CALEYI

Australian Plants SOCIETY NSW

NORTHERN BEACHES GROUP

austplants.com.au/northern-beaches

November/December 2018

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COMING EVENTS

Saturday December 8, 2018 at Stony Range Regional Botanic Garden, Dee Why.
12 noon for 12.30 pm APS Northern Beaches Christmas lunch.
Barbecue chickens will be provided. Please bring a salad or dessert. An email will be circulated to assess contributions and avoid double ups. Don't forget to also bring a hat, insect repellent and something to drink. You may also wish to bring your own cutlery, plates, glasses etc.

As usual there will be a Kris Kringle. If you wish to participate please bring a wrapped gift to maximum value of $10.

From the Editor
I wish you all a wonderful festive season and thankyou for all the great photographs, reports, and other stories you have contributed to Caleyi. Jane march@ozemail.com.au

THE KATANDRA WALK –Sunday 21st October 2018

Penny Hunstead

Despite predictions of rain, seven members of our group turned up for the walk at Katandra Bushland Sanctuary. We made our walk in overcast, but, thankfully, fine weather.

Katandra, a Crown Reserve is managed and maintained by volunteers. It is open to the public on Sundays, July to October. David Seymour, the chairman of the volunteers committee, welcomed us at the bush hut information centre and start of the walk.

The entire walk is along a narrow track , which is well-graded and has mostly leaf litter underfoot. It extends from a ridgetop, down to a rainforest gully .. There had been a recent control burn in the area around the bush hut, to protect it from possible summer fires. There was little regrowth, even of ferns or epicormic growth on the eucalypts.

The first plant community encountered, is Hawkesbury sandstone heath. In bloom were *Boronia mollis, Platylobium formosum* and *Mitrasacme polymorpha.*

The heath is followed by a dense *Casuarina torulosa* forest. Casuarina mulch inhibits the growth of many species, but *Hakea sericea, Banksia ericifolia , Lomandra longifolia* and *Xanthorrhoea australis* were in bloom, in this Casuarina forest.

Below the Casuarinas, aspect and soil type favoured a Eucalyptus and Syncarpia forest. Species flowering here, were *Glycine clandestine, Prostanthera denticulata, Patersonia glabrata, Hibbertia linearis, Dianella*

caerulea, Rulingia dasyphylla and *Platylobium formosum*. In this area was a beautiful big cave with small stalactites and stalagmites, coloured red-brown from the iron in the surrounding rock.

The final plant community was rainforest. The dominant trees here were *Ficus rubiginosa, Glochidion ferdinandi, Ceratopetalum apetalum, Synoum glandulosum* and *Livistona australis*. Recent rains had fed the creek and favoured the ferns – *Todea Barbara, Sticheras flabellatus, Cyathea australis, Doodia aspera* and *Culcita dubia*. In the damp ground, *Gahnia clarkei.*

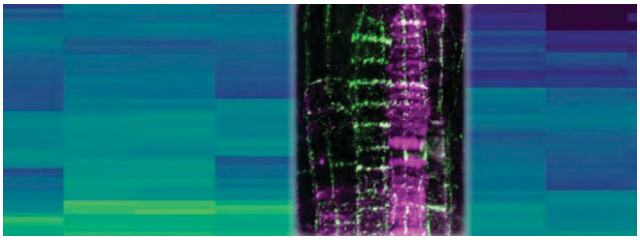
This 2 kilometre walk is an absolute delight ! Most of the area dominated by beautiful trees of great height and huge girth. We could see why Katandra – meaning "Song of Birds" – was so named, as beautiful bird calls floated down from the tree tops.

We finished our morning at Flower Power café, in Warriewood. A very pleasant hour to recollect the walk, over lunch.

SECRETS OF PLANT DEVELOPMENT UNLOCKED

Science daily August 23, 2018 University of British Columbia

Researchers have discovered an internal messaging system that plants use to manage the growth and division of their cells. Understanding this negative-feedback loop that helps plants survive under harsh conditions could enable innovations in agriculture, forestry and conservation as climate change takes hold.



The CLASP protein helps cells divide within the roots and shoots of the thale cress plant. Credit: Geoffrey Wasteneys/UBC

University of British Columbia researchers have discovered an internal messaging system that plants use to manage the growth and division of their cells. These growth-management processes are critical for all organisms, because without them, cells can proliferate out of control -- as they do in cancers and bacterial infections.

Plants use this messaging system to survive under harsh conditions or to compete successfully when conditions are favourable. It tells them when to grow, when to stagnate, when to flower, and when to store resources -- all based on the prevailing conditions. Understanding how it all works could enable innovations in agriculture, forestry and conservation as climate change takes hold.

UBC botany professor Geoffrey Wasteneys and his colleagues discovered that the system is driven by a protein called CLASP. The protein, found in plants, animals and fungi, plays an essential role in cell growth and division by coordinating the assembly of filaments within cells. Its gene in plants was first identified by Wasteneys in 2007.

Their study published today in Current Biology reveals that production of CLASP is reduced by a plant-growth hormone called brassinosteroid. The researchers established this by exposing thale cress -- a small flowering plant native to Eurasia and Africa -- to brassinosteroid. This exposure stunted the plants in a way that closely resembled mutant versions of the plant that lacked the CLASP protein altogether. This observation led the team to conduct experiments that proved CLASP is indeed a direct target of brassinosteroid.

However, the researchers were puzzled because limiting growth through exposure to brassinosteroid is a one-way process that merely shuts down cell division. In a surprise twist, the researchers discovered that CLASP prevents the degradation of brassinosteroid receptors, so when CLASP is scarce, brassinosteroid becomes less effective, which results in CLASP levels rising again. Essentially, the protein and the hormone affect each other in a negative-feedback loop.

"You can liken it to the predator-prey feedback loop," said Wasteneys. "We know that fox populations plummet if they over-consume rabbits. In the absence of foxes, rabbit populations explode, causing the eventual collapse of their ecosystem. "These findings are unique because they show, for the first time, that CLASP is governing its own destiny by directly sustaining the hormone pathway that regulates its expression."

These new insights are of particular interest to agriculture as the industry looks for new ways manage the effects of climate change, Wasteneys said. "One of the aims of the future is to be able to have smart plants that can sense their environment and adjust their development, so that they will reliably produce crops under increasingly adverse conditions. This mechanism is pivotal to that."

Wasteneys' team from the botany department worked with colleagues from the University of Manitoba and the University of Saskatchewan. Their study was supported by the Natural Sciences and Engineering Research Council, the Canada Research Chairs Program, and Canada Foundation for Innovation.

CHRISTMAS LUNCH

Just a reminder that we'd love to see you at our end of year celebration.

Saturday December 8, 2018 at Stony Range Regional Botanic Garden, Dee Why.
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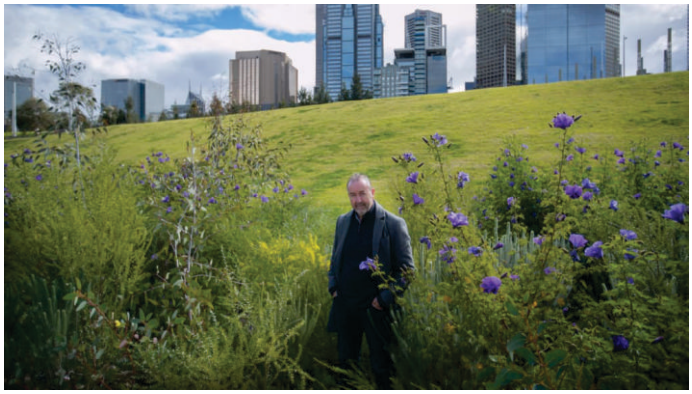
WORLD-FIRST NATIVE 'MEADOW' A MODEL ALTERNATIVE TO THE CITY'S GRASSY FIELDS

Two years on, these colourful expanses have exceeded expectations.
SMH August 13, 2018 Megan Backhouse

Planting in public places has always been a balancing act between creating visually interesting landscapes and fitting within stringent maintenance budgets. But what if you could come up with a planting scheme that was as layered and floriferous as the most beguiling wildflower meadow but as resilient and sustainable as a native grass monoculture?

Four years ago representatives from the universities of Melbourne and Sheffield and the City of Melbourne set out to do just that. They teamed up on a project to develop a meadow that was high on aesthetics, low on maintenance and composed entirely of robust Australian shrubs (Sheffield researchers are also exploring different planting mixes to suit a range of ecologies).



John Rayner in the trial meadow at Birrarung Marr.Credit:Simon Schluter

The aim was to develop a recipe for a playful, shrubby expanse that could be replicated across different sites.

Two trial meadows were planted – one at Birrarung Marr and the other at Royal Park – in September 2016. Each plot was covered with 200 millimetres of scoria and divided into 20 nine-square-metre sub-plots, some of which were planted more densely than others and some with more species. The Birrarung Marr meadow has "texture, colour and movement," says John Rayner.

The Birrarung Marr meadow has "texture, colour and movement," says John Rayner.Credit:Simon Schluter

They were irrigated for only six months and at one point cut back – or coppiced – to 15 centimetres above the ground. These "woody meadows" have since been monitored by Melbourne University project leaders Claire Farrell and John Rayner, together with research assistant Leanne Hanrahan.

Rayner says the landscapes have "exceeded expectations" in terms of plant survival, growth, density and flowering. Anecdotally, they have also been popular, with passers-by saying they make a welcome change from some of the less diverse public plantings around town.

A mix of Australian plants were grouped together as part of the project. Credit:Simon Schluter

Importantly, their maintenance requirements fall within council regimes. Much of the work takes place well before planting – in the researching of what plants will thrive with the climate, soil, limited maintenance and regular coppicing.

The 21 species chosen (from an original list of 1200) provide long visual displays and a mix of heights ("base", "bump" and "emergent".)

Farrell and Rayner have regularly measured the heights of all plants, noted the species that were in flower, assessed the degree of canopy closure and kept a record of all that died or just failed to thrive. They found the plots that did best were those with high density (a spacing of 38 centimetres between plants) and low diversity (a mix of just 12 species).

Some plants did not perform as expected – the *Banksia spinulosa subsp. spinulosa* and *Xanthosia rotundifolia* have not been vigorous enough, both the *Grevillea lanigera 'Mini Prostrate'* and *G. 'Coconut Ice'* have been "hit and miss", while the "bump" layer's A*cacia acinacea* did so well it might be considered part of the higher "emergent" layer in future.

Farrell and Rayner plan to tweak their plant list and experiment with their coppicing regime – the first cut-back, in March 2017, was done with secateurs but next time a brush cutter will likely be used.

While some horticulturalists overseas – notably Cassian Schmidt in Germany – are also developing repeatable plant communities for different ecologies and regions, Rayner says coming up with a mix of shrubs that can be planted together is a world-first.

"This [woody meadow] has texture, colour and movement but it's also very functional. It could be a replacement for some of those low-diversity grassy plantings that are everywhere."

Rayner would also like to extend the project across new plots to experiment with different mixes that would work across other climates and soils and in new applications, such as in streets or under established trees.

Gardeners can also try it at home. There is signage at both sites, while details of the project are available at thegirg.org.

TEA TREE: THE PROTECTOR

theplanthunter.com.au June 30, 2015 Justina Edwards

Every plant has a story; we are surrounded by flora that has their own pasts, their own connections to cultures, mythology and rituals.The much-loved Australian native Tea Tree is one such plant. Popularised in Australia for its therapeutic essential oil in the 1970's, these plants have a secret life of their own which existed for many thousands of years before their modern day resurrection. There are many plants like this in Australia, and around the world, with stories that go far beyond the kitchen or the medicine cabinet.

Growing up I was lucky enough to get taken on many bush walks. As a kid with a wild imagination I would transport myself back thousands of years in time and pretend I was foraging with my clan to gather water and plants to take to my camp for making dinner.

I remember collecting rocks and feathers, but most of all, picking eucalyptus and tea tree leaves and crushing them in my hand, instinctively sniffing their unmatched scent. It smelled so good and somehow made me feel better. Little did I know that this was more or less how the leaves had been used for thousands of years.

The Australian native Tea Tree, *Melaleuca alternifolia*, is a unique plant found only in one region of Australia. It is one of the few native Australian plants that has survived a transfer over from Indigenous to mainstream culture. Traditionally, it was used to treat wounds as well as skin ailments and not surprisingly, the leaves were crushed and inhaled to alleviate colds and coughs. Today, the essential oil distilled from the leaves of the plant is prized the world over for it's anti-bacterial and anti-fungal prowess.

Tea tree oil is an invaluable addition to any medicine cabinet as it has multiple uses and can replace many synthetic products. It is most commonly used as a natural antiseptic, with proven, powerful anti-bacterial properties making it perfect for applying on cuts and scrapes. Not only does it fight the infection but it promotes fast healing of wounds.

It also has anti-fungal properties, which help fight athlete's foot and nail infections, as well as candida overgrowth. Tea tree oil has gained popularity over the past 40 years or so since steam distillation of essential oils became possible on a commercial scale. Of course, this is only a smidge of time compared to the thousands of years that the Bundjalung people of Eastern Australia used the leaves for various medicinal uses.

The trees are endemic to south eastern Queensland and northern New South Wales. There, they can be found in abundance along the shores of fresh water lakes where they stain the water a rich brown tint from the tannins produced in their leaves. So revered was the anti-bacterial potency or 'protective' quality of the plants that the tea tree lakes were reserved for women only and were sacred places used for child birthing ceremonies.

Some of these lakes still hold significant spiritual meaning to the local custodians of the land and are used for rituals today. If you are lucky enough to swim in a tea tree lake it leaves you feeling incredibly refreshed. You can recreate the experience by adding a few drops to your bath at home and soaking up the beautiful, natural vapours that steam up from the water.

Adding a few drops to an oil burner can have a positive effect on your mood; in aromatherapy, tea tree is said to have a calming and uplifting effect. The story goes that Captain James Cook observed the Bundjalung steeping the leaves to make a healing tea. Soon enough people were heading out to the bush with mobile, wood-fired distillation carts to hand harvest and steam distill the oils from the leaves. During World War II, tea tree, along with eucalyptus oil was a highly recommended addition to first aid kits.

Very often today, our only experience of a plant is superficial, removed from its natural surroundings. This is the case with pretty much all of the food we eat, flowers we buy and the natural medicine we seek out. How important is it to know the story of a plant? Some might say it's not important at all. However, I would suggest that if not for the reverence and first hand knowledge of local gathers over hundreds and thousands of years who selected specimens for superior flavour, healing capabilities, or striking beauty, that food/flower/natural medicine would not be in your home today.

Although I can't venture into the bush and harvest fresh leaves everyday, as I look at the little brown glass bottle of essential oil in my bathroom, I'm comforted knowing it's ancestry lies not in a lab, but by a lake in northern New South Wales.

LILLY PILLY FOSSILS REVEAL SNOWLESS SNOWY MOUNTAINS

sciencedaily.com October 3, 2018 University of Adelaide

Leaf fossils discovered high in Australia's Snowy Mountains have revealed a past history of warmer rainforest vegetation and a lack of snow, in contrast with the alpine vegetation and winter snow-covered slopes of today

These are mummified Syzygium leaves discovered from the fossil-bearing sediments at Kiandra, NSW. Credit: Myall Tarran

Leaf fossils discovered high in Australia's Snowy Mountains have revealed a past history of warmer rainforest vegetation and a lack of snow, in contrast with the alpine vegetation and winter snow-covered slopes of today.

University of Adelaide research, published in the American Journal of Botany, describes fossils of the iconic Australian tree, the Lilly Pilly, prized for its glossy, green leaves, white flowers, and red or pink edible fruits, and commonly planted in streets and gardens across Australia.

Lilly Pilly trees (from the genus Syzygium) occur naturally in tropical to subtropical rainforests throughout Australasia, southern Asia and Africa, not mountain slopes covered by winter snow.

Researchers identified fossil Lilly Pilly leaves recovered from old gold mining pits near the historic town of Kiandra, 1400 metres above sea level in the Snowy Mountains of New South Wales. The fossils are preserved in ancient lake sediments, overlain by basalt rock, deposited

by lava flows that erupted during some of the last stages of uplift that produced the Eastern Highlands about 20 million years ago.

"The Lilly Pilly was a traditional food source for Aboriginal peoples and early European settlers and is still an important food source for many native animals and birds, as well as used for making cakes and jams," says lead researcher Myall Tarran, PhD candidate in the University's School of Biological Sciences. "But despite being such an important and iconic plant, no convincing fossils have ever been described in the scientific literature, until now.

"These fossils add to growing evidence that in this region about 20 million years ago there would have been temperate rainforest. The climate was warmer and wetter, perhaps analogous to the modern day Atherton Tablelands in North Queensland.
"There would have been no, or very little, winter snowfall and the alpine zone, as we know it in the Snowy Mountains, was not yet established."

Mr Tarran says it's possible the lack of snow was a result of continuing tectonic uplift, but higher atmospheric carbon dioxide levels were likely to have played a role.

"Uplift still hadn't fully finished in the region at that stage, so perhaps this forest was actually growing at a slightly lower altitude," he says. "But we also know that atmospheric carbon dioxide levels, and therefore global average temperatures, were much higher during this time."

"The fossils provide us with a window into what the Snowy Mountains looked like in a much warmer world, and help us to think about what a warmer world will look like. For us here in Australia, that might mean no snow in the mountains."

IN DANGEROUS FUNGAL FAMILY'S BEFRIENDING OF PLANTS, A STORY OF LOSS

Sciencedaily.com September 28, 2018 University of Wisconsin-Madison

With its red and white cap and hallucinogenic properties, the fly amanita has long inspired art and literature. It's friendly association with plants came about by letting go of a few key genes, new research finds. Credit: Jacqueline Hess

If Lewis Carroll had described in detail the mushroom Alice nibbles in Wonderland to shrink and grow to her rightful size, he might have noted a scarlet cap topped with white warts: the fly amanita.

This brilliant, distinctive toadstool is hallucinogenic. Eating it can distort perception and cause objects to appear to expand and contract, making this mushroom at home in Wonderland. Fly amanitas inspired the magic mushrooms in Super Mario Brothers and are littered throughout art and literature. Other members of the Amanita genus, like the death-cap mushroom, are fatal.

Yet these fanciful and sometimes dangerous mushrooms are also friendly -- at least to plants. Most Amanitas can only survive by closely partnering with plants, providing their roots with minerals and nutrients in exchange for sugars. This symbiosis evolved more than 50 million years ago and helps forest ecosystems thrive.

Anne Pringle, a professor of botany and bacteriology at the University of Wisconsin-Madison, researches what genetic changes drove some Amanitas away from their ancestral, decomposing lifestyle toward this intimate relationship with plants. In new work, Pringle and her collaborators show that gene loss -- not the evolution of new genes -- helped drive this major change in the mushrooms' lifestyle.

The team also suspects that they've identified a species of Amanita that is on its way to evolving a new symbiosis with plants. In all, the results provide further evidence that symbiosis may be a lot easier to develop than scientists once thought.

Or, as Pringle puts it: "Making friends is easy."

The new study was published Sept. 18 in the journal Molecular Biology and Evolution. Jaqueline Hess of the University of Vienna led the study, with collaborators in Norway, the Netherlands, France and Saudi Arabia.

To get at what separated symbiotic from free-living Amanitas, the researchers sequenced the genomes of three symbiotic Amanita species -- including the fly amanita -- and three close relatives that aren't symbiotic. The genomic sequences allowed them to reconstruct the evolutionary paths that led to the fungi's different adaptations. "We went into this thinking we'd find commonalities between the three symbiotic Amanitas," Pringle says.But despite their similar lifestyles, symbiotic Amanitas looked vastly different from one another on the genomic level. Some symbiotic species had almost double the number of genes as their similarly symbiotic relatives. The symbiotic mushrooms seemed to take different genomic paths after they first diverged, developing unique ways to tailor their partnership with plants.

Earlier research on other families of mushrooms had suggested that one defining characteristic of symbiotic lifestyles was the loss of enzymes capable of degrading the cellulose-laden walls of plant cells. These genes are crucial for decomposers eating through leaf litter. But for fungi that associate with plants and must avoid harming their partners, cellulose-digesting enzymes are only a liability.

So when Pringle, Hess and their team looked at this group of digestive enzymes, they were surprised to find that the free-living species Amanita inopinata was missing these genes. Although symbiotic Amanita mushrooms had indeed lost this suite of digestive enzymes, Amanita inopinata's lack of them meant the researchers couldn't link this loss to symbiosis itself.

Pringle says the unexpected absence of cell wall-digesting genes in Amanita inopinata's genome may actually be a clue pointing to evolution at work. If symbiosis only develops once fungi let go of these digestive enzymes, the researchers reason, then Amanita inopinata may be primed to evolve a closer partnership with plants.

Not quite symbiotic, perhaps not fully independent, Amanita inopinata seems to be "stuck between two worlds," says Hess, who began the work while a postdoctoral researcher in the Pringle lab and is now a senior scientist at the University of Vienna.

The evolution of Amanita inopinata -- "the unexpected one," in Latin -- and the other Amanitas also seem to support a developing consensus that symbiosis, once thought to be exceptional, may actually be easy to evolve. The researchers didn't find that Amanita needed to develop a new, complex suite of genes in order to start partnering with plants. Instead, just letting go of a few once-vital genes may be sufficient to forge new relationships in nature.

"The story of making friends is one of loss," says Pringle.

AUSTRALIA'S NATIVE RHODODENDRONS HIDE IN THE HIGH MOUNTAIN FORESTS

theconversation.com October 20, 2018 Stuart Worboys, James Cook University

The 1800s was a time of colonial expansion across the globe. During this time the great and the good of Britain filled their grand gardens with exotic novelties from all corners of the world. Amongst these were many species of Asian rhododendron, a diverse and colourful genus of shrubs and small trees, whose high altitude origins made them well suited to the cool temperate climate of England and Scotland.

Throughout the 19th century, commercial collectors and field naturalists discovered rhododendron species in southern China, the Himalayas, on the high peaks of Borneo, Java and especially New Guinea.

These finds lead Victoria's government botanist of the time, Ferdinand von Mueller, to speculate about finding rhododendrons on the high tropical mountains on the northeast coast of Queensland. He wrote:
When in 1855 [I] saw… the bold outlines of Mount Bellenden-Ker, the highest mount of tropical Australia, towering to 5,000 feet, [I] was led to think, that the upper region might prove to be the home of species of Rhododendron… forms of plants characteristic of cool Malayan sylvan regions.

But the lofty heights of Mt Bellenden Ker were unknown to European Australians. It would be another 32 years before an expedition led by naturalist W.A. Sayer reached its central peak. Sayer's expedition, accompanied by two indigenous assistants, reached the mountain's high ridge after several mishap-filled attempts. It was here they confirmed Mueller's suspicions. Sayer's account of its discovery is interesting:

The top of the range is razor-backed, and on travelling along the range beyond the spur by which we ascended, I could not see the sides, they being, if anything, hanging over. We tumbled rocks over, but could not hear them fall.

It was here that I observed the Rhodendron Lochae growing, and asked the Kanaka to get it; but he remarked, 'S'pose I fall, I no see daylight any more; I go bung altogether;' so I had to get it myself.

Mueller received the hard-won specimens and named the species *Rhododendron lochae* (later corrected to *R. lochiae*) after Lady Loch, the wife of the Victorian Governor.

Since then, rhododendron plants have been found on nine peaks and tablelands in the Wet Tropics region of north Queensland. Populations on peaks south of Cairns are called *Rhododendron lochiae*, whilst plants growing on mountains to the north of Cairns are considered by some to be a distinct species: *Rhododendron viriosum*.

Both northern and southern plants are straggly shrubs that grow in thin soils or rock cracks, sometimes in open cloud-swept boulder fields, sometimes in deep shade along creeks, or rarely as epiphytes on moss-covered trees. They produce bunches of gloriously red, bell-shaped flowers, followed by dry brown capsules filled with small winged seeds that are apparently spread by wind.

They grow slowly but with relative ease from cuttings, and are often cultivated in gardens and nurseries in temperate Australia. However, over time knowledge of the precise origin of these cultivated plants has been lost, which means they are unsuitable for detailed scientific investigations.

All of Australia's rhododendron populations are located at altitudes above 950m in National Parks within the Wet Tropics World Heritage Area. Most are difficult to access, requiring arduous climbs on rough foot tracks through leech-infested rainforest. And yet, although isolated in protected areas, they are threatened by human activities: loss of habitat due to climate change.

Recent climate modelling research published by scientists from James Cook University and the CSIRO predicts significant reductions in suitable habitat for a suite of mountaintop flora species in Australia's tropics (our rhododendrons were not included in the analysis, but occupy the habitats assessed).

The habitat of many of these species is predicted to disappear altogether well before the end of the century.

Using rhododendron as a model, the Australian Tropical Herbarium at James Cook University is working to save these threatened species through "ex situ" conservation – cultivation in temperate zone public gardens, well outside their natural range. Because the threatening process – climate change – is not readily mitigated, establishing precautionary ex situ collections is the only viable conservation intervention for these plants.

With funding from the Australian Rhododendron Society Victoria Branch and the Ian Potter Foundation, and the support of traditional owners, Queensland National Parks and the Wet Tropics Management Authority, we have mounted expeditions to collect samples from most of the known populations.

These expeditions have put expert naturalists into rarely visited and challenging environments. Beyond gathering rhododendron samples, new moss species have been discovered and are being named, a fern previously thought extinct was rediscovered, and beautiful little epiphytic orchids have been found on a mountain where they'd not previously been recorded. Golden bower-bird bowers have been mapped in remote mountain rainforests, and a likely new species of snail has been discovered.

Australia now has a well-documented and genetically diverse collection of native rhododendron plants thriving in the Dandenong Ranges Botanic Garden. We plan to expand this work, ensuring the preservation and public display of rhododendron and many other mountain species threatened by climate change.

THIS HUMONGOUS FUNGUS IS AS MASSIVE AS THREE BLUE WHALES

smithsonian.com October 15, 2018 Jason Daley

wikimedia commons

A new estimate suggests this mushroom is **2,500 Years Old** and **Weighs 440 tons**

The blue whale gets a lot of ink for the being the largest animal to ever live, beating out even the biggest dinosaurs. But it turns out the largest organisms on Earth aren't in the oceans, they are beneath our feet. By weight and area, honey mushrooms in the genus Armillaria beat whales many times over. Now, reports **Matthew Taub** at **Atlas Obscura**, a new analysis of the original **"humongous fungus"** in Michigan's Upper Peninsula shows the massive mushroom is much bigger and much older than researchers first believed.

About **25 years ago**, researchers discovered that an **Armillaria gallica** mushroom near **Crystal Falls, Michigan**, covered about **91 acres**, **weighed 110 tons** and was about **1,500 years old**, setting a new record for the largest organism at the time. For a new study published on the preprint service bioRxiv, James Anderson, a biologist at the University of Toronto and one of the original discoverers of the fungus, returned to the site and took 245 samples from the mushroom and examined its genome. The team confirmed that indeed, the entire fungus is just one individual.

The DNA also showed a very slow mutation rate, meaning that the honey mushroom isn't evolving very quickly. The visit also led them to revise the fungus's age to **2,500 years** and determine that it is four times as massive as the original estimate, or about **440 tons**, the equivalent of three blue whales.

How can a mushroom be that big? What we think of as mushrooms are just the fruiting bodies of the organisms. The main part of a mushroom is mass of underground tendrils called mycelium. Depending on the species, these tendrils can feed on soil, decaying plant matter or wood. In the case of the massive honey mushrooms, they have particularly thick black tendrils called rhizomorphs, reports Sarah Zhang at The Atlantic. The rhizomorphs can spread to acre upon acre in search of wood to consume. While other mushrooms prefer already decaying wood, the honey mushroom infects living trees, often killing them over the course of several decades, then continues eating them after they are dead. While it's possible to find the underground mass by the honey mushrooms that it occasionally sends up, the telltale sign that the fungus is underfoot is the grove of dying trees above it.

The **Crystal Falls humongous fungus** was the original humongous fungus that showed these organisms can reach massive size. But since its discovery it has been eclipsed by other honey mushrooms. An Armillaria found in eastern **Oregon's Blue Mountains** covers **three square miles** and may be over **8,000 years old**, holding the current title for humongous-est of the funguses. The size and huge distribution of these mushrooms underground is difficult to imagine. "I wish all of the substrate [soil, wood and other matter the fungus grows on] would be transparent for five minutes, so I could see where it is and what it's doing," Anderson tells Zhang. "We would learn so much from a five-minute glimpse."

FLOWERS AT NORTH CURL CURL

Russell Beardmore.

The flowers on North Curl Curl headland have been extraordinary this year, with Flannel Flowers everywhere. Also some wonderful showings of Dampiera stricta.

Russell Beardmore.

Join us in the historic **City of Albany, Western Australia**, to celebrate and explore the unique flora of the **South West** region. The **2019 ANPSA Conference**, Blooming Biodiversity, is hosted by the **Wildflower Society of Western Australia.**

Blooming Biodiversity features tours to and from the City of Albany, presentations and discussions by botanical experts, full-day wildflower and nature excursions, a conference dinner and the opportunity to meet and connect with fellow wildflower experts and enthusiasts from all around Australia.

Registrations for the Conference will open in early 2019. In the meantime, you can access the Blooming Biodiversity website, which has everything you need to know about the Conference, including details of pre and post Conference tours, wildflower excursions during the Conference, speakers and Albany accommodation. You can even take a sneak peek at the draft program. More details will be added as planning continues.

SPEAKERS

Blooming Biodiversity features lectures and workshops delivered by leading botanists. Keynote speaker Greg Keighery heads a panel of experts in their field. Professor Stephen Hopper will present the AJ Swaby Address.

PRE AND POST CONFERENCE TOURS

Blooming Biodiversity offers a range of guided tours before and after the conference, giving you the opportunity to experience the flora and scenery of Western Australia up close. (The pre-conference tours run from Perth to Albany, and the post conference tour from Albany to Perth .)

Tour 1: Kwongan and Woodland Tour (6 nights)

Wildflowers of northern heaths and inland woodlands

This tour will first take you north east of Perth where you will discover the beauty of the Kwongan and the plants that live there. Stops include the Gravity Discovery Centre in the town of Gingin, where there is a rich patch of Coastal Plain bushland and where you may see *Gompholobium scabrum* (Painted Lady) and *Philotheca spicata*.

The tour continues north, where you will explore the Kwongan heath of Mount Lesueur National Park and Hi Vallee Farm. Mt Lesueur covers 26,987 hectares and is home to over 900 plant species including acacias, hibbertias, leschenaultias, melaleucas and gastrolobiums.

The tour will then move inland where you may see more flora of the Wheatbelt including *Macropidia fuliginosa* (Black Kangaroo Paw), *Cyanostegia lanceolata* (Tinsel flower) and the extraordinarily popular yet elusive "Wreath Flower" (*Lechenaultia macrantha*).

On the final day of this tour, you will visit Boyagin Nature Reserve and Boyagin Rock. You can climb to the summit of the rock and take in the spectacular panoramic views before looking for special flora adaptations such *Kunzea pulchella*, which grows in the incredibly tough conditions of the rocky outcrop.

Tour 2: Granitites and Lowlands (1 night)

Forests of the Darling Scarp and central Wheatbelt woodlands

This tour is designed for participants who have limited time but want to see some of Western Australia's highlights. It will get you to Albany in two days (or back to Perth in two days for the post - conference tour). Stops include Ellis Brook Valley Reserve, an area just outside suburbia on the scarp of the Darling Range. It is best known for a waterfall that tumbles over diorite rocks and runs down a steep valley. However, the main attractions are the hills, which can be blanketed with vivid flowers in spring.

Tour 3: Heathlands and Barrens Tour (5 nights)

Hidden gems between Fitzgerald and Cape LeGrand National Park

Experience up close the beauty of the Southern Coast and the Fitzgerald Biosphere in this jam packed tour. Highlights include Quaalup Homestead, a wilderness retreat with a nature trail that will take you through heathland with labelled plants, including *Petrophile prostrata* and *Actinodium cunninghamii* – a plant in the Myrtaceaea family.

You will also take in the sensational surrounds of West Mount Barren and East Mount Barren, quartzite peaks within the Fitzgerald River National Park. The most colourful examples of the Hakea victoria may be found at the western end of the park; at East Mt Barren you may spot rare plants such as the delicate *Stylidium galioides*, a creeping triggerplant, or even the brilliant red clusters of the Barrens Regelia, *R. velutina*, which is restricted to the area. Additional tour stops include the beautiful coastal towns of Bremer Bay and Esperance. You will also explore Mt Benson, and a short walk along its summit track may reward you with many plants from the Proteaceae family such as Banksia pallida, *Banksia cirsioides* and *Banksia lemanniana.*

Tour 4: Coasts and Forests Tour (4 nights)

South West coastal forests and views

This tour will enable you to experience up close the beauty of the South West Australia, one of 25 original global hotspots for plants and wildlife.

The highlight of the first day is a visit to Yalgorup National Park, just south of Mandurah. Here you will see Lake Clifton, famous for its large population of thrombolites. Thrombolites are living rocks and resemble the earliest forms of life on Earth. They have a striking limestone colour and round shape and can be viewed from an observation deck.

On the second day, you will visit the Whicher Range, which features diverse endemic flora, including the critically endangered species, *Petrophile latericola*, also known as Ironstone Pixie mop. The remainder of the tour will be spent among the majestic, towering Karri trees of the Karri Forest. These magnificent trees can grow up to heights of 90 metres. You can test your fitness (and bravery) by climbing the Gloucester tree in Pemberton. This 'king Karri' is the world's second tallest fire-lookout tree and boasts spectacular views from its top.