australia's largest cattle stations and bigger than some countries. Dean had not long ditched the security of a commercial studio for a broader professional experience, and had been working for aid agencies in overseas trouble spots before we tracked him down in Mount Isa, Queensland. He was in search of the "real Aussie outback" and certainly found it when we sent him a further 430km north-west, across the border onto Brunette. He discovered a vibrant, isolated community of more than 50 people, most of whom were young, single and male – such as stockmen William Luff and Chris Kane, seen here wrangling one of the station's 72,000 head of cattle. Each working day began just before 4am, with the cook cranking out a hot breakfast. When this shot was taken – just before lunch – the sun was over the yardarm and most people had already put in an eight-hour day. They'd tumble exhausted into bed another eight hours later.



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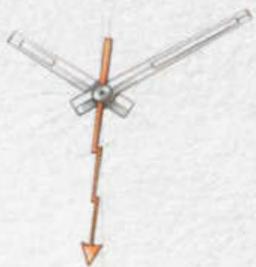
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MAIN IMAGE: Ta'er Monastery | Peter Walton

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Lightning bolt seconds hand

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