

*Journal of the*

# **Australasian Cave and Karst Management Association**



# The ACKMA Journal

Official Publication of the Australasian Cave and Karst Management Association Incorporated.

Published quarterly in March, June, September and December.

The opinions expressed in the ACKMA Journal are those of the individual authors and not necessarily those of ACKMA Inc or its officers.

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## FRONT COVER and BACK COVER

Nikau Cave, Waikaretu, New Zealand.

Photo credit Shaun Jeffers Photography for Open Waikato.

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# Editorial

## Christian Bom

Welcome to the first edition of the ACKMA Journal for 2022. I sincerely hope you have all had a good start to the year. For those working at tourist caves, it has been great to see international guests arriving again so I hope we will start getting busy again soon.

Recently we (Capricorn Caves) have started to welcome school groups back to the caves once again for their annual camp. As a guide that has worked in caves for seven years now, it brings me great joy to see the look on the face of these young ones when they see the caves for the first time. It is a place that brings a sense of awe and wonder to all, and a great teaching opportunity. Environmental education is at the heart of what we as cave guides do.

I know I am preaching to the converted here, but quality interpretation of the incredible environments we work in, whether from a guide's perspective or a scientific perspective, is one of the most effective ways that we can protect these environments long into the future.

Our dedicated ACKMA committee and distinguished members have been hard at work with ever-evolving conservation issues that are arising world-wide.

As many of you would be aware, there has been great concern for the Cave and Karst environments of Brazil due to proposed changes to environmental legislation. Andy Spate has written a letter with input from David Gillieson to the Ministry of Mines and Energy, the Planning Department and government department that deals with biodiversity issues (IPAMA). A big thanks to Andy and Dave for their efforts.

As always there are plenty of conservation issues on the home front too, with development proposals in several karst precincts. ACKMA's strong voice on these matters is having an impact on these proposals, although there is always more work that needs to be done from the greater community to stand against what will ultimately have detrimental effects on our valuable karst environments across Australasia.

In the meantime, there is some great work being done to gain a greater understanding of our impacts on caves. As many readers will know, Dr Liz Reed has been conducting studies on the impacts that lights have to the cave environment, predominantly on biofilms and invertebrates. As many of our show cave operations use fixed lights, this research will no doubt help us adapt to the current understanding and begin finding new ways to lessen our impact.

I would also like to announce that my wife and I are about to start our own tourism business, therefore I intend to step down as the ACKMA journal editor at the next AGM coming up on the 14th May. This has been a difficult decision. I have learnt a lot in this role and have gained some valuable skills. If you are interested in potentially taking over this role, please let me know and I can tell you more about what it entails. Previous experience is not necessary.

Dave Gillieson has also indicated that he wishes to step down from the position of ACKMA Treasurer at the May AGM. The position involves working with our Webmaster Rauleigh Webb to maintain the membership database. She/he supplies Rauleigh with bank statements every couple of months so he can update the financial status of members. The Treasurer also maintains our bank account with Bendigo Bank and initiates funds transfers, with one other authorized person to co-sign. The main income is the individual membership payments, by bank transfer, PayPal or (rarely) by cheque. Donations to the Honorary Life Members (HLM) fund are kept in the same account but are tabulated as a separate item and summarized in the database. She/he prepares the annual financial statement of the Association which is presented at the AGM. The statement is also supplied to the Secretary, along with the Minutes of the AGM and a completed submission form, so she/he can lodge our annual return to the Victorian Office of Consumer Affairs. So it's not a hard job but it needs someone who has good financial management skills or is happy to learn them.



**We recognise the traditional people of the lands of all our members and editorial contributors.**

**ACKMA acknowledges the Traditional Owners of the land on which we meet and work, and all Traditional Owners of country throughout Australia. We recognise Aboriginal and Torres Strait Islander peoples' continuing connection to land, place, waters, and community. We pay our respects to their cultures, country, and elders past present and emerging.**

**ACKMA recognises the unique role of Māori as Tangata Whenua and embraces Te Tiriti o Waitangi recognising Māori as tino rangatiratanga of Aotearoa/New Zealand while embracing the three guiding principles of the Treaty – Partnership, Participation, and Protection. We will endeavor to implement bicultural policies and practices that incorporate and value Māori cultural concepts, values, and practices.**

# ACKMA President Report February 2022

Ian Eddison

The International Year of Caves and Karst had been extended from 2021 to 2022 due to it being very difficult on an international scale to actually celebrate and attend events in any way during the recent pandemic. So continue to plan and celebrate caves and karst this year.

- The creative Celebration of Caves and Karst in Australasia competition, a joint initiative of ACKMA, ASF and NZSS had been well attended and the winning entries were notified 18th December 2021. The announcement of winners are published elsewhere in this issue.
- Well the new year got off promptly with online meetings on behalf of ACKMA with the ASF, an ASF Council meeting and a Wombeyan Caves Precinct Plan meeting. I also attended an ASF Special Interest Group (SIG) on the Nullarbor. I have found a welcoming within the ASF for ACKMA representation.
- I have made calls to important connections with Wombeyan Caves on their Precinct Plan but there was a great reluctance for engagement on the subject by those people. I was therefore left very concerned that the 'no comment' in either support or concern for any part of the plan meant an unnecessary political instruction to not discuss it. This coupled with no initial consultation with ACKMA (Also any cave related group) has caused great concern in the cave and karst communities. Yet, an amicable and lengthy telephone conversation with NPWS Blue Mountains, Assets & Infrastructure team leader regarding the Wombeyan Caves Precinct Plan occurred, which was reassuring. A response on behalf of ACKMA has been prepared.
- Participants of the EcoGuide course over 20-21 October 2021 are encouraged to complete their manual and interpretation example. I am very happy to assist in any way I can and so too are our friends who ran the training, Savannah Guides.
- A revision of the Hills of Gold Wind Farm, (Near Timor caves NSW) has meant a win for vegetation cover and

some distance has been gained from turbines from nearby craggy outcrops and caves.

- Brazil Caves and Karst has come under a revised and lower level of protection. Andy Spate has prepared a response on behalf of ACKMA to raise the importance of the Brazil caves and karst and to reject the lowering of its protection. We are concerned the government action is to pave the way for limestone mining.
- The Atmospheric Data Logger project continues and you should have seen reports updated. Despite the challenges with restrictions due to the COVID-19 pandemic, the team continue to support the various sites engaged in this research. Thank you Andy Baker, Andy Spate and David Gillieson.
- A new caves protection group has been formed in Australia - Australian Cave and Karst Protection Association (ACKPA). At this point I am uncertain of the need for this or the added strengths it may bring to certain threats to caves and karst. No doubt there is more to be heard on this.
- Found a fossil. I refer you to <https://www.foundafossil.com> please look at this and complete the survey <https://www.foundafossil.com/the-survey> as well as share it with the public. Sally Hurst recently visited Wellington Caves on her tour of fossil sites across NSW.

I wish you all a great 2022. Please remember to promote the International Year of Caves and Karst and the themes explore, understand and protect. Keep on guard against COVID and I trust you all stay well.

*Ian Eddison*

*President*



**DEADLINE** >>>>>

## DEADLINE FOR JUNE JOURNAL

Could you please send through any articles for the **June edition of the journal** by the second Friday of May. **Friday 13th May 2022.**

# Australian Cave Animal of the Year 2022

## Ghost Bat *Macroderma gigas*

### Batting for Bats in 2022.

All the countries with Cave Animal of the Year programs have a bat for their 2022 animal in a bid to raise community understanding of the plight of bats.

The ghost bats certainly need friends. It is listed as endangered under state legislation in South Australia and Queensland, vulnerable under Western Australian legislation and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999, and near threatened in the Northern Territory.

Can you help raise the profile of the ghost bat in 2022? Are you able to display a poster in your workplace, show cave site, national park site, library, class room, local school or any other public place? Please get in touch with me at [hello@caveanimaloftheyear.org.au](mailto:hello@caveanimaloftheyear.org.au)

We still have a dozen ghost bat mugs (\$10 plus postage) if you'd like one for your collection or a gift for a cave or bat loving friend.

Learn more about the ghost bat at [www.caveanimaloftheyear.com](http://www.caveanimaloftheyear.com)

Wikipedia has excellent readily available material:

Ghost bat - Wikipedia (which includes a map of the ghost bat's current range)

Bat - Wikipedia

Animal echolocation - Wikipedia

Thanks for joining in the effort to Bat for Bats in 2022.

*Cathie Plowman*



# Mapping of Capricorn Caves

Lydia Georgeson

Hello! My name is Lydia Georgeson, and I am the Natural Resource Manager at Capricorn Caves. I am only new to this role but have been at Capricorn Caves for almost 4 years now working as a tour and outdoor recreation guide. At the end of last year, I graduated from Central Queensland University with a Bachelor of Science (Applied Biology) with Distinction. Working at the caves whilst studying was a great way to apply my knowledge and facilitate my learning!

Whilst in my final year of university, I was fortunate to use my degree to undertake two projects at the caves: the 3D mapping of the cave system with LiDAR technology, and the study of epilithic life on the caves. Here's a little overview of the projects and where I'm at with them.

## Mapping of Capricorn Caves with LiDAR

I started this project back at the end of 2020 with my supervisor Dr. Nathan English, and it was a lot bigger than I anticipated. For a single pass/fail unit, I quickly realised what I had undertaken was probably more of an Honours worthy project.

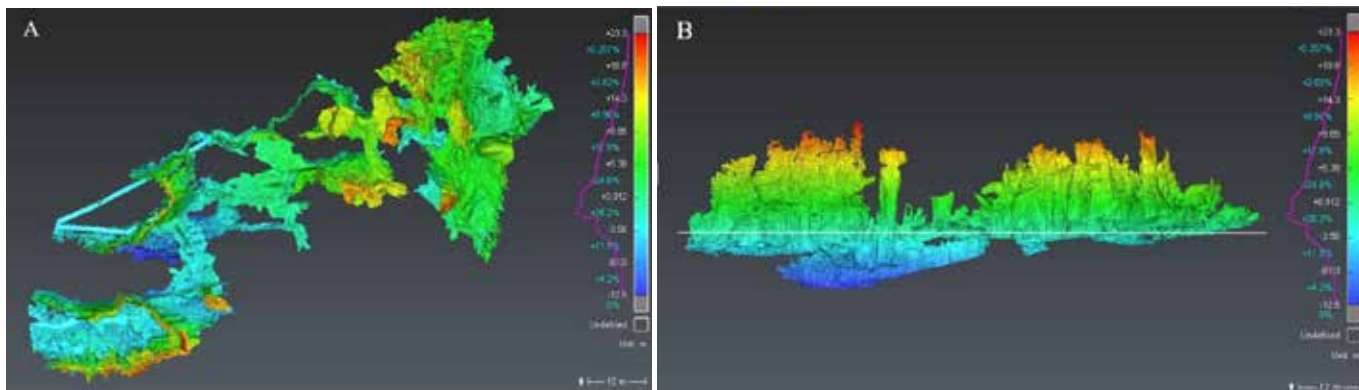
For those of you unfamiliar with LiDAR, it stands for 'Light Detection and Ranging' and is essentially a laser scanner. It is the most efficient and accurate way to scan and map caves, and there are numerous devices on the market to suit different needs. The device used at Capricorn Caves was a Leica Geosystems BLK360 that collected on average 45 million points from one stationary 6-minute scan. 6 minutes per scan might not seem like a long time but when you have to climb or crawl to the next area with a very expensive piece of equipment and try to set it up in a less than ideal location, it can be a quite challenging and time consuming.



*LiDAR (BLK360) setup on tripod at top of Deep Vault cave (left), and Lydia with LiDAR at bottom of Deep Vault cave (right)*

Over 300 scans were taken in total, however, I could not use all of these for a variety of reasons. 200 individual scans, and roughly 9 billion individual points were used to create three separate point clouds (i.e., three separate maps). These point clouds were then used to create 3D meshes where the individual points were stitched together to form solid walls. From this cave volume, surface area and 2D outlines were derived.

I have pinched the below figure of one of the Capricorn Caves meshes from the paper I am currently finalising. The colour depth indicator, scale bar and person (2m tall) scale give an indication of the size of the cave. 0 m (white line) is in line with where tourists currently walk through the iconic Cathedral cave.



3D mesh of the Cathedral Tour route at Capricorn Caves. A – plan view, B – elevation view.

I am finalising a paper to submit for publication titled 'Importance of high-resolution 3D cave maps for research, tourism and infrastructure: a case study of LiDAR mapping in Capricorn Caves, Australia'. In the future, I would love to continue scanning the caves so that one entire point cloud of the system could be created. Maybe one day!

### Analyses of epilithic life on Capricorn Caves

For this study, my supervisor was Assoc. Prof. Larelle Fabbro, an expert in cyanobacteria. The study was aimed at investigating the diversity of epilithic cyanobacteria, lichens and cyanolichens at Capricorn Caves with particular focus on the cyanobacteria. This epilithic life is found all over the karst of Capricorn Caves and where sunlight penetrates the cave. I collected three samples that were of interest to me and microscopically observed them.

From the three samples taken, a Chlorophyta and fungi lichen, as well as four cyanobacteria were identified. By analysing morphological and ecological characteristics, I was able to narrow the cyanobacteria down to at least the genus level. The genus of cyanobacteria identified were *Lyngbya*, *Chroococcus*, *Cyanosarcina* and *Brasilonema*.

One of the sample sites is pictured below. This is the first cave you enter on the Cathedral Tour, the 'Vestibule' cave. This green mat covers a large portion of the walls, and we will often be asked what it is. For a long time, many of us said it was a lichen but from microscopic analyses (photos on right) it is evident it is a cyanobacteria and its characteristics indicate this is likely *Cyanosarcina parthenonensis*.



Cyanobacteria growing on limestone of Vestibule cave (left) at Capricorn Caves.

Several specimens collected are of particular interest so Larelle and I will be following through with this study and sending some samples away to be genetically tested.

If you have any questions or just want to chat about the mapping or the cyanobacteria study, I'd be happy to talk. My email is [Lydia.georgeson@capricorncaves.com.au](mailto:Lydia.georgeson@capricorncaves.com.au). Thanks for reading!

# In the Blink of a Magic Eye

Grant Gartrell

To improve our understanding of the caves in the Kelly Hill Conservation Park, a reasonable place to start is by locating all the cave entrances within the Park. That's what the South Australian Speleo Council working group have been trying to do over the past couple of years, taking advantage of the brief opportunity for improved visibility resulting from an extensive wildfire in late 2019 / early 2020. The opportunity was taken at the time to carry out extensive high resolution airborne photographic and LIDAR recording of the Park's ground surface, and we have been following up by taking advantage of modern and extremely capable GPS location devices to ensure that the records are far more permanent and accurate than was previously possible.

Hopefully there will not be another opportunity to gather such a photographic record for many decades, but we now have so much new data that we can expect to continue analysing that for decades anyway.

## Why Bother?

Why bother? Perhaps the first question we should ask ourselves is why we should even bother. There is a well decorated tourist cave with a few chambers, and the bush is really pretty when it's not on fire, but if there is any general public perception at all, it would be that maybe the cave goes for a couple of hundred metres and that's about it. Is it possible we do not fully appreciate what we have? Should we be assuming it must fit squarely in the category of being a nice little experience to have for half an hour or so before we go to the pub for lunch.

Lunch sounds good, actually, but I am posing the question because I believe we should bother. Despite several thrilling discoveries I have already been fortunate enough to participate in over the last 60 years of my involvement with Kelly Hill, we have barely scratched the surface, let alone plumbed its depths. Without taking anything away from Kelly Hill, the same could be said for many karst areas around Australia, and one of the reasons is that not only is caving technology, lighting and equipment, getting better, but also so is the science becoming ever more fascinating. Kelly Hill has tended to miss out from time to time because of logistical and transport difficulties when it is so much easier to hop in your car and drive to any of quite a large number of caving areas accessible to South Australian cavers. Even more before COVID19 effectively closed the Western Australian border. As perverse as it may seem, the really awful fires of a couple of years ago have focussed a spotlight on the western end of Kangaroo Island in general and Kelly Hill in particular that has every chance of re-writing our understanding and appreciation of this undervalued coastal karst.

At the last count the surveyed length of what has hitherto been regarded as the main Kelly Hill cave system was more like 2 kilometres than 200 metres, and the airflows tell us that there is a lot more yet to find. Since the fire, we have found many new entrances, and at least one significant new cave system, with promise of more to come. If that isn't enough to convince you, then consider the quality of the decoration, with its propensity for mega-helictites. "Trog's Delight" ( Figure 1 ) and a number of

others found in Kelly Hill are reminiscent of the perhaps better known "Epstein Sculpture" in Western Australia's Easter Cave, rare as hen's teeth but characteristic of coastal calcarenite caves, along with other distinctive forms of decoration ( Figures 2, 3 and 4).

## The Shark Hook

The Kelly Hill Tourist Cave recently lost its famous shark hook. There is little doubt it was shattered by vibration generated by scaling of the roof in the nearby entrance tunnel area in an operation more suited to a mine than in close proximity to displays of fragile decoration. This particular ill-fated speleothem suffered some damage previously but had been restored. In retrospect it is perhaps surprising it survived so long. There must have been considerable vibration transmitted through the rock when the artificial entrance staircase tunnel was initially driven down about 20m from the surface and only just around the corner from the Shark Hook. Possibly a resonant frequency combined with a particular mass distribution and crystal structure singled out that particular speleothem. It is of course essential, particularly for a show cave, that safety assessments are made from time to time and remedial work carried out as necessary, but advice from cave specialists balancing this against protection of the values of the resource itself should also be an essential part of the process. It is never going to be easy but needs to be done better.

The shark hook was found shattered soon after the scaling work was carried out, and the shattering did not appear to be a legacy of the prior repair work. The pieces were carefully collected and stored in a container in the caves office so that further reconstruction and reinstatement could be carried out in due course. It was this action of caring that ultimately sealed its fate, when the fire swept through and the entire office burned to the ground. Because the building had asbestos cladding incorporated in the construction, the men in white suits went to great pains to clean up the site thoroughly along with any remnant treasures it had contained. Now all that remains of the shark hook are the multitudinous photographs, souvenir teaspoons and fridge magnets (Figure 5). But not quite. Out in the so-called southern extension of Kelly Hill there is a large highly decorated chamber known as the "Back of Woop-Woop". In one area of that chamber there is an extensive display of exquisite helictites, and one of those helictites could almost be a stunt double for the shark hook.

Yes, we should bother about Kelly Hill. There is no doubt we should bother, and it's no bother at all, really. I am not going to explain, just yet, anyway, what I mean by the term "coastal calcarenite caves", but instead refer you to an excellent new book entitled "CAVES Processes, Development and Management" by Professor David Gillieson, which not only explains the properties of calcarenite, but puts it into context with other forms of limestone. It is not strictly a new book, but an extensively re-written and updated version of the original. It should be on the bookshelves of every serious caver and cave manager. If your bookshelves, like mine, are overflowing, load it on to your phone, so you can even take it caving



and read it in the dark. I am saying this purely and simply because I find the book so comprehensive, so well referenced, and so hard to put down, and not because David himself is an active and valuable contributor to the current post wildfire South Australian Speleo Council review of Kelly Hill and Flinders Chase karst.

I might be introducing here ideas that may be new to some Kelly Hill cavers. I could have benefitted from them myself 60 years ago at the inception of my involvement with Kelly Hill, but back in those days much of the research that provided the foundations for these ideas had not yet been conducted. It wasn't until some fifteen years after I became interested in caving and Kelly Hill that I saw the research vessel *Glomar Challenger* in the Western Australian port of Fremantle prior to it departing to drill holes in the ocean floor along the coast of Antarctica. That historic voyage made a significant contribution to the research upon which the now well accepted phenomenon of continental drift was based, and which also has a direct bearing on Kangaroo Island coastal karst.

Even in dune limestone cave entrances don't occur randomly. They are associated with caves formed by karst processes, and in particular the development of subterranean drainage systems.

So how do we pin down more precisely the location of subterranean drainage systems? In the case of Kelly Hill the place to start is by looking at the more traditional surface drainage systems feeding water towards the Kelly Hill Park, and then consider what is likely to have happened to that drainage when the area was progressively covered by Aeolian calcarenite. To the West of the Park we have a shallow valley, containing the South West River, cutting through Grassdale Station, now also part of the Park, and reaching the sea at Hanson Bay. To the east of the Park, the Stunsail Boom River similarly cuts right through the broad river flats of the Stunsail Boom property, before finally penetrating a ridge of coastal dunes to get to the sea. In both regions the rivers themselves cut through shallow soils and low dunes laid down post Permian. Most of the southern coast of the Park is comprised of limestone cliffs perhaps 20 to 50 metres in height supported on a lower rock platform approximately at sea level and made up of Kanmantoo Group metasediments interspersed with occasional intrusions of granite.

I find the subject of Geology fascinating, especially where it provides clues to the formation of cave systems. When I first joined CEGSA back in the early 1960's the Group was privileged to be strongly supported by the late Brian Daily who not only wrote dozens of erudite papers on South Australian geology but wrote them in such a way that non-specialists such as I could read and at least think we understood them. Brian had much to do with Kangaroo Island, which was considered geologically to be an interesting extension of the Mount Lofty Ranges. He was lead author of the geology chapter in the first edition of a wonderful publication produced first in 1979, updated with a second edition in 2002, by the Royal Society of South Australia (Inc.) entitled "Natural History of Kangaroo Island".

Most of the geology of the western end of the Island was either buried under other geology or situated part way down an inaccessible cliff, so instead, Brian and his colleagues tended to spend much of their time sorting

out the complex geology of the Dudley Peninsula and the north coast of the Island close to Kingscote. Several species of trilobites associated with Cambrian sediments have been found at Emu Bay and elsewhere on Kangaroo Island, and one such species, *Balcoracania dailyi* has even been named after Brian.

The big trouble with geology, which is based on unravelling the record of the past contained in rocks, is that half or more of the record may be missing altogether. Sedimentary rocks get laid down in an orderly fashion on the beds of seas or lakes. Some include distinctive fossils. Some have since been ground away by glaciers or even the cumulative effects of little drops of water working in concert over millennia. I am not the first to describe reading the geological record as trying to read a book out of which someone has removed and destroyed over half the pages. Nevertheless, there remains still a great deal that we can learn from geology, and that is generally more than sufficiently fascinating to compensate for the missing bits.

The Kanmantoo Group metasediments exposed along most of the coastal perimeter of the park were accumulated in a shallow sea during the Cambrian period 500 million years ago. I am not clear on everything that happened since then, but there was certainly a mountain building exercise known as the Delamerian Orogeny. Some suggest that a mountain range to rival the Himalayas, and known as the Delamerides rose up during this time. The unresolved argument concerns the degree to which the new mountains were being ground down as they formed, and therefore whether or not they rose to become a major world range before being ground down again, which is more or less their current state. A similar argument exists about other mountain ranges that were indicated to be forming in an Australian inland landscape now remarkably devoid of such features. The Kanmantoo Group metasediments of Kangaroo Island still form a low relief basement surface under much of the southern and western coast. The Permian glaciation, apparently responsible for grinding down large swathes of South Australia's more lumpy scenery about 250 million years ago, took place while Australia was still joined to Antarctica. Separation of the two land-masses with the break-up of Gondwana was well under way about 50 – 60 million years ago. What happened to the land during the Tertiary period is less clear, but it seems the southern section of the western end of Kangaroo Island was inundated during the Miocene, as was the Murray Basin at that time. A small amount of Tertiary limestone is recorded, including limestone at Mount Taylor, Kingscote and Porky Flat. There was even some identified at Kelly Hill, although I am not quite sure where. The Aeolian calcarenite at Kelly Hill, however, is of Quaternary age.

The mechanism for accumulating this limestone itself is interesting. The Quaternary period commenced around 1.8 million years ago. Prior to that it is thought that both the South West River and the combined North West River, North East River and Stunsail Boom River systems would have continually been draining the higher inland country of Kangaroo Island. It therefore makes sense that the lesser catchments intermediate to those systems would also be continuing to operate. As the calcarenite dunes accumulated at Kelly Hill and fairly rapidly concreted into place, one would imagine that the existing drainage, when operating, would have

continued to either wash away the lime sands as they accumulated, or punch through and under the dunes, or a combination of both processes. It is not clear to what extent drainage channels were originally established under Kelly Hill in shallow soils similar to the Grassdale and Stunsail Boom properties, and to what extent the Aeolian calcarenite deposits overlie or replace such soils. Since the formation of the calcarenite dunes themselves it is clear that the upstream alluvial plain at the base of the dunes in the immediate vicinity of the Kelly Hill tourist cave has built up at least a metre or so, and that water entering the dune at various points of influx along this interface has cut channels down through the sediment into the limestone.

The process has been described as “syngenetic karst” which simply means that the processes of cave formation and dune formation were both happening at the same time. The mechanisms of this process, once started, are well understood, and were described by the late Alan Hill in a CEGSA Occasional Paper written shortly after CEGSA carried out the first comprehensive survey of Kelly Hill 65 years ago. The dunes were consolidating through re-solution and cementation. Drainage water percolating through the dunes tended to form a base level of flat chambers. Large areas of flat roof in these chambers gradually shed blocks of rock in an “upward mining”, in the process forming more stable arch or dome-shaped chambers. The soluble component of the break-down rocks continued slowly to be dissolved by the intermittent stream waters that were etching out the flat chambers. So far we have only considered development of the cave chambers themselves, but also within those chambers, as appropriate, various forms of cave decoration often will be simultaneously forming, at the earliest opportunity. Compared with the sometimes great age of other well-known cave systems we may form the mistaken impression that quaternary processes are too recent to give rise to any significant cave decoration. In one extensive chamber recently discovered within the Kelly Hill system large blocks of exquisitely banded flowstone occur that are of the order of 3 metres in thickness. Pushing the limits of Uranium series dating ascribes an age to this flowstone of around 750,000 years, so the chamber containing it already had considerable dimensions back then.

What has not been so clearly appreciated perhaps by most cavers otherwise aware of karst processes, is the important role played by cyclic climate change. Ice ages in the early part of the Quaternary recurred at intervals of about 41,000 years, attributed to synchronicity with the Milankovic cycles governing variations of the Earth’s wobble and orbital distance from the Sun. Over the last million years the cycle has changed to more like a 100,000 year period. That still adds up to many ice ages over the full 1.8 Million year duration of the Quaternary. The development of the thick blocks of flowstone already described above should span something like the last 8 ice-age cycles. Possibly at some time in the future someone might have the means and opportunity to interpret the spacing of the bands in this flowstone, and through correlation with known information about some of the ice ages, even fill in a few of the blanks.

The particular importance of these ice ages is that they were accompanied by a lowering of sea levels (see Figure 6), exposing large quantities of lime sand off the shore of Kelly Hill and other similar coasts. It is suggested that

strong onshore winds were then responsible for intense periods of dune building, during which time, exactly because of those very same ice ages, the surface stream flows would have reduced markedly and perhaps even stopped for extended periods. There are indications that these periods of low, or minimal, flow have been offset in past interglacials by wetter periods than we are currently experiencing.

The most recent ice age occurred between 18,000 and 10,000 years ago, and during that time the sea level dropped over 150 metres. Over the last 700,000 years only a small amount of time has been spent with higher sea levels than now, about 120,000 to 140,000 years ago, but the average sea level over the full 700,000 year period has been about 55 metres lower. Since past climates have had a part to play in karst processes at Kelly Hill, we must expect that anthropogenic climate change will also impact those karst processes in some manner.

### **The Magic Eye**

Some years ago I became aware of “Magic Eye” pictures, or autostereograms composed of subtly changing repeating dot patterns that unconsciously fed the brain on encoded depth information. It was possible to stare at the image for long periods without seeing anything but the repetitive pattern. Even so, something must have been going on somewhere in the brain, and a three-dimensional image would start to flicker into existence, and often take on a surprising vividness and reality. Having seen it once, your brain usually remembered enough to see it more easily the second and subsequent times, and it turned out, for me and some others obviously similarly wired up, to be quite an amazing experience.

That is the closest analogy that I can conjure up to explain an experience that I have recently had as a consequence of simply staring for long periods of time at a precious old topographic map of the Kelly Hill Conservation Park. Another analogy that might help would be the experience I shared with others who looked at our globes of the earth and noticed the way the east coast of the Americas along the western side of the Atlantic Ocean followed so well the West Coast of Africa and Europe on the eastern perimeter of the Atlantic. Half a century ago, after much ocean floor drilling, and mapping of the mid-Atlantic ridge, somebody joined the dots and the theory of continental drift was confirmed. We all became instant experts on giant jigsaw puzzles that made up the once-supercontinents Pangaea and Gondwana. I am trying to make the point about the difference between seeing with your eyes and actually seeing with the full bit, including your brain, when the light switches on in your head, if you get my continental drift.

I have been clocking up late nights poring over the detailed and very revealing topographic contour data, until, very much like the image first springing to life in front of one’s eyes when viewing a Magic Eye picture, all the pieces drop into place, and suddenly the whole region starts to give up its secrets.

The process is not quite as automatic as that invoked in the brain by a Magic Eye picture pattern, but there is no doubt in my mind that it follows some of the same steps. The photographic imagery itself is not intrinsically three dimensional in nature, but contains

clues such as shadowing, light and shade along ridge lines, and so forth, that may initially be ambiguous, but eventually when interpreted correctly make the most sense. In complex terrains, the ambiguity may be quite severe. Up until now we have been closely inspecting the visual data looking often near the limits to small scale resolution for unambiguous signs of entrance dolines, windows or solution pipes. Even these are not always obvious from the air, so it helps when we are already familiar with the feature on the ground and can then confirm the provenance of the aerial image. Such classic examples are the "K11" and "Little K11" entrances, the "K 1" entrance and so forth. Some other so-called "new" entrances are also unequivocal, but equally there are plenty of known cave entrances, such as "K3", where the initial dark zone is hidden by overhanging low cliff on the side of a relatively gentle depression, that may not be at all visible in the airborne data. This is where the separate topographic information immediately provides the important 3D component of the dataset, and can even confirm whether a particular shape is a local ridge or valley, summit or closed depression, which in turn can start to delineate adjoining and possibly related features, drainage lines and so forth.

Finally, we can perhaps quite painstakingly combine the two datasets, perhaps on paper, and certainly in the first instance within our mental imagery, to build up a comprehensive drainage construct which very quickly yields for us a consistent picture of what is happening right across the Kelly Hill Conservation Park.

Let us start first with the drainage system that we don't know all that much about, but we think we know best. The catchment starts well to the north of the south coast road. It is bounded on the west by tributaries to South West River, which drains into Hanson Bay, and to the east by tributaries to North West River which joins with North East River to form the Stunsail Boom River just before it crosses the South Coast Road and finally makes its way to the coast. In between these two quite distinct catchments is an area of land stretching 5 to 6 kilometres north of the South Coast Road and about 5 to 6 kilometres west to east. The western portion of this land forms the catchment for Little Terror Creek which flows into the eastern portion of the Grassdale property, now added to the park, and the eastern portion of the land drains via several channels into the main Kelly Hill Cave influx as well as a number of minor influxes along the base of the dune system immediately to the east of the main influx.

The relationship between all of these influxes can be quite complex, and has been made even more so by earthworks associated with culverts installed under the South Coast Road as it has been upgraded. The main influx is far more developed than the minor influxes, and still receives significant but ephemeral flows. This influx is characterised by water passing through rock-pile. It can easily be temporarily blocked by accumulations of sticks and leaves swept into it, and when that happens a shallow lake overflows back along the base of the limestone ridge and the excess water flows into several of half a dozen minor influxes up to a few hundred metres further to the east. It is not altogether clear where the water flows once it has gone underground. Underground watercourses are found in several caves up to a kilometre or more to the south of the tourist cave, including K11 and K88, but there is a further 5 kilometres or so of

calcarene dune between that location and the south coast, and there is little doubt that the water must make its way somewhere underneath that country.

In the middle of last century the show cave was established as the nucleus of a National Pleasure Resort, an evocative name for a facility operated by the State Tourism Board. The reserve so created stretched for 3 km along the South Coast Road. It extended south for about 1.5km in the east to include the entrance of K11, and about 3km in the west to include a large lagoon. Further to the south was a large section of un-allotted crown land, and further to the east along the road was a block of several thousand acres leased in perpetuity to a Mr Flavel. Eventually Flavel's land was purchased and added to the park. The un-allotted Crown Land was also included in the park, but separately designated as a Wilderness Protection Area. While both of these critically important acquisitions increase the conservation status of the area in total, the ongoing distinction between conservation park and wilderness protection area tends to perpetuate the notion of separate objectives for each distinct parcel of land, rather than giving due recognition to the intrinsic interconnectedness of the karst drainage and associated attributes of the whole area. It is especially clear that the already noted extent of the catchment north of the South Coast Road potentially makes the karst drainage within the total area vulnerable to any inappropriate practices that might be undertaken within that northern catchment. Whether this vulnerability can be adequately managed by placing and ensuring compliance with reasonable constraints on permitted practices within the northern catchments is a matter for future consideration.

South and to the East of the main catchment for Kelly Hill Tourist Cave, but west of the North West River/Stunsail Boom catchment there is another distinct catchment, consisting of about 4 square kilometres of almost flat plain north of the South Coast Road and another 5 or so square kilometres of similar country to the south of the South Coast Road. About a kilometre east of the Kelly Hill Tourist Cave the edge of the calcarenite dune system cuts back in a south-easterly direction and at the base of the main dune ridge there are a couple of closed depressions, one of which fits the description given by Harry Hansen, the first Ranger at Flinders Chase, as taking water during flood conditions. A portion of the hilly dune country to the west of this feature also contributes to its catchment. While there is no record of floods sufficient to trigger this mechanism in recent times, bear in mind the previous discussion about periodic glacial cycles and wetter inter-glacial periods.

There is a third, more complex catchment, as illustrated in Figure 7. The large lagoon about 3 km southwest of the Kelly Hill Tourist Cave is rarely seen with large quantities of water these days, but is in itself evidence of wetter times in the past. The lagoon is bounded to the south behind coastal calcarenite dunes and appears to take drainage from the more westerly portion of the old National Pleasure Resort. The aerial photography and topography clearly shows the lagoon draining towards the sea at both the eastern and western ends. At the western end the drainage from the lagoon makes its way under overflow conditions towards the adjacent flood plains alongside the Southwest River in Grassdale, and thence to the sea at Hanson Bay. At the eastern end,

the drainage proceeds down a short channel (that would presumably have filled with sediment by now without being kept clear by periodic flow) where it appears to dive underground. It looks as though it once re-appeared in a smaller lagoon, these days almost permanently dry, before taking two separate courses as it progresses through and under some of the highest dune country in the entire park. A few hundred metres further to the east, the easternmost drainage channel is aligned with a closed depression about 30 metres deep.

The relationship between all of these features suggests they functioned normally when the main lagoon itself was more active during wetter conditions. Even if no

immediate access is available to cave tunnels which may have been active at the peak of the wetter period(s), there may exist evidence of, or sections of, such tunnels that confirm such past activity. This also supports the notion of wetter periods feeding an eastern influx. It would be great if we could find conclusive evidence straight away, but in any event the indicators are so strong that both of these areas are prospective for a close and thorough investigation.

Because of the need to book ferries and accommodation well ahead, planning is already in place for several visits this year. Like the newly discovered Phoenix Cave, much is rising from the ashes.



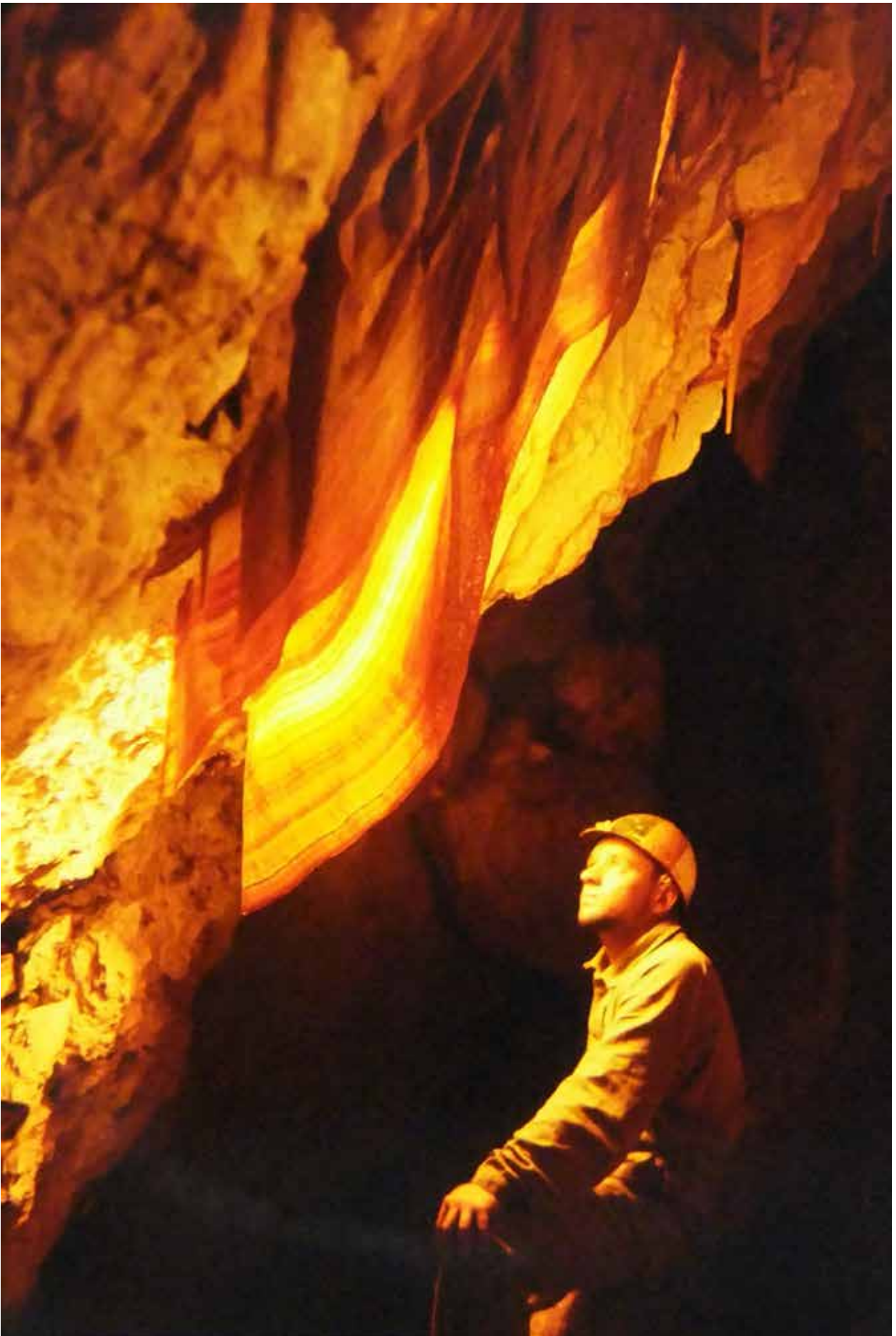
*Figure 1: "Trog's Delight" with a younger version of the Author, for scale.*



*Figure 2: Dense decoration reasonably common in Kelly Hill.*



*Figure 3: A reasonably representative scene in Kelly Hill*



*Figure 4: Professor Tom Wigley in earlier days admiring a group of shawls in the “Trog’s Delight” chamber, Kelly Hill.*

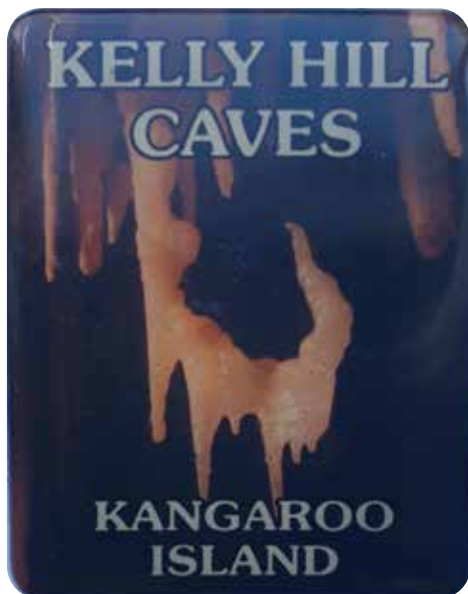


Figure 5: The Shark Hook Fridge Magnet. Unfortunately now a collector's item.

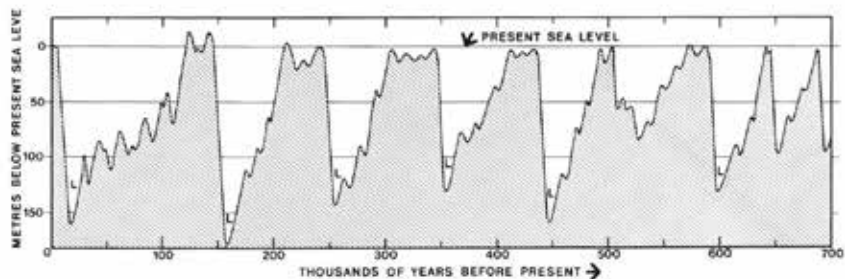


Figure 6: Historic Sea Level Change. After Chris C Von Der Borch, in *Natural History of Kangaroo Island*, 2nd Edition, published July 2002 by the Royal Society of South Australia (Inc.)

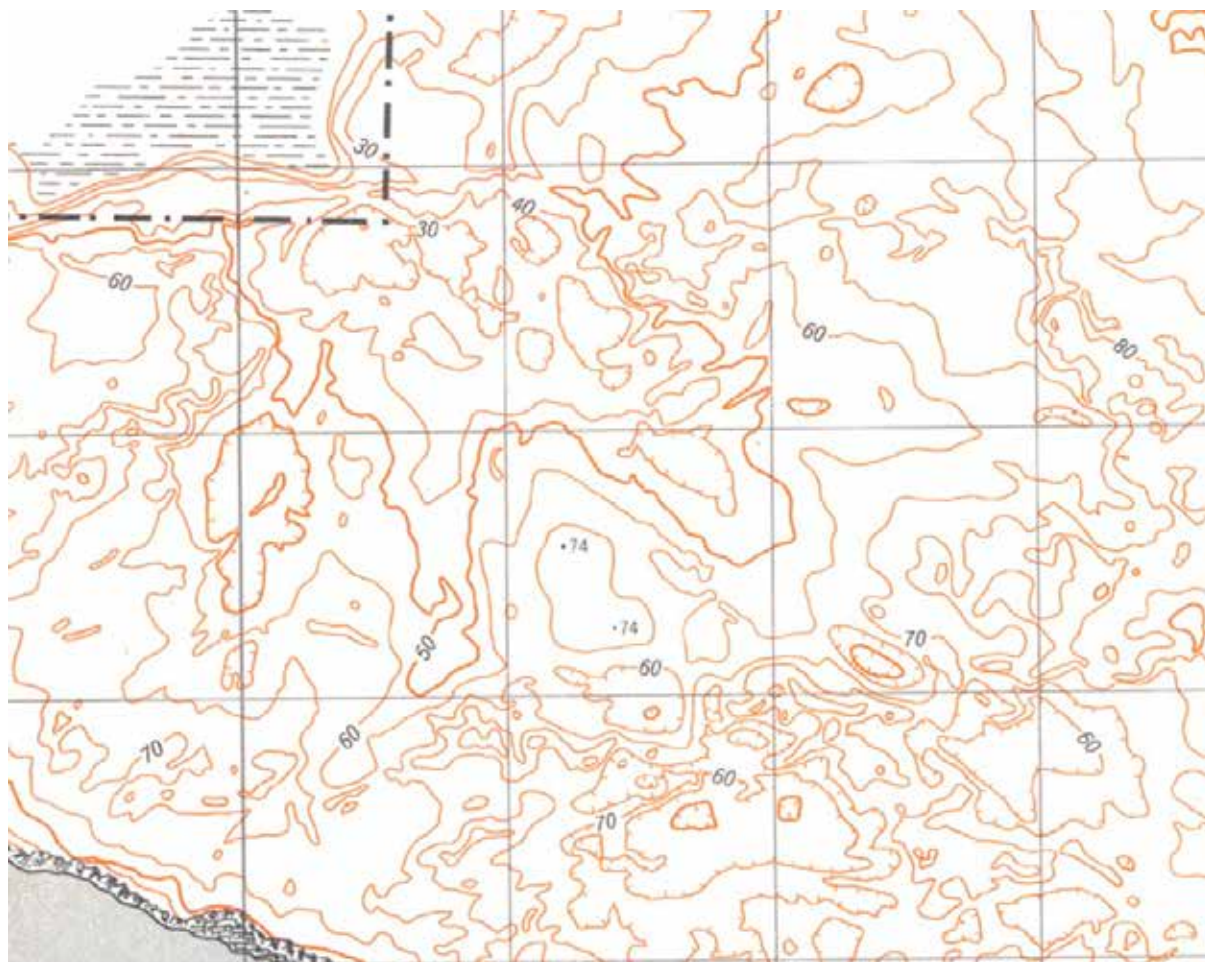


Figure 7: Excerpt from Grainger 1:50000 topographic map, sheet 6226-II, early compilation copy, showing interesting contours to the South-east of the Grassdale Lagoon. Strong lineations linked to the South-east corner of the lagoon are evident as well as deep closed depressions. Contours are at 10 metre intervals, and closed contours have tick marks on the down-slope side of the contour line. Grid-line spacing 1 kilometre.

# Ernie Holland and the Cave Divers at Jenolan

Ian D. Lewis - Prisident, CEGSA Life Member, CEGSA and CDAA

In the 1970's, cave diving took off in Australia on a national scale. Sinkholes in Mount Gambier were being explored and mapped and the vast underwater caves of the Nullarbor were being discovered. Some of us from the Cave Divers Association of Australia (CDAA) then turned our attention to the challenging cave diving in the highlands of Eastern Australia.

We contacted Ernie Holland at Jenolan to ask if the underground river could be re-explored after Ben Nurse and Denis Burke of SSS had made their initial discoveries 20 years before in the early 1950's. We were not optimistic that the Jenolan management would be receptive to our proposal after the series of cave diving deaths in Mount Gambier, but Ernie was excited and very supportive. I think he must have already been aware of our increasing skills and achievements in underwater caves elsewhere. We made several trips across to Jenolan from South Australia and combined with Sydney cave divers Ron Allum and Al Grundy over several years. Each dive revealed more of the hidden Imperial River and the sumps etc on the Lucas Cave side of the Arch. Ernie was always keen to hear of our finds and insisted that we write them up in the log in the Guides Office which we did, and they are on record there.

Ernie thrived on the exciting stories we began to bring back from our diving. There was great excitement when I found a smoker's pipe sitting on a rock in a dry chamber after Sump 6 in Imperial Cave and brought it out. It was instantly recognised by Senior Guide John Culley as his own pipe from a previous dry cave exploration decades earlier from an upper level down into a chamber which

had a small pool in a side tunnel ... where I popped up with dive gear from the other side, decades later. Ernie and John and all the guides were really chuffed to learn of this connection as it validated their long-held story of the earlier Guides exploration, the Lost Chamber, and the pipe.

On another occasion in the first Imperial River sinking in the tourist area of the cave, we dug our hands in the mud and gravel and came up with fingers dripping with pennies, thruppences, shillings etc thrown into the pool by generations of visitors! Ernie and the tourists watching on loved the great publicity shots! There was more excitement when our first RDF point beyond several Imperial sumps was located directly beneath Cave Guide John Callaghan's carrot patch halfway up the hillside behind his house! Ernie's outgoing character delighted in such stories.

As cave divers, we have always been grateful for the full-hearted support that Ernie gave us as without that, or with a more cautious management at the time (perhaps less speleo-oriented), none of this would have happened perhaps for some decades more - or maybe not at all with modern management risk aversion for some types of outdoor activities in public reserves and Parks. Ernie was keen that the divers' discoveries be woven into the Guides' stories as part of the rich exploration history of the Jenolan Cave system.

Ernie, it was privilege knowing, working, and laughing with you and you have the fond and grateful memories of the cave divers for all that you did for us!



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# Cure for the Itch

Steph Massacci

## Living my childhood dream.

Cave guiding at Naracoorte Cave National Park in South Australia's southeast along the limestone coast, has been a favourite holiday destination of mine since a family holiday when I was a young child. Like many children the idea of going down into the Earth (a cave) was daunting at first, however after becoming mesmerised by the natural beauty I was instantly hooked. Being an avid Jurassic Park fan, the Victoria Fossil cave captivated me and fostered the desire that working with fossils of extinct animals wasn't just something from the movies. Now years later, this once young, captivated child has been able to pass on the passion to the next generation of potential palaeontologists and cave enthusiasts.

Even with Covid restrictions there was always a massive smile under the mask. Photo credit: Jack Parker Visuals

After exploring other potential career avenues such as veterinary nursing; there was still an itch that the veterinary industry wasn't scratching (and no, nothing to do with fleas!). I began to re-evaluate where I wanted to be to find the spark of inspiration, just like my younger self had in the caves all those years ago.

With much deliberation, I finally began a science degree at the University of Adelaide with mid-year entry during 2018, and at the conclusion of 2021 I had completed my Bachelor of Science in Palaeontology and Evolutionary Biology; a feat that had my younger self had previously thought was out of reach. Throughout my studies at university, I had the opportunity to attend multiple

field trips down to the Naracoorte Caves and this was organised due to the amazing and incredibly rich fossil deposits. This has led to its world heritage listing for the exceptional preservation and abundance of Pleistocene (2.58Ma-12Ka) faunal remains. Toward the conclusion of my degree, I was presented with the opportunity to join the site interpreters of Naracoorte which was an exceptional opportunity. So, with bags packed, I temporarily moved over four hours away to Naracoorte for the Christmas period.

Becoming the person, who in my opinion had the best job in the world was an absolute dream come true. Having the opportunity to engage with the extended community, and to share my passion for cave conservation, whilst discovering and sharing the stories of the past in the hope to inspire other adults and the next generation, brings me immense gratification. The enthusiasm of other science communicators, such as Sir David Attenborough and Steve Irwin have inspired my dedication to encourage everyone to become as engaged with the caves and the fossil stories as possible.

This experience has cemented in me that the world of palaeontology and science communication is where I have desired to be and has definitely 'scratched that itch'. While I continue my studies in palaeontology, currently beginning my honours degree, I look forward with much anticipation for the next holiday break where I can engage with future cave and fossil enthusiasts again.



*Even with Covid restrictions there was always a massive smile under the mask. Photo credit: Jack Parker Visuals*

# The Australasian Celebration of the International Year of Caves and Karst competition

The Australasian Celebration of the International Year of Caves and Karst competition, a joint initiative of ACKMA, ASF and NZSS had been well attended and the winning entries were notified 18th December 2021.

ACKMA alongside our friends ASF and NZSS provided the \$1,000 grand prize and Ledlenser provided four \$500 vouchers. There were 52 entries in all, in different media. The most popular section was written entries comprising poems and stories. All entries have been provided to the joint partners and ACKMA Editor and Webmaster. You will see entries in our journal, social media and web site in the coming months.

## **Winner Video entry - 'Adapted to the dark' by Sil Iannello**

The judges recognise the original work, the science behind the subject, the importance of the conservation message and the overall flair of the presentation.

## **Winner Creative arts entry - 'Harwoods hole' by Peter MacNab**

The judges recognise the cutting edge techniques of a cave scene of significance which also made the judges feel drawn into the scene.

## **Winner Photograph entry - 'Croesus wandering' by John Oxley**

The judges recognise the ability to achieve depth, reflections and composition which draws you in and the old mythology of the scene Croesus in a modern day image which brings the traditions of mythology of the past into modern day technology.

## **Winner Stories and poems entry - 'A karst of shadows' by Leah Miller**

The judges recognize the skill to play on words, the character and the journey. Leah was also able to create sounds in the heads of our judges through her creative writing.

After carefully assessing all the entries, deciding on the winners of each of the categories, this entry 'A karst of shadows' has been awarded the Grand Prize.

## **A special thanks to our generous sponsor Ledlenser.**

Thank you to all the 52 participants, especially the children's entries, some of which rivaled the adult entries. It was especially interesting to read the inspiration behind the works. There really has been a wonderful amount of creativity on the subject of caves and karst. The ASF, NZSS and ACKMA worked very well together to coordinate and run this competition but it would not be a success if it were not for the participants. Some of which spent months creating their art, cross stitch or writing. Wellington Caves NSW showcased the entire set of entries over the December 2021 school holiday period into February 2022. As mentioned in my December report these can be made available for any cave tourist site for exhibition. I would encourage any cave tourist site and any speleological society to work with their local arts group to run something suitable to celebrate the International Year of Caves and Karst.

## **A LITTLE ON THE JUDGES:**

### **Domino Houlbrook-Cove**

Domino is a passionate landscape photographer and independent artist. Domino's images have won a number of awards and her work appears on national and international tourism websites as well as in brochures, travel planners and magazines.

As an independent artist she has appeared in productions across Sydney, the Blue Mountains and Central West releasing her first CD in 1997. Since moving to NSW's Central West, she has also trained and mentored aspiring singers/performers.

Domino was fondly known as the 'Singing Guide' of the Jenolan Caves, for 25 years. Starting as a casual guide and then moving into various permanent roles including guiding, sales & marketing specialist, meetings and events manager and media liaison. She performed annually in the Carols in the Caves. From 2006-2013 she took on the roles of Producer and Director of Carols in the Caves and associated Festival winning multiple awards.

### **Lisa Thomas**

I am currently considered retired from full time paid work, however manage to spend a large amount of time equivalent nearly to full time work as President of Wellington Arts. Way back in the 1980's I completed a fine arts degree and then working life and family got in the way of being creative!!!! The past 4 years have allowed me to explore my creative urges in a more hands on way but I am enjoying new challenges, the use of new mediums and learning from professionals.

Wellington Arts Centre Inc, as we are registered as, formed in Wellington in 2015 and has now evolved into a growing and vibrant, recognised arts hub within NSW with close to 100 members.

We are 100% volunteer based with a very strong focus in the delivery of a diverse range of community events and projects in and around Wellington NSW. The principal aim is to foster inclusiveness and work effectively on bringing the community together through the arts. Our projects often involve the ability to work with other not for profit organisations within our community and foster partnerships with like-minded artists. Our members group consists of an assorted range of vocations and brings together a wealth of talent not only in the arts but in professional capacities and business skills.

We are very fortunate to have the Wellington Caves complex on our doorstep and look forward to being able to support the 2021 initiative through the arts.

Lisa was awarded Citizen of the Year award on Australia Day 2022 in Wellington NSW for her work in the community of Wellington NSW.

### **Michael Burge**

Michael is a writer, journalist and artist with three decades' experience in the performing arts, broadcasting, media, events and publishing. He is a graduate of Australia's National Institute of Dramatic Art, and ARTTS International (UK). Currently director of the annual High Country Writers Festival, Michael is also curator of The Makers Shed, a New England artisanal gallery; and oversees performing arts tours for Arts North West, the RADO of the NSW New England North West region. His debut novel, a coming-of-age thriller set in rural Australia, will be published in 2021 by MidnightSun. From 2008 to 2012 he enjoyed working as a casual cave guide at Jenolan Caves, where many underground journeys inspired his next full-length work of fiction. Michael's work can be accessed via [www.burgewords.com](http://www.burgewords.com)

## ANDYSEZ 63 - *Lightning and caves.*

Andy Spate

My father had a little aphorism that he trotted out from time to time when circumstances suggested it:

*Lord xxx tried to fix the electric light.  
It struck him dead and serve him right!  
For it is duty of the wealthy man,  
To provide employment for the artisan.*

The Victorian State Electricity Commission had this as a warning in the early 1960s:

*Boy – pliers  
Electric wires  
Boy ashes!*

Whether these have any relevance to this ANDSEZ maybe doubtful.

But Mary found this in the Manawatu Standard newspaper for 20th December 1883.

So why could lightning and caves be connected, and do we have to worry?

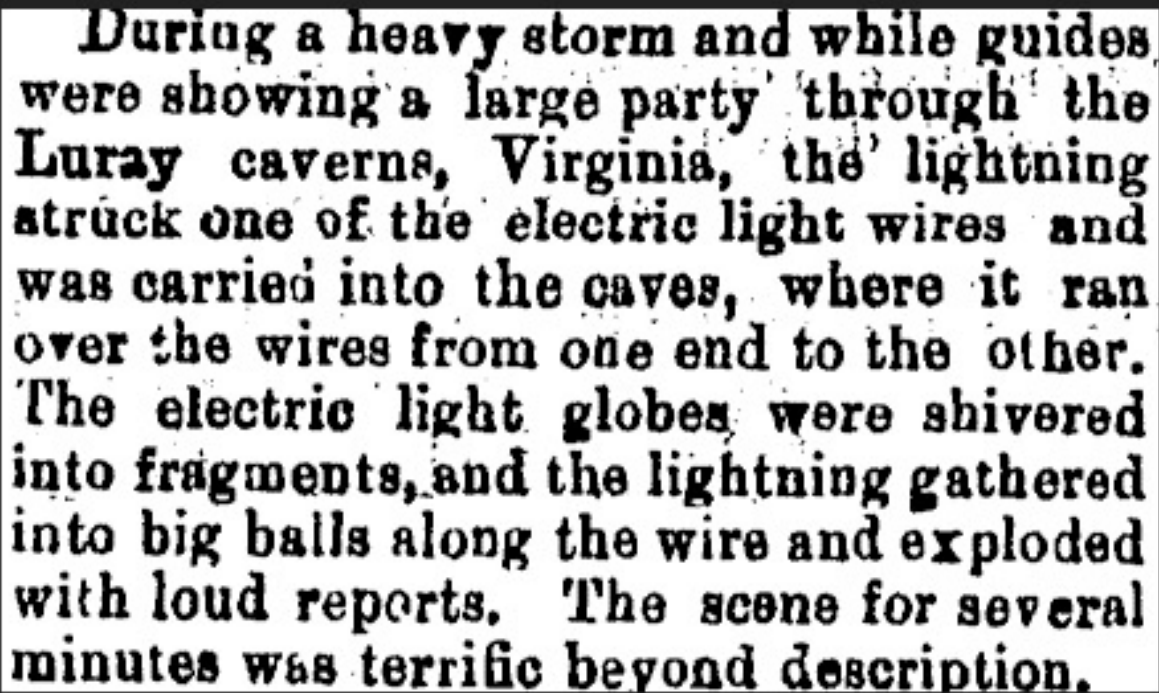
Andy Baker says:

*I do teach a little on the electrical properties of rocks, but related to solar flares and coronal mass ejections and their impacts. Limestone has about the highest electrical resistivity of all rocks, so it would seem logical that if there's a strike at show cave entrance, the current would take the most conductive route.*

*I found this map of lightning strikes / km<sup>2</sup> / year which could be interesting to compare to karst areas?*

*<https://www.weatherzone.com.au/news/where-is-australia-s-stormiest-place/535130>*

*That would be interesting. Geology doesn't influence the location of lightning strikes, so I would not expect a causal*



**During a heavy storm and while guides were showing a large party through the Luray caverns, Virginia, the lightning struck one of the electric light wires and was carried into the caves, where it ran over the wires from one end to the other. The electric light globes were shattered into fragments, and the lightning gathered into big balls along the wire and exploded with loud reports. The scene for several minutes was terrific beyond description.**

The connection between the gentleman who was in Luray Caverns (USA) and a newspaper in Palmerston North, North Island, New Zealand is very enigmatic.

But it allows us to have an ANDSEZ 63. I write this in a thunderstorm in Tasmania so if it does ever appear uncompleted, I have been thunderstruck!

I seized on Mary's contribution as the idea behind another ANDSEZ as I read somewhere some years ago about the potential risks for visitors to show caves – but no amount of googling and consultation with colleagues here and abroad has led me back to that source or similar observations. So regrettably what I have to present this time is a bit fragmental.

*relationship. But it should be possible to identify areas which have higher and lower probability of a lightning strike occurring near a cave entrance. Maybe NSW ranges (Wellington, Wee Jasper, etc.) with about 60 strikes / km<sup>2</sup> / yr if I guesstimate from the scale on the map.*

Dave Gillieson tells me:

*I do recall lightning striking near Henry Shannon and myself on Viator Hill at Texas, as we came out of Russenden Cave to a summer thunderstorm. Warm moist air rising from the entrance? Ground conduction of electrical discharge? Who knows?*

There are many climbers' tales of being on ledges and shallow overhangs during lightning storms and having their gear buzzing with static electricity. Rick White and I had ball lightning run along the ground for 50 m near us at the top of a climb at Binna Burra.

The inimitable Bill Halliday has this to say:

#### PROTECTION AGAINST LIGHTNING

To the Editor

In the April 17, 1954, issue of *The Journal* (page 1353) the "Code for Protection Against Lightning," compiled by the National Bureau of Standards suggested in part that shelter from lightning should be sought in a cave. Despite the recognized reliability of the Bureau of Standards, it appears that, in this case, it has been misled by the scarcity of physical studies in North American caves — a deplorable situation that the National Speleological Society is attempting to correct. Studies by European speleologists have revealed that conductivity and degree of ionization of cave air generally exceed that of outside air (British Caving, Cullingford, C.H.D., editor, London, Routledge & Hegan Paul, Ltd., 1953, p. 151), and it is their belief that this creates a potential lightning hazard. It is an empirical observation that trees near the mouths of caves in certain French forests are more frequently struck by lightning than those elsewhere in the woods (Norbert Casteret, quoted by Myers, J. O., in *British Caving*). Furthermore, a noted French speleologist was knocked from the steel cable ladder on which he was descending in the cave of the Hennemorte several years ago when lightning struck a tree at the edge of the cave entrance. Fortunately, he was tied to a safety rope at the time and suffered no severe injury (Trombe, F.: *Lc Mysicrc de la Hennemorte*, Paris. Susse, 1948, pp. 60-61).

In North America, newspaper reports in recent years have told of the death of a girl scout and injury of several others when lightning struck the entrance of Wind Cave.

Wyoming. In addition, one mountaineer was reported killed and at least one was injured while climbing in the Bugaboo range of British Columbia when the rock shelter in which they were resting was similarly struck. As a result of these observations, it appears that caves, and even mere rock shelters, are actually very unsafe refuges during thunderstorms.

William R. Halliday, M.D.

Member, Board of Governors

National Speleological Society

270 G St., Salt Lake City.

Journal of the American Medical Association, vol 155 1956.

Following NSS article is anecdotally useful regarding lightning safety:

<http://forums.caves.org/viewtopic.php?f=13&t=3691>

This link tells you more about the science of lightning — and about amazing mega flashes. Can you imagine a horizontal lightning flash of 17 seconds duration stretching many hundreds of kilometres!!

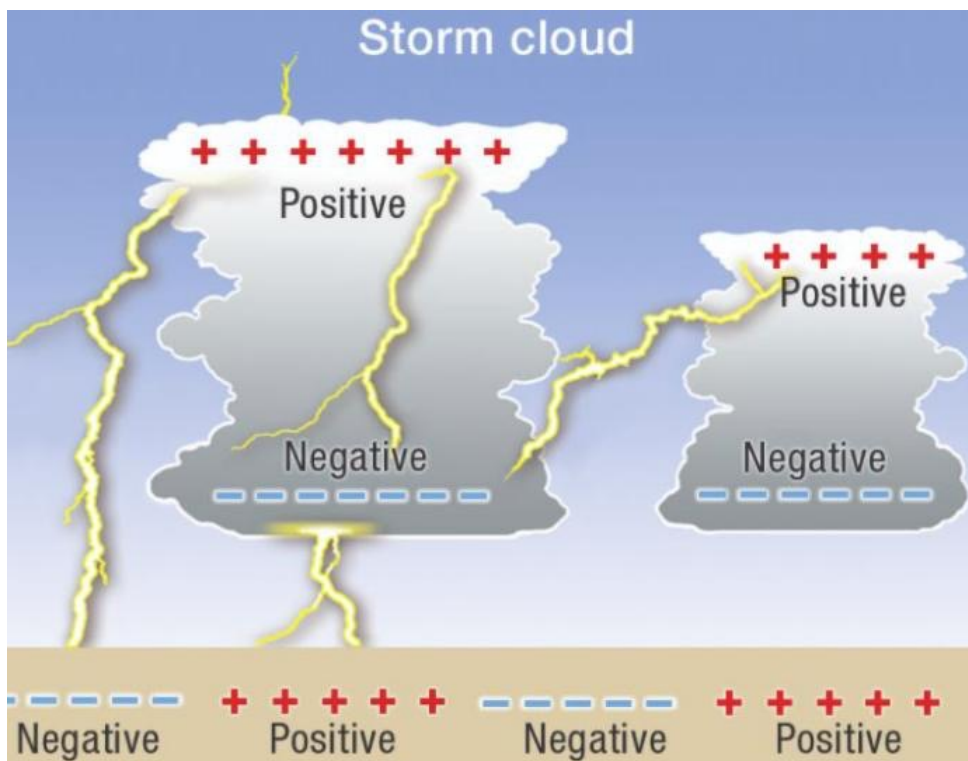
Read the link ...

Anyway? what relevance has this to ACKMA? Firstly, stay away from cave entrances during thunderstorms — go deeper!

Secondly, the article that stimulated my interest in this many years ago — that I cannot find again — discussed the dangers of lightning in show caves as evidenced by Mary's article. It suggested, if I remember correctly, that show caves should have a metre gap close to the entrance to avoid electric shocks deeper in the cave — I doubt whether it would be enough if lightning strikes close to the entrance.

I would love to hear if anyone has better information than this.

Thanks to Mary, Andy, and Dave.



The image above comes from <https://www.abc.net.au/news/science/2022-02-03/megaflash-lightning-what-is-it-and-do-we-see-it-in-australia/100798672>

