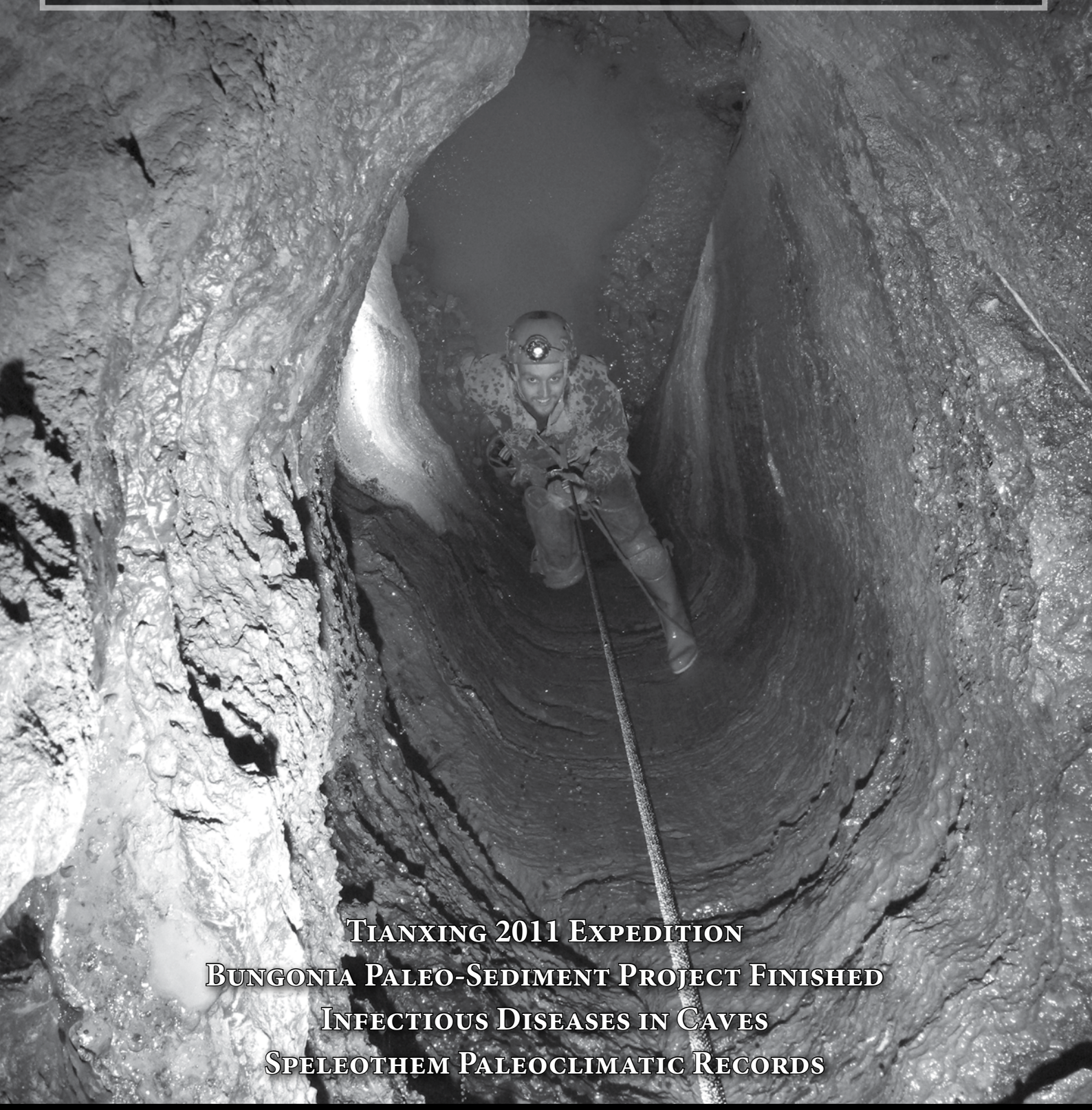
CAVES AUSTRALIA

The Journal of the Australian Speleological Federation



Tianxing 2011 Expedition
Bungonia Paleo-Sediment Project Finished
Infectious Diseases in Caves
Speleothem Paleoclimatic Records

No. 187 • DECEMBER 2011

COMING EVENTS

This list covers events of interest to anyone seriously interested in caves and karst. The list is just that: if you want further information the contact details for each event are included in the list for you to contact directly. The relevant websites and details of other international and regional events may be listed on the IUS website http:///www.uis-speleo.org/ or on the ASF website http://www.caves.org.au. For international events, the Chair of International Commission (Nicholas White, nicholaswhite@netspace.net.au) may have extra information. This list only covers events in 2011 and the first half of 2012.

However, 2013 looks very busy with the next ASF Conference, TAGalong, in January at Galong NSW, the ACKMA Conference in May at Waitomo Caves, New Zealand and the international IUS congress in July at Brno, Czech Republic.

We'll keep you posted on these events in future **Caves Australia** *issues*

2012

January 7

ASF Council Meeting, Bankstown Grammar School Sydney. For details contact your club.

March 14-18

15th International Symposium on Vulcanospeleology, Amman, Jordan. Caving field trips to the volcanic fields of Jordan and possibly Syria, March 19-22, 2012. Details are available at http://www.vulcanospeleology.org/

April 11—13

15th Australasian Bat Society Conference and AGM, Melbourne. Details on the society website: http://tinyurl.com/7uravjk

May 4-6

ACKMA Annual General Meeting (and 25th birthday), Wee Jasper, NSW. For details contact Suzanne Newnham suzannenewnham@skymesh.com.au.

June 25-29

NSS Convention in Greenbrier Valley, WV. For details see the MAYACON 2012 website (http://www.nss2012.com/)

September 13-15

International Congress on Scientific Research in Show Caves, Skocjan Caves Park, Slovenia. The Congress will focus on scientific research in show caves. For details of the venue, program and costs check the Park Škocjanske jame website http://www.park-skocjanske-jame.si or e-mail: psj@psj.gov.si for details.

September 16 -21

39th International Hydrogeology (IAH) Congress, Niagara Falls, Canada. The 2012 Congress will allow the presentation of a wide variety of new and evolving hydrogeological issues and opportunities that includes a major session on Karst Hydrogeology. For details see: http://www.iah2012.org/index.php

Mole Creek Caving

A letter to the Editor

To the Editor:

The article in *Caves Australia* 185 titled "Whatever Happened to Mole Creek?" by Stephen Bunton was a good and interesting account of the history of caving at Mole Creek in Tasmania but I was disappointed with the author's portrayal of Stephen Blanden as a secretive solo caver towards the end of this article and I wanted to respond to this. As a proofreader for this publication I was upset to have missed the comments made in this article and I can only apologise for this oversight.

Soon after Stephen Blanden's arrival in Tasmania in 1984, he became an active caver and has been a member of the Savage River Caving Club since 1991. Stephen is also currently a member of the Northern Caverneers and has been for many years.

During this time Stephen has contributed to and made available much information to the Speleo community on Mt Cripps, Gunns Plains, Moina Caves and Mole Creek in either specific publications or in the many articles published in *Speleopod* (the journal of the Savage River Caving Club) and in *Troglodyte* (the Northern Caverneers magazine).

The claim that "...there is no real, concerted effort at systematic documentation of the caves by cavers..." is not true. Stephen has systematically documented many karst areas in north-west Tasmania (*Caves of Gunns Plains,* 2004; Moina Caves, 2003 are good examples) and he is currently working on a publication that documents the caves of Mole Creek.

All of his publications are available for purchase through Savage River caving Club or Stephen himself. Stephen was offended at being labelled an "amateur caver" and I am not surprised, because with this list of achievements in karst documentation, that label is unfair.

—Jodie Rutledge

CAVES AUSTRALIA

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ASF

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Cover: Pitch in Da Keng Wan, China. Photo by Rob Middleton.

ASF Executive

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Vice President	Phil Maynard
Vice President	John Cugley
Treasurer	Grace Matts
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EDITORIAL

PLAN FOR ACTION

RE-READING the Timor quarry struggle to protect the karst *(Newcaves Chronicles* Vol.34 July 2010) has brought back memories of smaller local struggles in our area: a plan to enlarge a quarry; rezoning of land from rural to heavy industrial; 'harvesting' water from catchment areas and creeks and pumping it into storage dams.

In every instance a plan has been presented to our community with minimal community consultation and, to my recollection, with scant regard for the environmental issues, despite protestations to the contrary.

Some of the strategies used here to try to change/influence plans might be helpful if your club has concerns about an issue:

- **Ask to see the Development Application (DA). There may even be older DA's for the same area. Check if guidelines have been breached in the past.**
- **Get a copy of protected woodlands (Box/Gum) from NPWS. Do a flora and fauna checklist. As well, check to see if development change will have any effect on water.**
- **Contact individual local council members (after a committee of some kind has been formed). In every instance we found that council policy is not unanimous. Writing letters to our local paper before contacting them proved helpful, too.**
- **Find like-minded groups and broaden your support.**
- **Meet regularly, keep good minutes and keep everyone informed. Local stakeholders (landowners) we found nearly always supportive and informal networks quite influential.**

All campaigns are very wearing and wearying.

Despite this, our experience has been (as was NVHSS's) that community/personal ties are strengthened and new friends made.

President's report

Season's Greetings to One and All

ONE OF the undisputed laws of the cosmos is that as we get older time flies faster (this is now further supported by the recent observation that matter can go faster than the speed of light).

2011 has all but disappeared behind me as I have had my head and mind absorbed in the complexities of human neuroscience.

Many times this year I have related personal events in and around caves and observations of fellow cavers and found interesting insights as to what makes us different and also the same and what the real addiction to caving is all about.

I promise an interesting article for an upcoming issue of *Caves Australia*.

The warmth of summer encompasses me and a few upcoming opportunities to venture underground are welcome and I will head north and east to do just that.

This year has seen many things happening in Australian caving with great new discoveries and subsequent documentation all around the country.

Every state has far from exhausted the exploration potential of its own karst and it often is the more accessible cavities that get the immediate attention.

With time and energy, gaps in knowledge will be filled and other small gaps may be slightly modified (to allow me in!)

It is great to see that all problems and disputes have definable and attainable solutions and, given the wide range of personalities and backgrounds of all cavers and cave managers, time is the important element… everybody can mellow and back down from their personal agenda. Time heals.

I look forward to meeting as many of you as can come to the ASF Council meeting in January in Sydney.

It will be a time to define and tick the boxes and see where and how the Federation is developing and being effective.

We may think we get bogged down in politics in ASF but as a professional body we must be able to be introspective and break out of self-limiting practice and move forward as is necessary.

We will meet to discuss and develop and show the world what our common sport, hobby and vocation of Speleology is all about.

I commend all of the Executive and Commission members for the tireless work they do. ASF is in a good place and is moving forward in a timely manner.

The potential of where to go to is limited by energy and, to a smaller degree, time.

Let us get down and dirty, then clean up and talk the talk.

In Caving
Stan Flavel

WANTED **ARTICLES FOR *CAVES AUSTRALIA!***

Whether caving, cave diving or generally just caving, *Caves Australia* readers are interested in YOUR story.

It is only with YOUR contribution that we can produce a quality magazine for all to enjoy. For writing and style guidelines, contact the Editor or Production Manager for further information.

Tianxing 2011

Alan Jackson
STC

THE Hong Meigui Cave Exploration Society (HMG) has been taking on the immense task of exploring the caves of China's vast limestone geology since January 2001. This year four ASF members were lucky enough to tag along on the annual expedition to the area of Tianxing this past September, enjoying a few weeks of deep vertical cave exploration.

To provide the full background on the history and accolades of HMG would require a lengthy article on its own. A fairly comprehensive website covering the "who, what, where and why" of the society can be found at www.hongmeigui.net. In a nutshell: China is a bloody big country; a very large percentage of that country is covered with limestone; that limestone is chock full of empty spaces conducive to a sport called 'caving'. In the eleven years that HMG has been up and running its members have participated in over 90 expeditions and have explored and surveyed over 388 km of cave. The longest individual cave/system is 61 km long and the deepest cave so far is 1020 m (with estimated depth potential in excess of 2000 m in one area). In short — China is a cave explorer's paradise.

This trip was the 11th annual expedition to the Tianxing area. Tianxing is a small tobacco-growing rural village perched high in the rolling hills of southwestern China. To get there we flew into Chongqing (a massive filthy super-city on the Yangtze River with a total municipal population of around 29 million people). Chongqing met all my expectations of what urban China would be like — packed with people, high-density apartment block living, traffic chaos, horrendous air pollution and a raging pace of development. The next leg was a ~2.5 hour bus ride east on the new (4-5 years old) motorway to the city of Wulong. Apparently this leg used to take around 7 hours by bus but the motorway carves a more direct line with little respect for valleys or mountains; soaring bridges and numerous tunnels (up to 7 km long) cut a swathe through the increasingly exciting karst landscape. Wulong, a small city of around 300,000 people, is a popular spot for local and international tourists; it acts as a gateway to the South China Karst UNESCO World Heritage Site.

DIMA PARSHIN

Tanya (Russia) and a shield in Zuan Yan Keng

From Wulong it is usually a short trip up into the hills to Tianxing, via a visit to register with the local police in nearby Jiangkou. However, due to a road closure this year, it took an extra hour or two to get to our destination. The motorway was soon a distant memory as we were whisked up the narrow, gravel, winding goat track with our driver trying to emulate some rally driving hero.

ALAN JACKSON

Typical Chongqing traffic

THE EXPEDITION was for five weeks but we Australians only turned up for the last three weeks. A total of 25 people participated but only seven of those people stayed the full five weeks. There were 12 Poms (one of whom, Duncan Collis, resides principally in China and has been a driving force behind HMG since the beginning), four Australians (Serena Benjamin, Janine McKinnon, Tim Moulds and me), four Russians, a Canadian, two Americans (Steve currently lives in Shanghai and Erin Lynch mostly lives in nearby Wulong and is the adhesive that formed and binds HMG together), one Chinese and one Indian. Numbers fluctuated during the expedition but peaked at 24 for almost a week in the middle. It was a lot of people.

Accommodation and facilities were

Karst scenery on the track to Da Keng Wan

pretty good. Erin's long presence in the area (11 years), her command of the language and, most importantly, her vivacious yet diligent personality means that pretty much everything has been thought of and planned for in advance.

The expedition had access to numerous rooms (gear store, common room, sleeping areas and so on) and the owners of the buildings, Mr Liu and Mrs Wei kept us supplied with important consumables — principally food and beer.

The only real problem for this year's expedition was the water shortage. It had been dry in the preceding months and being surrounded by a karst area tends to mean that surface water doesn't hang around for long. All drinking water was (and always is) brought in in bottles/drums but this year there was very little washing or toilet flushing liquid. Important parts of the body were kept clean with a large supply of wet-wipes. Caving gear cleaning was restricted to the bare minimum — for inspection of PPE safety. The toilet became increasingly unpleasant as the expedition unfolded. Trogsuits were standing up by themselves, everyone was covered in a general layer of pig shit and cave mud (often the same thing in rural China) and the general odour was pretty bad. Fortunately we all smelled as bad as one another.

DIMA PARSHIN

Entrance pitch, Da Keng Wan

The first priority of the expedition was to push Zuan Yan Keng, or People Go Down Cave (PGD). PGD is not a translation of Zuan Yan Keng — keng means 'pit' but Zuan Yan is more a geographical reference than anything else. PGD had first been found, a mere 150 m from 'down town' Tianxing, in 1994. The first part of the cave consists of a complex series of small active inlets and oxbows with numerous dead ends. During the 2005 expedition the cave was revisited as a distraction from the main push in another cave, Lan Mu Shu, and progress was made to a large active stream passage. Several hundred metres of deep pools ('lobster pots'), short cascades and ledge traverses have formed in the most appalling rock imaginable (a band of mudstone sandwiched conformably between limestones). Time ran out with the cave at -177 m deep and 1.7 km long and wide open streamway passage. A little more progress was made in 2006 which saw the end of the horizontal streamway passage reached (now coined Comfortably Numb) — it terminated in a ~50 m pitch. The nature of the rock still hadn't changed but, thanks to some extra long through bolts, the pitch, christened Crappy Crapola Crapstone, was dropped and some real limestone was found again. The survey only made it to the top of Crappy Crapola (-207 m deep and 2 km long) but the way on beyond the 50 m pitch was open.

Imogen Furlong had been on the 2005 expedition and PGD had been eating away at the back of her mind for years. Imo has caved extensively internationally and had little trouble pulling together a strong international team from the contacts she's made over the years for a proper PGD push in 2011. By the time we Aussies arrived at the end of week two the known parts of the cave had been rigged (with quite a bit of


NICHOLAUS VIEIRA

re-bolting with long bolts in the mudstone) and four push/survey trips had been undertaken. The cave had taken on a more vertical nature and it was then surveyed to -550 m. The 'local experts' (Duncan and Erin) had theorised that PGD would connect into the underlying large master system, Dongba, most likely in an area near Glycogen Chamber (a huge 160 metre diameter chamber) — the trend of the passage and the water volume matched an inlet in that area. This had seemed likely until the water sumped at -500 m and the way on became a dry, breccia-filled phreatic passage heading in the opposite direction.

Two more bounce trips to the exploration front followed before a decision was made to set up a camp. The first of these two trips had wasted some time trying to push through rockfall in the base of a large chamber before giving up and installing a bolt traverse into a promising looking 'up' passage above the chamber. The second trip showed that the up passage continued going with very large dimensions but more importantly there was a junction with a fossil streamway that got us back on the downward path. The old streamway seemed to terminate not long after in a mud-filled chamber but an unpromising-looking low passage heading off from the top of a mud bank surprised us by slowly changing to stooping passage, then standing passage, then downward-trending passage. It was now taking 3-5 hours to get to the pushing front (then 4-7 hours out again), depending on the group, which wasn't leaving much time to explore on a 14-20 hour push trip. The expedition rules that enforced the 'survey what you explore' principle as well as taking both back- and foresights for every leg and sketching to scale both plan and elevation meant that progress was slow. This made for excellent quality survey but it often also meant that an 18+ hour bounce trip would only yield 100-150 m of new passage, sometimes less — not a good return.

Setting up camp had its own drawbacks, mainly the amount of extra gear that needed to be carted in and, ultimately, carted out, too. Another positive, though, was the reduced wear on your gear; repeated trips to -600 m on muddy ropes wreak havoc with your descending and ascending gear and the pile of dead Stop and Simple bobbins/pulleys was mounting back in the gear store. The other issue with camping was water — we'd lost the water at -500 m and the only obvious spot to camp was at the junction at -550. This meant we had a 50 m pitch between us and our water supply and urine disposal spot!

Team 1, with a bit of support from some bouncing sherpas, headed in and set up camp on day one with the intention of staying two nights. A second team of three also headed in on day one, but only to stay one night, to do some sherpa work and do some geology (Erin was the official rock-nerd keeping a track of strike, dip and faults). Our soft Western Australian member, Tim Moulds, was a member of Team Geology but he only made it to -200 m before deciding to leap across a turbid pool of unknown depth and substrate. What he found in the


SERENA BENJAMIN

Flying Monkeys Traverse, Zuan Yan Keng

THOMAS SMITH

Almost all the expedition members

bottom of the pool was a rolled ankle — there's a reason we usually keep our Western Australian cousins quarantined behind a few thousand kilometres of desert but, unfortunately, the resources boom in that state has lead to an increasing number of them earning enough money to afford the airfares required to escape. This incident had threatened to make it difficult for the remaining members of Team Geology as in theory it would mean they'd have four bags between two people, one of whom was not a two bags kind of caver, but luckily the bouncing sherpas in shining armour turned up with the good news that they'd double packed it right to camp despite having been instructed to drop some bags on the way. Note: it's easy to trick an unsuspecting Russian who speaks zero English into taking his bags further than originally planned as he didn't know what the original plan was anyway! All's well that ends well, although it was a slow trip out with the limping gimp.

Team 2 headed in the following morning and Team 3 (The Russians) headed in that evening, after sleeping all day in preparation. This would allow us to 'hot bed' three of the six beds in camp and improve efficiency. I headed in with Team 4 the following morning. We met Team 1 as they headed out halfway along the cave. They reported that the cave was going (down) and they'd found a massive chamber (Devine Retribution). This was our first update in a couple of days as the Nicola Radio was refusing to work. When we got to camp Team 2 had just got back from their push and had spent the day surveying the big chamber. We set to trying to fix the radio and tried to push a shitty drafting squeeze near camp. We failed on both accounts, but we did at least get the camp radio to receive — we just couldn't transmit for some reason. The message from the surface was that the survey data put the exploration front at ~40 m vertically from a connection with Dongba and instructed us where a likely tie-in station would be. This was relayed to the Russians and they headed off expecting to come back with good news in the morning.

We awoke from our slumbers in the morning to the distant shouting of the Russian version of 'rope free'. Masha eventually dragged herself into camp and confirmed that the connection had been made. This was great news but also slightly disappointing news … what would we do now? Only Erin had visited the section of Dongba that we'd connected into (seven years previously) so only she knew the good leads and she wasn't due at camp until the evening. Rather than head down and waste time blindly wandering around a partially explored area we decided to head back up the cave a bit (to -430 m) to push a lead we'd spotted over the top of The Gash (a 30 m pitch above the sump). We figured this might provide a way back to the water the other side of the sump. Team 2 was all tuckered out and headed for the surface while The Russians went to bed.

The traverse over the 30 m pitch (Flying Monkeys Traverse) went in easily enough and we were delighted to find large phreatic walking passage. We pushed one passage to its termination (trending up) but noted two other good leads unexplored. Back at camp that night we formulated a plan with Erin. She and Andy would head off in the morning for a super long push day beyond the connection. Nick (the super Canadian caver) was coming in the next morning at light speed and would catch up with them and assist. Another three were also coming in the following day to push the up lead behind camp and then help start the derig. Imo, Serena and I (Team 4) would head back to our lead over The Gash and then head out. The Russians left that evening.

The following morning I couldn't resist having a quick trip down to the connection — I had to get my male-induced 'must get as deep as I can' urge out of the way. Serena and I both went down, making ourselves useful by carting some rope and water down for the push team. I can now say I've been to -720 m, a new PB, and that Tasmanian caves are not deep enough.

We had a good long day on our way out pushing one of the two remaining leads we'd left the day before. We found dry passage that headed the same direction as the sump, surveyed to a point one metre lower than the sump and left a wide open lead to

return to one day (or one year). We got out in the wee hours of the morning after some 64 hours underground.

The Dongba team had an epic day with more leads than they had time for. It was a pity that the connection wasn't made till so close to expedition end. Another seven years should see the remaining leads suitably mature and ripe for another bout of exploration!

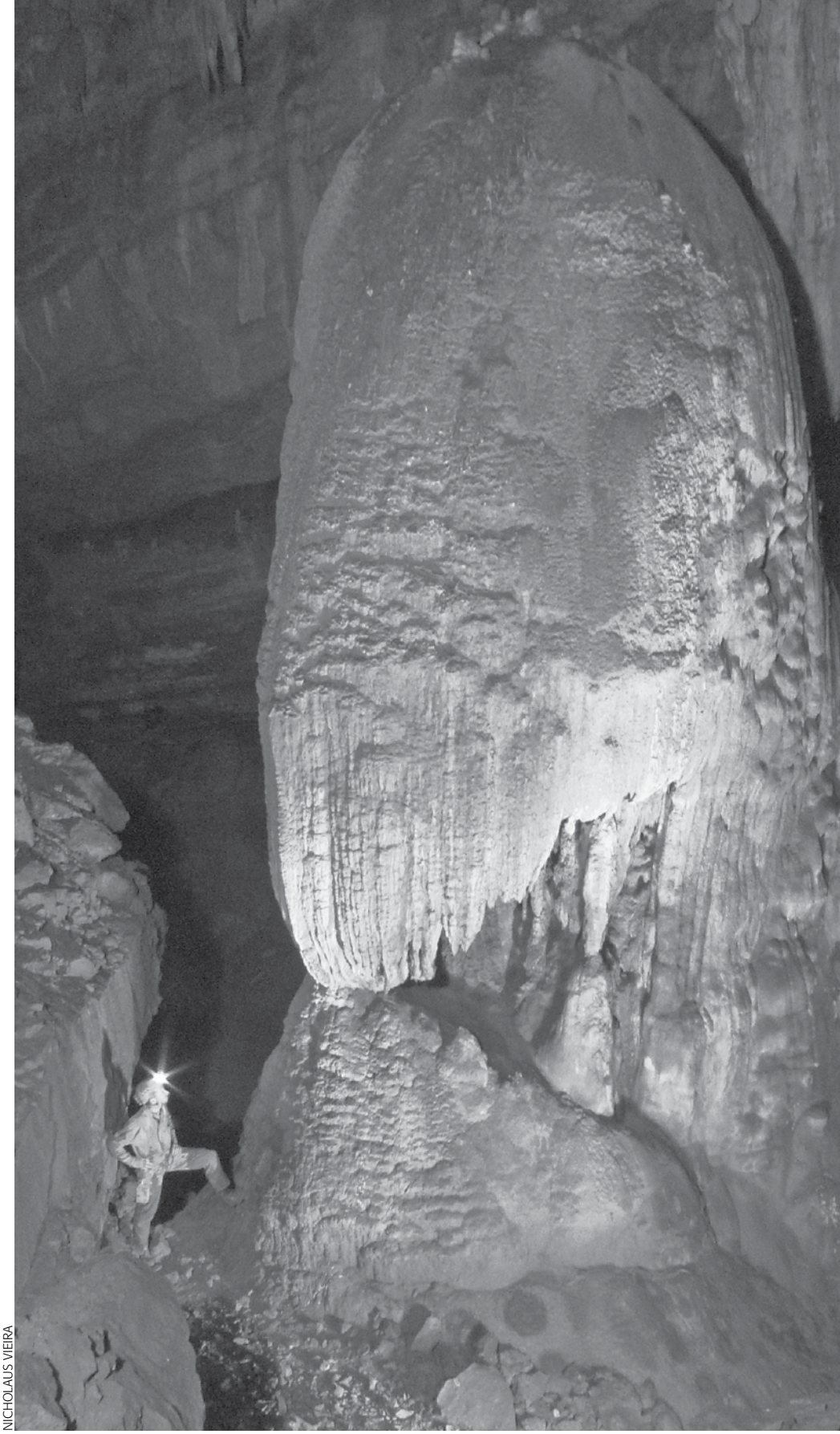
The derig team filled in its day finishing the aid climb in the ascending passage above camp. This led to a long horizontal section that yielded some 200 m of new passage, ending up some 340 horizontally and 90 m vertically from camp, with ongoing leads.

The next few days were dedicated to the derig. The initial derig team had an epic and got rope pulled out to -470 m and camp gear out to -320 m. The next team got all the gear up Crappy Crapola (I think I did that pitch four times that day with more bags than I care to remember and I must admit the Western Australian put in a good effort that day with a heavily strapped ankle and restored some lost honour) and trips over the next two days finally saw the last bag hauled up the entrance pitch.

As well as the downstream pushes in PGD there were other projects on the go. Upstream in the main PGD stream passage (Comfortably Numb) some 800 m of passage were surveyed over six trips. It terminated at an aven at -81 m. An easy connection to this point in the cave would mean avoiding the squalor of the entrance series, saving lots of transit time. All up PGD, to the connection point with Dongba, came in just a fraction under 5 km in length.

Da Keng Wan (Big Pit) and Liang Feng Dong (a.k.a. Beer Cooler) were two (now one) cave(s) that served as a welcome distraction from all the PGD action. The two caves were ultimately connected. DKW started out with a stunning 20 m entrance into a wide canyon which the sunlight poured into dramatically at certain times of the day. After a few trips a large chamber was found (~150 m long by 40 m wide) which kept the surveyors busy for a while. A few spectacular decorations in the chamber, one a ~10 m high egg-shaped blob of calcite (Thousand Year Egg), made for some good photography. In the end this cave exceeded 1.5 km in length and was left in wide open streamway passage at -258 m — another one for a future expedition. Beer Cooler, as the name suggests, was a nice little drafting entrance conveniently located on the track not far from DKW which served as a fridge for post trip beers.

All up it was an excellent expedition for me. It has left me wondering why I chose to wait until I was 31 years old and a father before I started putting my hand up for international expeditions — I should have spent my early twenties, when I didn't have a mortgage and children, skipping from expedition to expedition. What a pity wisdom only comes with age.

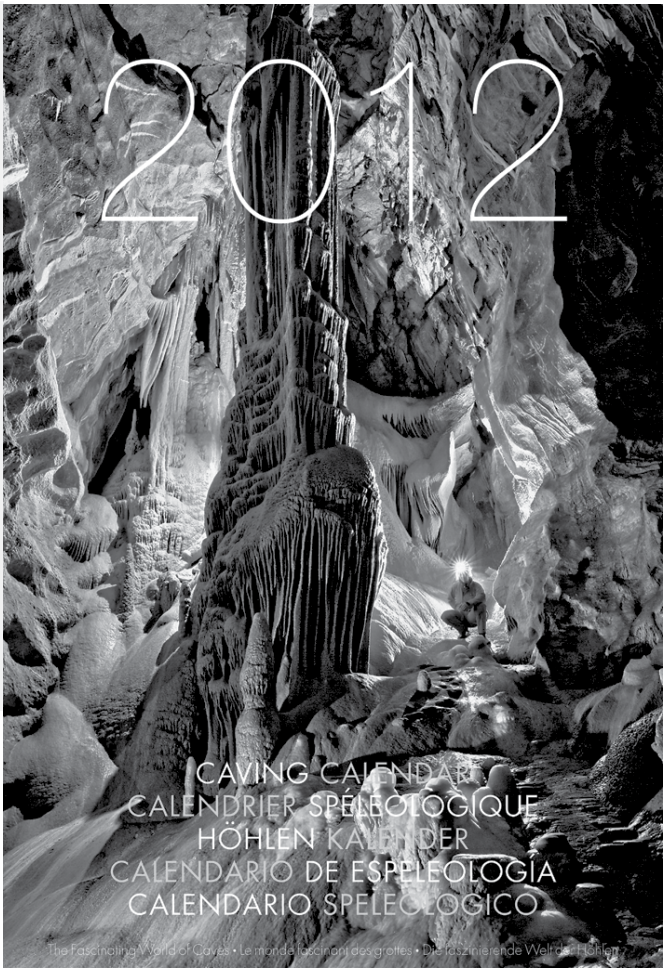


NICHOLAUS VIEIRA

Thousand Year Egg, Da Keng Wan

Tianxing 2011 would like to thank the Ghar Parau Foundation, Starless River and Petzl America for their support. We would also like to thank Andy Eavis and Oxford University Caving Club for the loan of equipment.

Finally, thanks go to our Chinese contacts including the Institute of Karst Geology in Guilin; Panjie and the People's Government of Wulong; and Mrs Wei, Mr Liu and the villagers of Tianxing.



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Introduction to Timor Caves

Garry K. Smith
NHVSS

THE Timor Caves are believed to have been discovered around the early 1850s. They are located 24 km east-north-east of Murrurundi, near the Northern boundary of the Hunter Valley.

This limestone is of the Middle to Upper Devonian period, approximately 375 million years old. A water reserve was gazetted to include the caves on 12th March 1867, however "as there is no water on this reserve, in all probability the land was retained as a Water Reserve on account of the caves". (Dunlop, E. H., 1924). If this is the case, then Timor Caves are among the earliest to be reserved in New South Wales.

The most popular and accessible caves are located along Isaacs Creek, a tributary of the Isis River, and are within the Caves Ridge Reserve.

The majority of caves are horizontal with a maximum vertical range of 20 m. Most can be explored by experienced cavers without the use of ladders or ropes and the larger caves can be fully explored in less than four hours.

There are a number of very interesting geological features in these caves which are of great significance.

These include fine examples of stalagmites which have been deposited in early cave development, then partly eroded away by later passage development, thus creating sectioned speleothems which can be clearly seen on the cave walls today. There are also a number of old passages that have been infilled by lava flows.

Many of the caves at Timor are excellent examples of hypogene caves (created by rising groundwater).

Throw this in the mix with the stunning karst dotted with giant grass trees up to 7 m tall and you have a landscape which will leave the observer with a lasting impression.

The Caves Ridge Reserve contains many of the public access caves which do not require permits. For a small fee visitors are able to camp on privately owned land adjacent to Isaacs Creek which borders the Eastern boundary of the reserve. Away from the reserve there are other caves in the Timor Karst; however, these are all on privately owned land and access to these caves is restricted.

GARRY K. SMITH

Timor — Main Cave TR1

GARRY K. SMITH

Grass trees on the Timor Karst

The Newcastle and Hunter Valley Speleological Society Inc. (NHVSS) has over many years built up a good working relationship with landowners in the region, so cavers' first point of contact should be through the NHVSS for access to caves outside the reserve.

The NHVSS postal address is PO Box 15, Broadmeadows, NSW 2292 Australia.

NHVSS has recently published the book *Timor Caves — Hunter Valley, New South Wales* which contains 57 cave maps, as well as chapters on geology, invertebrates, bats, karst-specific vegetation, birds, palaeontology, cave surveying and mapping, educational opportunities and minimal impact caving.

The book has a strong focus on conservation of the environment and natural wonders, both above and below ground. It can be ordered through the NHVSS website at www.nhvss.org.au

B4 Paleo Cave-Sediment Preservation Project Finished

Bungonia National Park NSW

Joe Sydney
HCG
Dirk Stoffels
CSS

BUNGONIA National Park has one of most significant karst regions in NSW. With over 300 known caves and deepest mainland cave, it is regarded as one of the sporting meccas in Australia.

Not only do cavers regularly visit, but it is also visited by families and adventurous outdoor sports people. Bungonia offers more than just caving with activities such as canyoning, bushwalking, bird watching and more.

But with all this activity, there is a price to pay. In the early 90s when Julie Bauer, author of the book *Under Bungonia,* was researching the park's geology as part of her university studies, she recognised that some cave sediments were worth future research. It was some years later that the Highland Caving Group (HCG) began noting the degradation of cave sediment by recreationalists in the Kings Cross area of B4 Fossil Cave. When they were crossing the Kings Cross void and climbing the embankment, cave sediment was being kicked away from the wall and floor. Some HCG members who also use the cave noted that the sediment was being eroded at an alarming rate, so they informed the Bungonia Recreation Advisory Group (BRAG).

In discussion with BRAG they asked for cavers' advice on what would be the best way of preserving the cave sediment. HCG needed to consult with the New South Wales Speleological Council clubs for further advice, with the Canberra Speleological Society (CSS) showing interest and offering advice. The discussion between HCG and CSS brought up many ideas with the most suitable being some type of bridge. The idea was floated with Parks and they too consulted their internal experts. Soon after it was agreed that a bridge would be the most appropriate for this location.

BRIDGE DESIGN

During 2008, CSS took on the challenge of designing a bridge and came up with an initial design. The draft plan was submitted to Parks who in turn gave it to their engineers.

The engineers accepted the design with few changes. The design is based on a number of horizontal laminations bolted together and a vertical ladder. Not only would this aid in keeping cavers to a path, but would also assist those with limited climbing skills needing to cross a wide void.

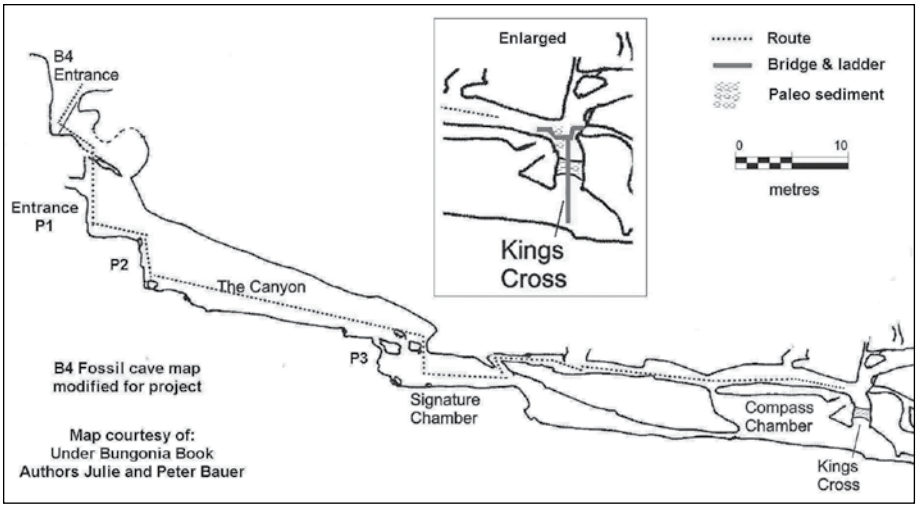
With plans approved, it was time to think about how to implement the concept. CSS decided that a pre-construction mock bridge would aid in seeing where it fitted, and also if the long lamination sections could be taken into the cave. Sections of 50mm PVC pipe with joints were ordered and a date of February 2008 was set aside to build the mock bridge. ASF clubs were contacted for 'experienced' caver assistance with 12 cavers turning up.

JOE SYDNEY

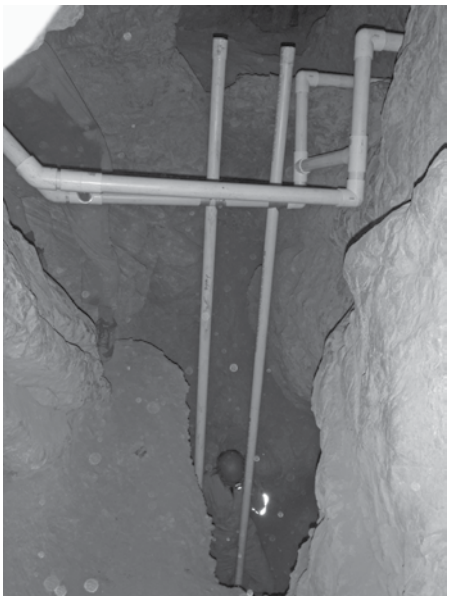
New HCG member Fiona Ray marks PVC pipe for cutting.

The pipes, joints and tools were taken into the cave with key people given tasks to do and soon the first side lamination/pipe was constructed. The bridge started to take form and we could see where the two bridge base plates needed to be installed. After a couple of hours, the PVC pipe bridge was complete. Most of it was then dismantled except for one 5-metre side section so that we could see if we could get it through the cave. If you know B4 Fossil Cave, there are some tricky sections that require some negotiation, but with lots of cavers spaced throughout the tight sections the process was quite easy.

With the PVC side lamination mockup now sitting in Dirk Stoffels' garage, it was



time to work on final specifications and metal requirements, which took some time. Consulting with Parks and their engineers, the most suitable material was selected based on geting the lamination sections into the cave, the cave environment, cost, and ease of fabrication.



JOE SYDNEY

Mock PVC bridge with ladder.

In the end, mild steel was selected with Parks experts agreeing. During early 2010 Parks, with approval from the Karst Geodiversity Unit, approved funding of $3300 to purchase the steel required by CSS to fabricate the bridge. In late 2010, with funding now available the steel was purchased and fabrication of two base plates and one side lamination could commence

In February 2011 the two base plates and single side lamination were fabricated and ready for a test fitting. Clubs were contacted again for experienced cavers for a trial installation date of Saturday 19 February 2011. Thirteen cavers were selected for their experience in various fields such as cave rigging, SRT etc. Three pitches were rigged for lowering and raising if needed and the 4.5-metre bridge component was wrapped to ensure cave protection.

With so many cavers present throughout the cave it was easy to pass the lamination through. The trickiest section was at the southern end of The Canyon where we noted that a couple of well placed bolts to aid lowering would not go astray. Later on the bolt placement was discussed by BRAG in the interest of caving safety; it was thought that the bolts could also aid a rescue from the popular cave if needed, so they were placed.

At the Kings Cross void the two base plates were fitted with lamination and we could see what rock required re-engineering. With a bit of tweaking it looked as though the bridge had sufficient room and

JOE SYDNEY

Setting up rigging at B4 entrance.

JOE SYDNEY

Lowering the lamination section into B4 entrance.

fitted nicely so we exited the cave, taking all the bridge parts with us. Knowing that it would fit with little trouble eased our minds.

Fabrication of the bridge and ladder was finished in April as it took some months to cut and weld 11 mild steel laminations for the bridge and fabricate a ladder. The ASF Conference at Chillagoe in Queensland meant that key players would not be available for installation of the bridge. On return from the Conference HCG immediately sent an email to clubs calling for assistance with installation on May 27th–29th. Twenty-four cavers turned up on the weekend.

JOE SYDNEY

Manoeuvering the lamination up into the Letterbox Squeeze.

JOE SYDNEY

Luke Gannon (HCG) measuring the level.

LUKE GANNON

Blackish Blind Snake found at second pitch.

A few cavers took the Friday off and assisted with the pre-rigging of the cave, installing the electrical lead for power tools, and setting up the generator and a Michie phone line. A UHF radio mast was also set up to communicate with cavers throughout the Park and Ranger station. Installation of all this took half a day so there was sufficient time for all the bridge laminations to be lowered into the entrance chamber.

JOHN BRUSH

Carrying a bridge section through B4 Fossil cave.

JOHN BRUSH

Levelling the bridge frame.

JOHN BRUSH

Drilling the anchor holes.

Cavers were briefed at the B4 car park on safety, their tasks and toolboxes so that everyone knew the overall plan and where things were. The first cavers started to enter around 9 am, bridge components and tools soon arrived and work commenced. First was levelling of base plates and then the fitting of the side lamination. Once fitted,

the M20 x 200mm deep baseplate bolt holes were drilled, with bolts temporarily placed. When all the laminations were in place, the side bolts pulling the bridge together were placed and the bridge was then one solid piece of metal.

With the bridge constructed by 6 pm, it was time to exit the cave for a hot meal. As many caving clubs were involved, a grant from the ASF Karst Conservation Fund covered the costs of equipment, transport of bridge components, petrol and a hot meal for the cavers! HCG members cooked up a fine meal with minestrone, marinated chicken and steak with hot potatoes and pasta salad followed by apple crumble with custard. The cavers were very appreciative that after a hard day's work, hot food was ready for them.

Later that night after dinner, a few key cavers had to return to the cave to glue in the bolts. By the morning, the glue would be set and the bridge ready for its final stage of construction, the ladder.

The ladder did not take long to install and in the meantime, cavers started to take out what gear was not needed. By noon the ladder was installed and the cave completely de-rigged.

The installation was a total success and is a testament to the experience and the hard working nature of all cavers involved.

It is estimated that the worth of cavers' time spent on this project between 1992 and May 2011 is around $47,300.

HCC and CSS would like to thank Bungonia National Park and the Bungonia Recreation Advisory Group (BRAG) for allowing them to undertake this project.

We also thank the ASF Karst Conservation Fund.

A final 'Thank you' must go to all the hard-working cavers from the following clubs: CASM, CSS, HSC, HCG, SUSS and UTSS.

JOE SYDNEY

The bridge and ladder installed over B4 Kings Cross void.

JOE SYDNEY

Photo showing slot where cavers climbed and damaged paleo cave sediment on wall. The bridge encourages cavers to bypass this section.

Infectious diseases in caves

An Australian perspective

Nicholas White (VSA), Andy Spate (WASG) and Janeen Samuel (VSA)

A recent article published in the journal *Wilderness & Environmental Medicine* (2011, Volume 22, pages 115-121) may be of interest to cavers, cave managers, scientists and others who visit caves, especially outside Australia. The article, titled Infectious Diseases Associated with Caves, is by Dr Ricardo Pereira Igreja, from the Department of Preventive Medicine, Faculty of Medicine, Federal University of Rio de Janeiro, Brazil. It seems to be aimed primarily at clinicians, but it summarises the infectious risks for cave users, and some of the precautions that can be taken against them, in a readable fashion. The paper should be read in conjunction with this discussion. It is somewhat simplistic in its discussion of who visits caves and why they do. It doesn't cover all the diseases that might affect Australian cave users. Read it in full at http://www.wemjournal.org/article/S1080-6032(11)00069-X/fulltext.

The abstract reads:

"In recent times, caving has become increasingly popular, with almost 2 million people visiting national park caves each year in the United States. Although the 2 million tourist visits are extremely low risk, smaller numbers of sport cavers are at risk for some high risk conditions, and expedition cavers are at risk for some obscure infections. Infectious diseases like histoplasmosis, rabies, leptospirosis, and tick-borne relapsing fever may be transmitted by the underground fauna. To reduce the risk of illness or injury while caving, knowledge of potential risks before engaging in this activity is important. Caving preparation needs to be carefully planned and executed, including vaccinations, prophylactic medications, and advice regarding safe conduct and behaviors."

Below are some comments on the different sections of the paper, with particular reference to the situation in Australia. They are not complete in themselves but are intended to be read in conjunction with the paper. Please note that none of the three authors of these comments is either a medical doctor or an expert on any of the diseases discussed, so if you are concerned about a possible exposure you should consult your medical adviser and/or the Department of Health.

There are at least three potential disease vectors associated with caves—bats, arthropods and birds. We will discuss each of these in turn below with the diseases in the same order as in Dr Igreja's paper

BATS

In discussing the role of bats, it is important to note that the Order of bats, or Chiroptera, is divided into two main groups: the Megachiroptera ("megabats") and the Microchiroptera ("microbats"). The megabats include the flying foxes; they are all fruit, nectar or pollen eaters and they do not occur in the Americas or Europe. The microbats are found on every continent except Antarctica. Most are insectivorous and some are cave-dwellers; in Australia all cave-dwelling bats are microbats. However, some microbats in the Americas eat fruit or nectar and may be referred to as "fruit bats" - and some African and Asian megabats live in caves. The largest microbats are bigger than the smallest megabats, as exemplified in Australia by the big "micro" ghost bat and the little "mega" blossom bats.

The distinction between the two groups is important because, in the last fifteen years, several "emerging" diseases affecting humans have been traced to a possible origin in one or more species of bat, and in almost every case these have been megabats.

So, although Dr Igreja is right in saying bats are linked to the transmission of the three diseases he lists, this is an oversimplification. Any bat may give you rabies, no bat will give you histoplasmosis, and only a megabat (as far as we know to date) will give you Marburg haemorrhagic fever.

HISTOPLASMOSIS

Histoplasmosis does occur in Australia. There are reports of cases in cavers from Wee Jasper, Bungonia, Timor (NSW) and Chillagoe as well as in geologists working in mines, and one death apparently associated with the demolition of a battery hen building in South Australia. The disease is acquired by exposure to *Histoplasma* spores in dust generated by disturbance of dry guano, not directly from bats nor from other infected animals or people. Bats can become infected, and thus can theoretically transfer the causative fungus from one cave to another by faecal contamination.

Smith (1994) and Spate (1994: available on the ACKMA CD) provide discussions of histoplasmosis in Australia. Whitten's very personal paper (1992) makes for interesting reading as it indicates how the medical profession can overlook the possibility of diseases such as histoplasmosis.

It's a good idea to wear a proper mask (not just one of those el cheapos you get in hardware stores) wherever there's a likelihood of heavy exposure to dried guano, whether bird or bat. This mask should be of the particle filter type and fit well. NIOSH (2005: National Institute Occupational Safety and Health: Histoplasmosis Protecting Workers at Risk See: http://www.cdc.gov/niosh/docs/2005-109/) provides detailed advice. Should you suffer pulmonary or upper respiratory problems within about two weeks of caving it would be prudent to advise the medical system of your possible exposure to histoplasmosis. Anti-fungal treatment may be warranted and this is quite different from treatment for tuberculosis. In some individuals progression to disseminated histoplasmosis can be a life-threatening disease.

RABIES

"Classic" rabies doesn't occur in Australia, but the closely related Australian Bat Lyssavirus, which is present here in megabats and some species of microbats, produces an identical disease and has killed two people. In one instance the source of the transmission to humans was a bite from a fruit bat and in the other from handling a microbat, the non-cave-dwelling Yellow-bellied sheathtail bat *(Saccolaimus flaviventris)*. The Australian Bat Lyssavirus has been isolated from four species of megabat (flying foxes) and from the Yellow-bellied sheathtail bat. Antibodies to the Australian Bat Lyssavirus have been found in seven genera representing five of six families of microbats in Australia. Some of these are cave dwelling bat species (Anon., 2009).

Experts are divided over whether the virus has always been in Australia or is a recent introduction. If the latter is the case, it could still be expanding into new species. Certainly, overseas bats of the same genera as our common cave-dwelling species have been shown to carry Lyssaviruses. All bats

should be regarded as potential carriers. Anyone likely to be handling them (e.g. for research or rescue purposes) should receive prophylactic vaccination. Ordinary cavers should stay out of chambers with bats in them, thus avoiding both disturbance of bats and risk of infection.

MARBURG – AND EBOLA – HAEMORRHAGIC FEVERS

These only need to be considered if you are going overseas—mainly to Africa. In Africa, human infections with both these viruses have been linked to infections in various species of megabat. In the case of Marburg virus, the bat involved is a member of the genus *Rousettus.* This is the only genus of megabat that lives in caves (and echo-locates.). There are no cave-dwelling megabats in Australia, but there are some species of *Rousettus* in Asia.

Recently a type of Ebola virus has been discovered in the Philippines. However, it is different in that, so far, it does not seem to cause disease in people and it has not been detected in bats.

HENDRA VIRUS

This virus has no connection to caves or microbats. We include it because it has been in the news lately, with deaths of horses in Queensland and northern NSW, and statements by some prominent people along the lines of "we must kill all the bats"!

Hendra virus is a new type of virus which first appeared in Brisbane in 1994. It is now known to be carried by flying foxes—i.e. megabats. It has never been found in microbats. Horses are apparently infected by the flying foxes, and in some cases have then passed the disease on to people (and to one dog). There have been no cases of people being infected directly from the bats. Because the virus is frequently fatal to horses and people it is causing grave concern, but it should not be an excuse for killing either mega- or micro- bats. It is hoped that a vaccine for horses will be available by next year, and this should prevent further occurrences.

A similar virus, Nipah virus, is found in megabats, particularly of the genus *Pteropus*, in Asia and parts of East Africa. In the initial outbreak, in Malaysia, pigs were infected first and passed the virus on to people; however, the virus can sometimes be passed directly from bats to humans. There are so far no records of it in cave-dwelling megabats.

SEVERE ACUTE RESPIRATORY SYNDROME (SARS)

SARS was a viral disease that emerged in China in late 2002. It spread rapidly, thanks to air travel, to several countries in Asia, Europe and North America, and killed several hundred people before it was eradicated. It is thought that the ultimate source of the virus was Chinese horseshoe bats *(Rhinolophus sinicus),* since a similar (though not identical) virus has been found in them. It is likely that another type of animal was infected by the bats and then passed the virus to humans.

Closely related viruses have been found in other species of *Rhinolophus* in Europe. Horseshoe bats are microbats and cave-dwellers. We have three species in Australia, with *Rhinolophus megaphyllus* being found all along the mainland east coastal strip, and there is no reason to think that they do not carry similar viruses. It should not be cause for alarm but another reason to treat bats with respect and to observe good hygiene when in contact with any sorts of animals or their excreta.

LEPTOSPIROSIS

This disease does occur in Australia and the bacteria are carried by many types of animal. It is present in native rodents, especially in the tropics, in marsupials including wombats, bandicoots and possums (possums in New Zealand too), and in megabats, but doesn't seem to have been detected in microbats—probably for want of looking. It is also found in many introduced animals including rats, house mice, deer, cattle and pigs. With the possible exception of caves in the tropical north, the greatest risk to cavers might be in a wet cave contaminated by effluent from dairies or piggeries, or if they explore drains or sewers—but then there would be other risks too, such as salmonellosis.

ARTHROPODA

Tick-borne relapsing fever hasn't been recorded in Australia but there are a few rickettsial diseases carried by ticks or mites, not to mention the paralysis toxin produced by the scrub tick. And we have plenty of mosquito-borne diseases (Dengue, Ross River, Barmah Forest Fevers, Murray Valley Encephalitis). We imagine all these would be more of a risk on the surface than in a cave, except in the entrance area. The idea of wearing insecticide-impregnated clothing inside a cave, as suggested by Dr Igreja, concerns us. This could be fatal to any cave-dwelling arthropods, which are likely to be harmless and maybe even rare and vulnerable, rather than disease-carrying.

BIRDS

Cryptococcosis and psittacosis both occur in Australia, but so far no cases are known to have been associated with caves. People who are immuno-compromised or suffer from pulmonary disease should seek expert medical advice before caving, particularly if there is a likelihood of exposure to bird or bat guano. It goes both ways

Animals that live in caves may occasionally pass diseases on to people, but it works the other way too: People may very easily carry disease-causing organisms from one cave to another, with devastating results to the inhabitants. So, please, be careless if you like about your own disease risk—Earth has no shortage of humans—but be very careful about cleaning and disinfecting your clothes, boots and gear between one cave area and another, and be absolutely over-the-top obsessive about it when moving between continents.Perhaps it is worth mentioning with regard to all the newer human infectious diseases derived from animals (zoonotic diseases) that these appear to be due to human interference with the animals themselves or their habitats.

SUMMARY

In summary, the paper discusses a number of diseases which pose risks to cavers, cave researchers and others. Of those listed histoplasmosis is certainly a risk for people entering bat caves in Australia. The paper will be of interest for cavers and speleologists visiting other parts of the world.

ACKNOWLEDGMENTS

Our thanks go to Joe Sydney for bringing Dr. Igreja's article to our attention and to Ken Grimes for his valuable comments on the text.

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Murra-El-Elevyn water temperature

Peter Buzzacott

BACKGROUND

In 1999 a team of scientists visited Murra-El-Elevyn cave on the Nullarbor Plain to collect water samples for analysis, microbial mantles for genotyping and to record the water temperature.[1] The team also visited Cocklebiddy, Tommy Grahams, Weebubbie and Warbla Caves.[2] The temperatures recorded in the entry lakes in 1999 and the temperatures today are presented in Table 1 for the three caves nearest Cocklebiddy Roadhouse.

Table 1: Water temperatures (degrees Celsius) for Nullabor caves[1, 3]

Cave	*1999*	*2009*	*Difference*
Cocklebiddy	18.8	19._.	< 0.7
Tommy Grahams	23.1	23.4	+ 0.3
Murra-El-Elevyn	23.7	18.9	– 4.8

As can be seen, the water temperature has barely changed in Cocklebiddy or Tommy Grahams Caves but in Murra the temperature appears to have dropped substantially.

The water in Tommys makes for a particularly warm environment and the dry parts of the cave make for a warm shelter on cold desert evenings.

Because the water is so warm, suggesting the possibility for a geothermal heat source, Tommys was selected for the first temperature mapping project (See *Caves Australia* 184). Murra was chosen next due to the potentially dramatic fall in water temperature.

METHODS

Before heading out to the desert exhaustive attempts were made to confirm the previously recorded water temperature in Murra. Posts were made on the ASF-CDS e-mail list, the CDAA member forum, former instructors and cave divers were contacted, requests were made to the DEC Esperance Office, the DEC Wildlife Branch, WA Museum and CEGSA.

The main result of this process was to confirm that no baseline water temperature data are on record for future research comparison.

An application for support was made to the ASF Grants Scheme and the Grants Committee awarded $750 to the project. The Directors of the ASF Karts Conservation Fund awarded a top-up of $381 to enable further visits to Cocklebiddy and Weebubbie Caves.

The Geoscience Australia website database was searched for earthquake records in the vicinity and one 2.8-magnitude quake was recorded 7 km away in December 1992. Nearby Cocklebiddy Cave has 7 km of flooded passage and so the epicentre of the earthquake appears to be theoretically within reach of the water in Murra. The spatial relationship between Cocklebiddy, Tommys, Murra and the earthquake, (adapted from a Google Earth image), is shown in Figure 1.

I wondered if the water temperature in Murra could have been previously maintained by a certain level of heated water inflow, and then slowly cooled over a decade or more if that in-flow was reduced by an earthquake. Questions, questions; it was time to collect some hard data.

I called my good buddy Andrew, we arranged permits through the DEC office citing our membership of the CDAA (ASF-CDS trip leaders are thin on the ground in WA) and soon we were heading east after work on a Thursday. We swapped tales of adventure as the sun set behind us till sometime after midnight we pulled off the road, threw down swags and hunkered down for the night.

Dawn bathed us in a warm glow so we hit the road without delay, breakfasted at Norseman and arrived at Murra by 11 am Friday morning to meet Heather and Mark, a couple of cave divers from Melbourne. We set up camp, set up our A-frame, arranged our loads and lowered all the dive gear down into the cave.

As the afternoon wore on we carried our kit underground, to the water's edge, and assembled our dive units. That done, we retired to camp and divided the chores. I cooked a heap of gourmet pork sausages, (with ginger and shallots), Heather whipped up a mash, Andrew and Mark got the fire and the red wine happening, the stars came out; life is pretty good on such occasions. We talked about the cave and made plans for the following day.

Andrew and I had sausage toasties for breakfast, then we abseiled down 35 m and carried our lunch to the water.

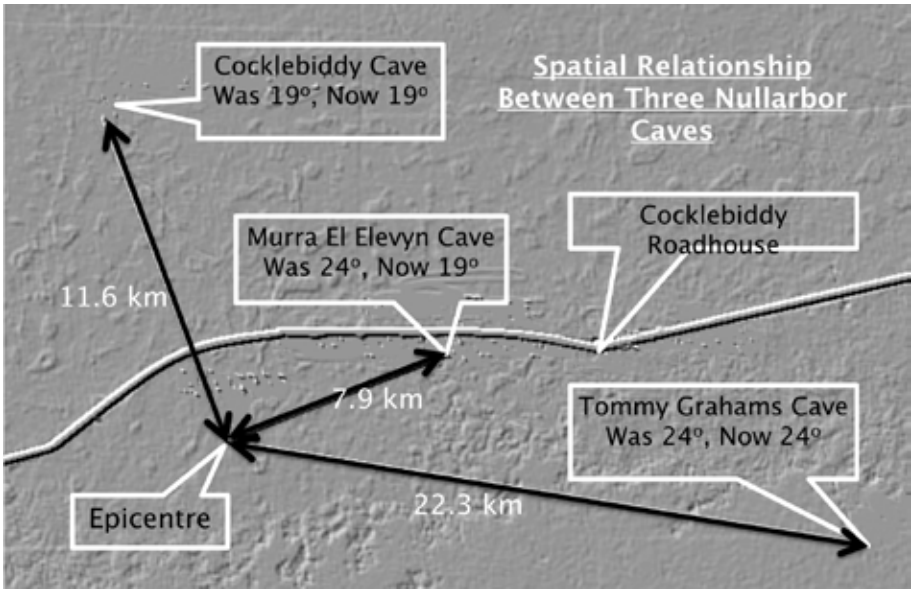

Figure 1: Diagram showing relationship between three caves and the 1992 earthquake epicentre

PETER BUZZACOTT

Andrew abseiling into the cave

We were soon dressed and ready for action. The plan for the first dive was to lay 200 m of line to the back of the main passage, then to clip on 12 loggers, one every 20 m or so, and a 13th was to be placed directly underneath one on the roof in the largest chamber, to record top and bottom temperatures. Andrew and I have been cave diving with each other since 2006. Before the dive we discussed our plan in detail and then, once in the water we worked steadily towards the goal, mindful of each other, our remaining gas, and other things I think about while cave diving.

The first dive was a success with all 13 loggers in place, though it did start with an amusing incident. My pre-dive checks went smoothly, then Andrew double-checked me at 5 m which is our usual method, but this time he signaled a slight bubble-leak at my regulator. I looked at it carefully and before my eyes the leak increased and air started pouring out of the regulator into the water. I turned off the tank valve and surfaced, looking for a spanner to tighten the hose. Andrew said he could see the spares kit near the water on a rock so, rather than take my gear off, I simply hopped out of the water wearing all my dive gear (including three full tanks) and shuffled over to the kit. But, the spares kit was not to be found, so I shuffled a way further and searched about here and there before deciding just to climb over a jumble of rocks to my own gear and fish out my own wrench from the bottom of my dive bag. By the time I'd sorted out the simple issue of tightening a hose I was sweating buckets and glad to sink back into the water.

Afterwards we had some lunch and prepared for the second dive, during which we planned to start surveying in the loggers and also to run a line to a side passage Heather and Mark were interested in visiting. The dive went to plan and, once we had packed-up for the day, the last thing I did in the cave was to lower a fourteenth logger down into the entry lake. That done we made our weary way back up to the camp for another night of camaraderie.

The next day Andrew and I resolved to complete the survey of each logger on the way into the cave followed by collecting all the loggers on the way out. Once again this was a busy dive and we worked well as a team. Andrew would swim forward to the next logger, pulling the fiberglass surveyor's tape out of its cradle as he went. Once he stopped I'd take up the tension by winding in the slack, record the distance, take a compass bearing along the tape and note the direction, and lastly make a note of the depth of the logger for my field notes, using my personal dive computer.

The loggers themselves similarly estimate their own depth based on ambient pressure and I'd previously taken these 14 loggers on a calibration dive to 10.01 m depth, with a standard deviation between them of just 5 cm. The field notes, however, could be a quick method of confirming which logger was where in the cave, if any confusion arises later.

Whenever Andrew saw me heading towards him reeling in the tape measure he would turn and swim to the next logger. As often happens with data collection and survey, after a few goes we settled into a routine and thereafter the work progressed quite efficiently.

Pulling the loggers out went smoothly; we had some lunch by the water and then it was time to reel in our line. We decided to reel-in about 150 m and then, gas permitting, Andrew would lead to another chamber I'd pointed out but which we hadn't yet visited.

I was wearing my brand new MB-Sub Cave torch which cost about $1000 but gee-whizz, she's a blinder. About the most interesting thing you notice straight away is that the light beam is square, and this makes it especially suited for cave diving because I can slowly move the square back and forth along the rock in front of my buddy and there is no mistaking that I want his attention. During the reeling in I had an issue with one of the reels jamming. It was fine laying line into the cave but when the spool winds the other way, as in when the line is being collected, then the spool winds down the spindle too, activating the brake, meaning I was having to stop and undo the brake every 20 m or so. The first time this happened Andrew wandered on towards the next logger so I signaled him slowly, he turned and came back. Later on, when I was filming sheets of hanging microbial mantles I turned the lens 90º and the beam widened out to light up the whole cave. This is the best torch I've ever had.

Surfacing in the entry lake, I quickly sat down and made field notes about anything I could think of: the order we clipped the loggers onto the line (coming out); the order we surveyed the loggers (going in); the time, physical locations (the first logger was tied to the hole in the big rock at the entrance to the main passage, etc); anything and everything I could think of. From experience I know how valuable field notes can turn out to be if a few loggers get mixed up, or if we find something odd.

On our last night in the desert we celebrated with a hot shower and a cold cider, followed by another big cook-up around the fire under a star-filled sky. We couldn't have asked for better weather.

Back home, I downloaded the data loggers, arranged my data in the right order and transcribed my notes. Three projections were planned to represent the position of the loggers: a depth-adjusted bird's-eye view; a side-on view from the east showing northerly progress and a side-on view from the south showing easterly progress; both side-on views showing temperature. Pythagoras' theorem was used to account

for differences in depth (for the bird's eye view), trigonometry was used to account for direction (for the side-on views) and the resultant temperature map is shown in Figure 2.

RESULTS

Figure 2 shows the birds-eye view of the route swum by the divers, and the water temperature recorded by each logger. The heavy arrow pointing east indicates the location of an as-yet-unmeasured passage.

DISCUSSION

A potential drop in water temperature of 5 degrees could have implications for the make-up of water-dwelling microbial mantle communities, for example potentially changing the dominant species from a hanging variety to one that forms dense mats on the cave floor.

Solubility of carbon dioxide could increase, leading to a lower pH and higher acidity, plus possibly altering solubility of other minerals, not to mention the effect of such a drop on the "dry" sections of the cave, such as altered minimum winter air temperatures and lower humidity. No source of warm water was discovered this trip though it was a success in that we now have a record of the variance throughout the main passage.

Tantalisingly, my buddy from the Tommy Grahams study called in for a coffee one day and asked how the trip went. I described the dives and mentioned the passage Mark and Heather had explored, heading east after a restriction near the end of the main passage when it heads south from the largest chamber. I'd had a look in there and my buddy asked me if I'd reached the end, blocked by a boulder collapse, but I hadn't reached the end and had turned in sight of where the line terminates, tied to a rock. It was then my buddy said that he'd felt "noticeably warm water" at the end of that passage.

Without looking for it, or expecting it, he had simply gone for a dive and felt warm water there.

The passage he refers to connects to the biggest chamber at the end of the main passage, in between a high roof and a third air chamber. Turns out those two locations, (either side of this potentially warm passage), recorded the warmest temperatures in the cave. Looks like I'll be heading back to Murra.

PETER BUZZACOTT

Heather holding the safety rope in the doline

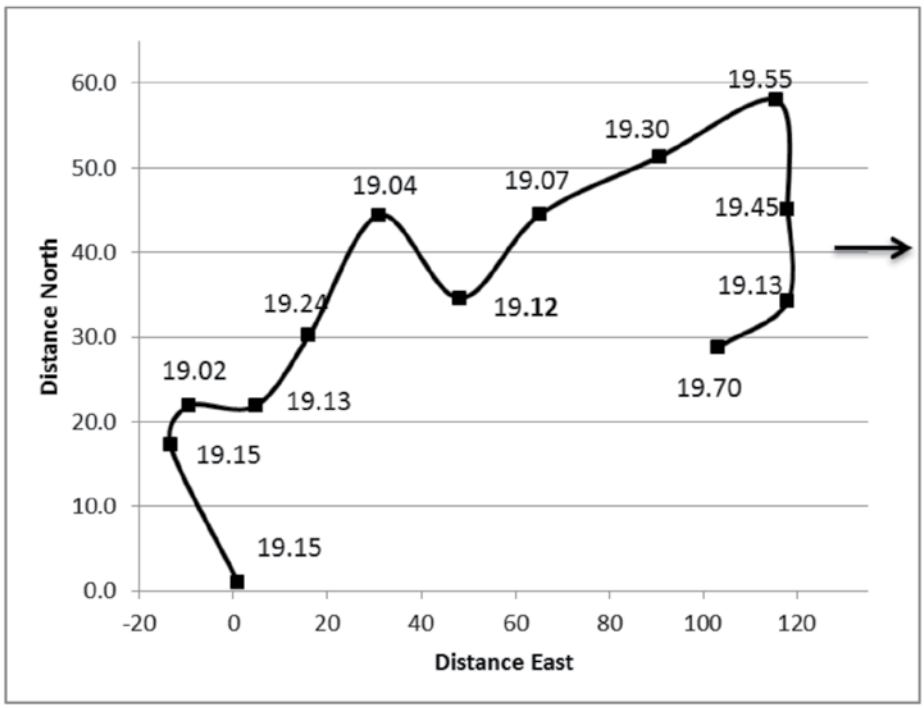

Figure 2: Birds-eye view of the Murra-El-Elevyn water temperature August 2011

CONCLUSIONS

This research cannot confirm if the water temperature in Murra-El-Elevyn has indeed dropped by five-degrees in a decade. But, at least now we have a record of the current water temperature. At the time of this study the water ranged from 19.02 to 19.70 degrees, got warmer the further into the cave we traveled, heading generally north and east, and got cooler the deeper loggers were placed. Next trip to Murra the map will be extended into narrower passages in search of "noticeably warmer water".

ACKNOWLEDGEMENTS

Sincere thanks are extended to DEC for allowing access to conduct this research, to the ASF Small Grants team for supporting the project, and to the editor of *Caves Australia* for publishing these results for posterity. Raw data available upon request.

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Unlocking the Potential of Speleothem Paleoclimatic Records

Helen Green
PhD Student School of Earth Sciences, University of Melbourne

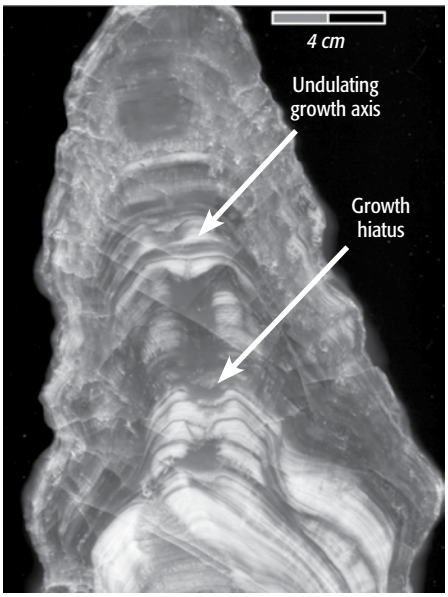
Use of speleothems for scientific research has been increasing over the past 30 years. We cannot ask for "more research to understand caves and karst" and then not have input into this. This is an article from a current earth science PhD student on the advantages of speleothems as a climate proxy and the need for appropriate management.

Well-dated, high resolution paleoclimate records from continental settings are becoming increasingly sought after for use in climate research with particular focus on testing and validating general circulation models at high spatial resolution, and investigating possible leads and lags between different components of the climate system.

Speleothems have been proposed as the multi-proxy paleoclimate archive with the potential to provide such data (McDermott, 2004) and, consequently, have been propelled to the forefront of paleoclimatology over the last decade. However, coupled with the increased awareness of their potential in paleoclimatic study, the great need to protect and preserve the fragile world of speleothem decorated caves has also become increasingly recognised.

These fascinating formations, often formed over thousands, and sometimes millions of years are unparalleled anywhere else on earth and although their numerous attributes over most other climatic proxies can't be ignored, it is the duty of paleoclimatologists to work closely with the caving community to utilise this valuable resource in the least invasive manner possible. It is clear that what must be followed is a procedure in which as little material is removed from the caves for the greatest gain in paleoclimatology, and with vastly improved sampling and technological techniques and equipment we are now able to closely follow such a procedure.

Generally hosted by karst caves, speleothem formation is the result of aqueous dissolution of calcium carbonate from the host rock and overlying soil and the consequent re-precipitation in the cave. The water involved in ultimately forming the speleothem deposit is sourced from meteoric precipitation falling above or nearby the particular cave site and hence the geochemistry of speleothem calcite holds information about the external climate at the time each particular layer was deposited.



HELEN GREEN

Buchan Sample RO collected from Royal Cave until recently held one of the Southern hemisphere's few records of a Younger Dryas climatic event well established in the Northern Hemisphere. The stalagmite has since been redated to disprove this record.

These secondary calcite cave deposits have been extensively used in paleoclimatic research as their growth mechanism is linked to Earth's atmosphere and hydrosphere in a number of ways, potentially providing information on paleo-rainfall and temperature patterns, alongside consequent fluctuations in the vegetative cover above the cave site. However, the recent increased recognition of speleothem importance has been bolstered by numerous improvements in the techniques applied to the generation of multi-proxy records and radiogenic dating. The substantially reduced sample size and consequently vastly improved resolution have allowed for annual resolution for records spanning extensive periods of paleoclimatic history. Alongside these advances, speleothems also possess multiple advantages over other paleoclimatic proxies with their particular suiting to paleoclimatic study and their advantages over other proxies increasingly recognised. Firstly, the occurrence of speleothems at a wide range of latitudes and altitudes means that they can provide hemispheric coverage compared to their latitudinally restricted ice core counterparts. Their growth inside caves means that they are sheltered from post depositional erosion and degradation and avoid processes such as bioturbation which often hamper the preservation of ocean sediment cores.

HELEN GREEN

A cluster of stalagmite samples removed from Royal Cave in Buchan during the production of the tourist route: These neighbouring stalagmites will provide four supporting records allowing for greater confidence in their interpretations and consequently, paleoclimatic reconstruction

Unlike biological archives, speleothems are resistant to adaptation over long periods of time (Franke, 1965). Their potential for continuous growth over long time periods allows for both high resolution and extensive records spanning up to millions of years, often outperforming the record length and resolution of all other available paleoclimatic proxies.

Speleothem suitability to uranium series dating processes also means that these high resolution records can be accurately and precisely anchored to chronologies independent of orbital tuning.

Cave walls, ceilings and floors are commonly adorned with a large variety of speleothem types and their mineralogy as well as their morphology is considered to be a function of the composition of the infiltrating seepage water feeding a particular

location, fluid flow (routes) and the growth conditions (temperature, chemistry and light) specific to each cave gallery (Richards and Dorale, 2003).

Despite this range of speleothem type, the simple stratigraphy of the "stalagmite" form has meant that they are the most prominent speleothems in paleoclimatic study.

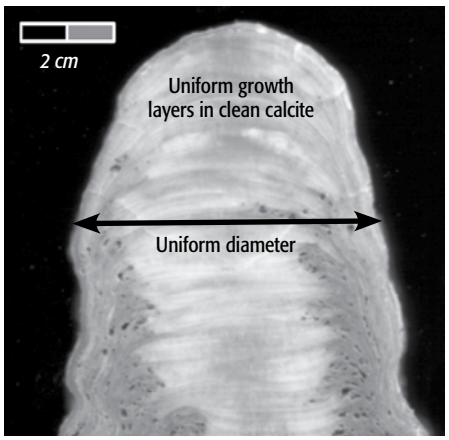
Though favoured for conservation purposes, the mechanism by which their "stalactite" counterparts grow involves calcite deposition both on the outer surface and through the central cavity resulting in coeval layers that are difficult to reliably sample (Lauritzen and Lundberg, 1999). Flowstones depositing in vast sheets on cave walls and floors hold more paleoclimatic potential with their lateral extent allowing for repeat sampling.

However, their potentially complicated growth histories, often involving switching flow direction and tendency to grow only during high flow events means their paleoclimatic records can prove difficult to interpret. Stalagmite growth mechanism allows the internal stratigraphy of the speleothem to be interpreted as a linear age progression, with the oldest calcite deposited first at the stalagmite base and becoming progressively younger towards the speleothem upper surface. Depositional processes control stalagmite morphology and can provide insights into both the speleothem's growth history and, consequently, indirect paleoclimatic information. Drip rate and fall height can be influential on speleothem shape with larger stalagmite diameters generally indicative of an increased drip rate (Franke, 1965) as well as influences from temperature and soil CO_2 variations.

Climate reconstructions are obtained from speleothems via variations in the chemical content of their calcite. Paleoclimatic studies have predominantly focused on variations in the stable isotope composition of both carbon and oxygen resulting from various physical and chemical processes, both directly and indirectly related to climatic fluctuations, and much of their regard as major paleoclimate and paleoenvironmental archives has resulted from such records.

However, alongside this isotopic information, the potential for speleothems to provide multi-proxy records has propelled them ahead of single-proxy archives such as those held in tree and sediment cores. Trace element records are frequently used to support the isotope archives.

However, the final recorded signals of both isotopes and trace elements consist of a complicated interplay of environmental controls and processes in systems spanning



HELEN GREEN

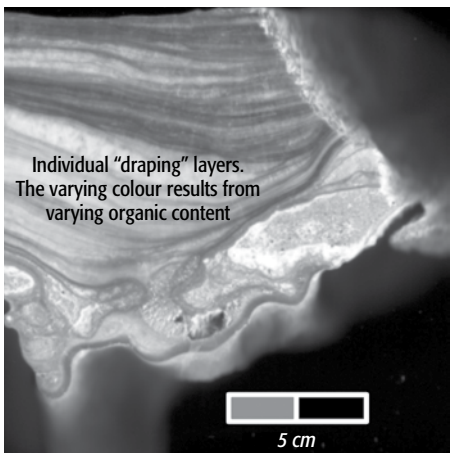
(Portland) Stalagmite cross section displaying uniform diameter and clear growth banding

from the source ocean to the atmosphere, soil zone and epikarst and finally within the cave system itself. Consequently, the controls on speleothem records are extremely complex and the challenge has become to disentangle the climatic signal from that influenced by local/ non-climatic factors.

To decipher the climatic influences on speleothem records, more information is required to provide further confidence in the paleoclimatic interpretation.

Speleothems located in proximity must be selected in order to maintain a set of growth constants (i.e. epikarst composition and thickness, cave ventilation, infiltrating water pathways, cave temperature) and to consequently minimise the number of non-climatic variables influencing the overall signal. The use of multiple neighbouring speleothems will allow the identification of coincident isotope or trace element excursions held in the calcite records supporting their interpretation as climatic or non climatic signals.

The sensitivity and conservation issues surrounding the removal of speleothems from caves are fully appreciated and understood but it appears that the removal of multiple samples from a single cave gives more reliable paleoclimatic results than the removal of multiple samples from



HELEN GREEN

(Portland) Flowstone cross section demonstrating clear growth banding but varying deposit thickness

caves spanning over a considerable area. Although individual speleothems can and have been used to produce adequate records of paleoclimatic fluctuations, sampling multiple samples from the same cave allows for a hugely increased confidence in such records and further secures speleothems as leaders in paleoclimatic research.

It is with this in mind that we must reassess the removal of speleothems from caves for paleoclimatic study in light of improved sampling and analytical techniques and equipment enabling a vastly improved adherence to the Australian Speleological Federation codes of ethics. The removal of sub-milligram sized samples for dating, trace element and isotope analysis means that stalagmite samples may be used multiple times for a range of different projects.

The development of a speleothem register in which the details and age range of samples removed from caves across Australia could be archived, would allow researchers to return to samples for both new studies and re-analysis. Alongside new samples, my PhD project has reanalysed a Buchan sample collected in 1996, exploiting improved techniques and reduced sample size requirements, to re-drill and re-date the remaining portion of the speleothem axis.

The requirement for such a decreased sample size means that once bisected, a geochemical analysis may be performed on just one half, or in some cases, a centimetre thick slab cut from the bisected face. The remaining portion of the stalagmite may then be polished and preserved for future study, or under particular circumstances, returned to the cave site for tourist/public display and interest and used to aid the understanding of paleoclimatic investigations.

Working together honestly and respectfully, speleologists and paleoclimatologists will be able to both protect and preserve these natural phenomena and produce exemplary paleoclimatic records of Australia.

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REVIEW

Cave of Forgotten Dreams in 3D

Review by Sue White

This 3D documentary of the discovery of spectacular 30,000-year-old cave paintings in Chauvet Cave in the south of France was shown at both the Sydney and Melbourne Film festivals and then was released for general screening on 22 September.

As I write this it is still showing for several sessions per day at the Nova Cinema in Carlton Vic, but I am unaware (and have not been able to discover) if it has continued showing elsewhere.

Despite the tightest of restrictions and considerable technical challenges, Herzog follows his previous pattern of taking us to an extraordinary place.

He and a tiny crew gained unprecedented access in an exclusive expedition to join the cave researchers.

He carefully details the technical difficulties faced in making the film, as well as musing on the potential spiritual meaning behind the spectacular Palaeolithic artworks.

A revelation in the movie suggests that tourist dollars might explain why he was allowed in.

The cave is already a regional attraction (there is an exhibition nearby), and certainly the movie is a fabulous bit of advertising that may even help France's bid to have Chauvet designated a UNESCO World Heritage site.

Chauvet Cave was discovered in December 1994 by three French cavers, Jean-Marie Chauvet, Éliette Brunel Des-

Review: ACKMA CD

Conference Proceedings and Journal Articles 2011

Susan White
Chair of ASF Publications and Helictite Commissions

THE LATEST CD produced by ACKMA (Australasian Cave & Karst Management Association) has recently arrived. Although this is a useful compilation of previous cave and karst management conference proceedings and ACKMA Journal articles, there are some issues with the publication.

This CD has the 23 papers and 10 extra abstracts from the latest Cave Management Conference at Ulverstone, Tasmania in May 2011 as well as the previous material. As usual this year's conference had a wide range of presentations detailing management and cave and karst science from around the world as well as well as an interesting selection of Australian and NZ offerings.

As expected, Tasmanian topics dominated with approximately half the papers relating to Tasmanian sites.

The range of topics was very wide: karst area descriptions, history, cave interpretation, cave guide training, various types of cave tours, cave biology, geomorphology, municipal planning on karst, the state of cave and karst management in various areas and particular projects. The papers vary in quality as expected of such a conference but I found the papers overall interesting and valuable.

Unfortunately there are some other problems which mar an otherwise worthy piece of publishing.

The title of the CD itself is inaccurate as *ACKMA conference proceedings 1973—2011.* This title implies that the conferences were all ACKMA conferences, whereas the first five (1973—1983) were convened by the ASF Cave Management Commission, the sixth was hosted in 1985 at Waitomo, New Zealand by the Tourist Hotel Corporation of New Zealand and the seventh in 1987 at Wombeyan by a triumvirate of the NSW National Parks and Wildlife Service, NSW Tourist Commission and ASF.

It was not until this Wombeyan meeting, in 1989, that ACKMA was formally established. The implication, unless you are already aware, that cave management conferences have always been the prerogative and the initiative of ACKMA is not an accurate portrayal of the history of cave management meetings since 1973. A more correct title is probably *Australasian Cave and Karst Management Conference Proceedings 1973—2011.* There is acknowledgement of ASF's role on the front index page but you would need to be looking for it to realise that the copyright is partially held by ASF. Unfortunately these and other inaccuracies detract from the whole exercise.

I often find the organisation of such CDs rather messy with HTML documents with separate figures not as easy to use as the PDFs. Both are presented here so one does have a choice.

I also personally do not like dark backgrounds, in this case green, with white (or light coloured text) but that is a personal preference. There is a main index which helps organise the overall CD.

The compilation of all the Australian and Australasian Cave and Karst Management conference proceedings is useful as it places all these related documents together. These are interesting reading and the evolution of management ideas in Australia and New Zealand since 1973 is illuminating. The various articles from the ACKMA Journal are also valuable as such articles are not always easily obtainable. The updating of the CD after each of the management conference is a valuable way of keeping the proceedings up to date.

champs and Christian Hillaire.

Following an air current coming from the cliff, they dug and crawled their way into the cave, which had been sealed tight for some 20,000 years.

The French government soon took custody of the cave, and ordinary visitors were barred to protect it from the kind of damage done to other prehistoric caverns, in particular, Lascaux.

There has been extensive debate on whether the earliest Chauvet paintings date from 32,000 to 30,000 BP or are actually somewhat younger.

Whatever the case, everyone agrees on their beauty and that Chauvet Cave is one of the world's outstanding cave art sites.

There are hundreds of paintings, astonishingly realistic drawings of horses, cattle and lions.

These are illuminated as cavers would see them in the lights of head-torches and hand-held lights. As a result torchlight brings the drawings to life.

It is an unforgettable cinematic experience that provides a unique glimpse of the artwork.

Cave of Forgotten Dreams works best when the music subsides, Herzog interrupts his English narration and the camera pans slowly across the walls.

The metaphysical digressions, the interview with a perfume designer whose hobby is detecting hidden caves by sense of smell and the epilogue involving albino alligators born in water heated by nuclear power plants is somewhat of an anticlimax to the photography of the artwork.

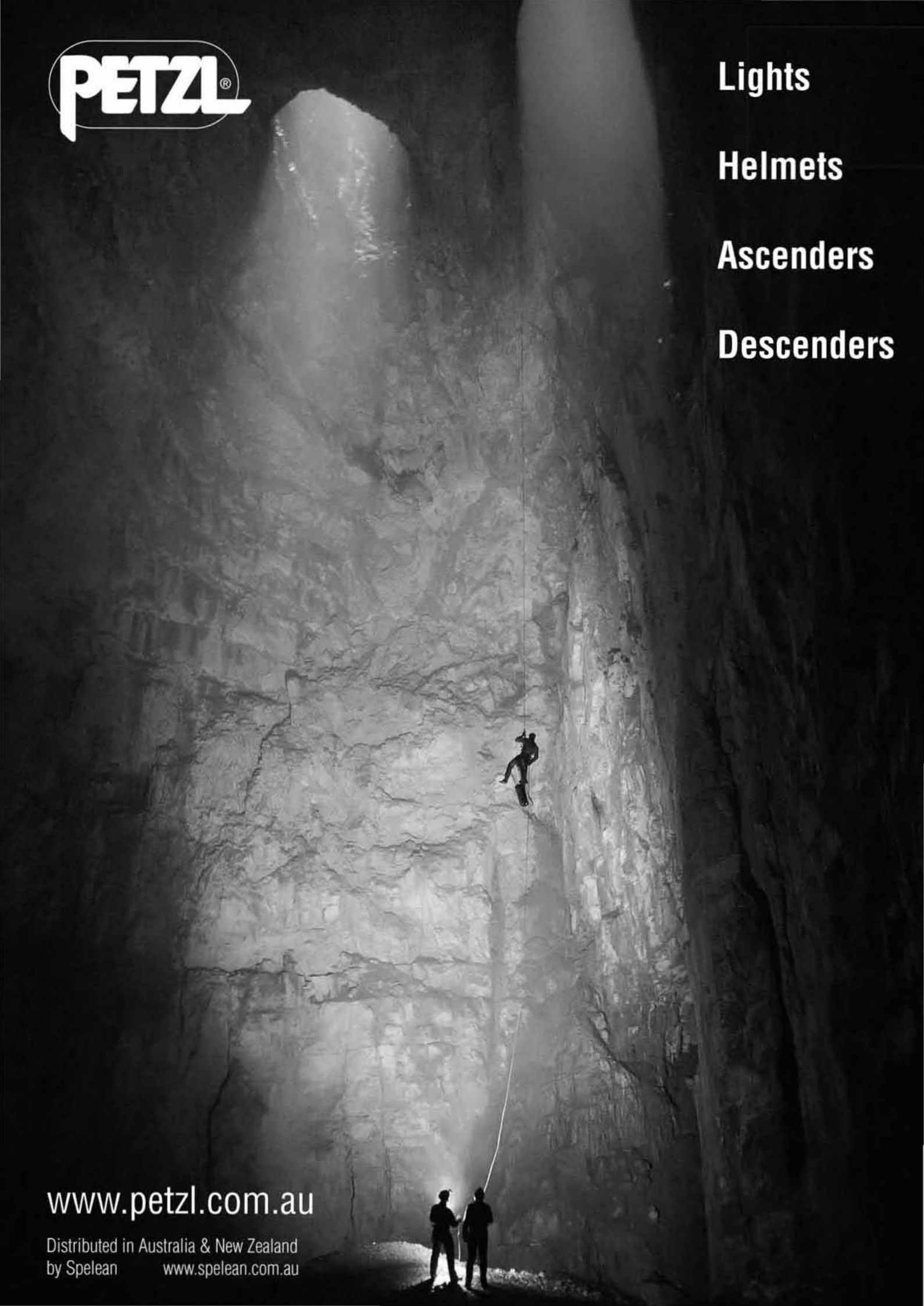
The spectacular cave shots of speleothems and a floor covered with animal bones are surpassed by the photography of the beautiful images of galloping horses, bison and a ghostly menagerie of cave lions, cave bears and woolly mammoths.

Multiple red palm prints of an early artist adorn one wall.

I watched it in excellent 3D which enhanced the effect of the decorated cave walls.

Despite the narration, new-age music and chanting, which I found distracting, the film can only be described as in the 'must see' category for cavers.

Cave of Forgotten Dreams in 3D (G)
Director: Werner Herzog
Genre: Documentary
Runtime: 90 minutes
Available formats: film
Film release date: 22 Sep 2011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