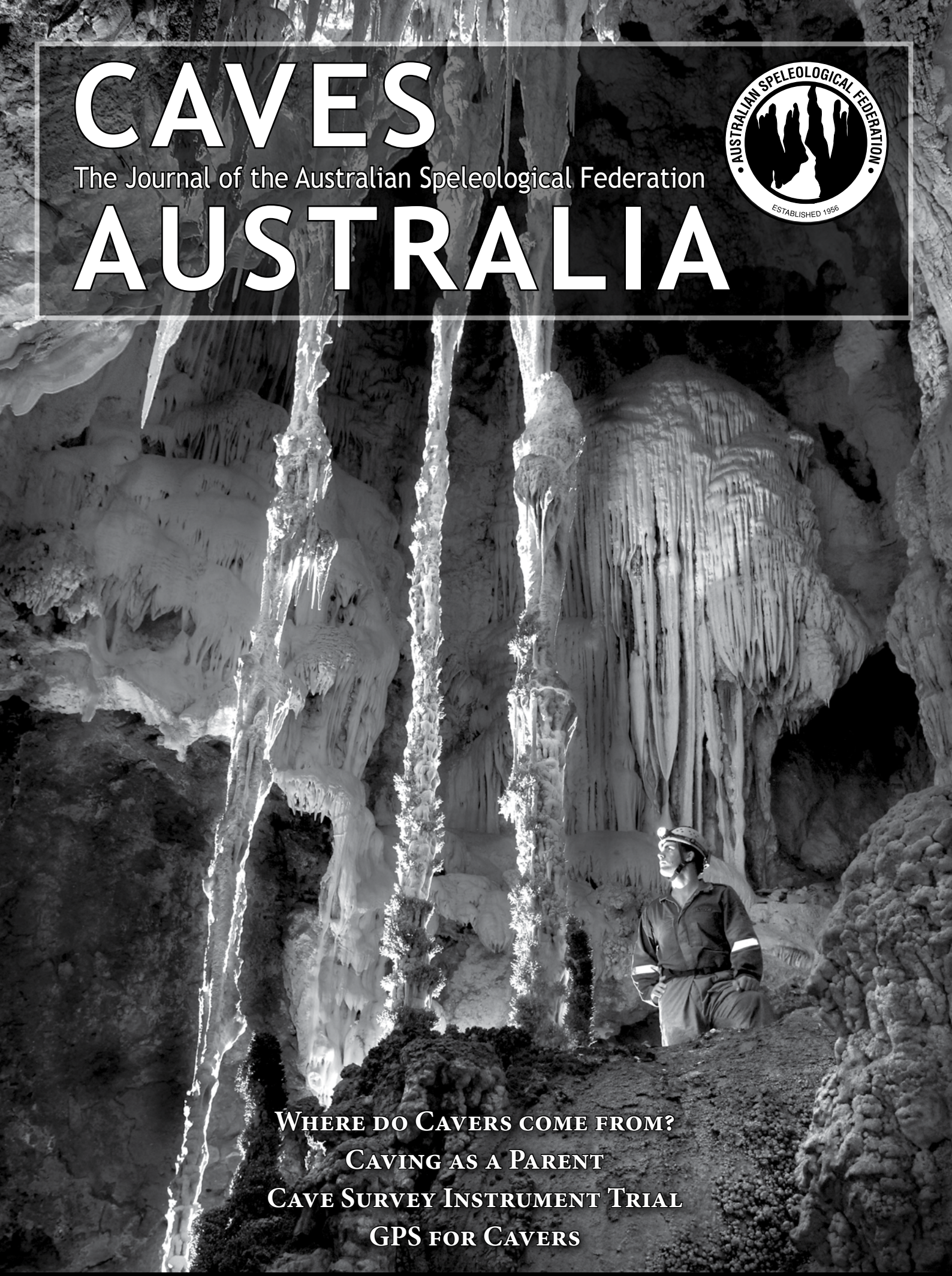
CAVES AUSTRALIA

The Journal of the Australian Speleological Federation



Where do Cavers come from?

Caving as a Parent

Cave Survey Instrument Trial

GPS for Cavers

No. 183 • DECEMBER 2010

COMING EVENTS

This list covers events of interest to cavers and others 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 are useful and details of international and regional events may be listed on the UIS/IUS website http:///www.uis-speleo.org/. Many of these events are listed 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.

2011

10—14 January

The 12th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst, St. Louis, Missouri, USA. Details of registration etc are available on the website http://www.pela.com/sinkhole2011.htm This highly successful interdisciplinary biennial conference series is one of the most important international meetings that concentrates on the practical application of karst science.

This is the twelfth in this series of highly successful interdisciplinary conferences which were first organized by the Florida Sinkhole Research Institute in 1984 as a means for geologists and geographers, who study how and where karst develops and how sinkholes form, to interact with engineers, planners and others, who must apply this information to build and maintain society's infrastructure and protect our environment. Since the first meeting in 1984, these biennial conferences have grown into the single most important international professional meeting concentrating on the practical application of karst science.

The goal of this conference is to share knowledge and experience among disciplines by emphasizing scientific and technological aspects of karst that have practical applications, together with case histories of those applications. There are a number of technical short courses associated with the conference.

17—22 April (Easter)

Chillicon: ASF Biennial Conference, Chillagoe North Queensland.

28th Biennial Conference organised by Chillagoe Caving Club. This week-long Conference will include national, international and local speakers, workshops and A LOT OF CAVING! If you're interested in caves, love them with a passion, or just want to find out what the fuss is all about then you're invited! Download from the website http://www.chillagoecavingclub.org.au a registration form, the Conference Brochure and details on program. (The registration form was also included in *Caves Australia 182.)* For more details contact: Winfried Weiss winfriedw@chillagoecavingclub.org.au

8th—13th May

19th Cave & Karst Management Conference, Ulverstone, Tasmania. Abstracts for oral (20 minute) presentations and poster presentations are now open and are due by 1 February 2011. Conference proceedings will be published on CD and a copy of your paper must be received by 15 March 2011. Details of costs, accommodation etc are available for download from the conference section of the ACKMA website (http://www.ackma.org/conf2011/index.html). For other details contact the convenor Tony Culberg. PO Box 122 Lindisfarne Tas. 7015 E-mail: culbergf@bigpond.com

27—30 June

The 6th International Conference, Climate Change – The Karst Record, will take place at the University of Birmingham. Three days of oral and poster presentations will be held on the University of Birmingham campus, with accommodation provided on the University Conference Park and in local hotels. Either side of the main meeting, one-day optional fieldtrips will be run to regional karst and tourist attractions. Some details are available on the website http://www.kr6conference.org/.

1—3 September

H2Karst, the 9th Conference on Limestone Hydrogeology, Besançon, France

This conference is organised by the Universities of Franche-Comté (France) and Neuchâtel (Switzerland) every 4 to 5 years. The themes of the conference are underground storage of water in karst (natural & artificial), relationship surface water—groundwater (low water support, floods, quality), karst ecosystems, aquifers, water quality, metrology and data transmission, and any issues relating to karst water. Two days of presentations will be followed by 2 excursions in parallel, one in the classical French Jurassic karst (Lison spring, experimental site of Fertans, studying infiltration), the other one in the Areuse karst system in the Swiss Jura (role of the forest). Abstracts and titles of presentation (poster and oral) are due by December 15th, 2010. For contact until the website is set up use h2karst.besancon@gmail.com

CAVES AUSTRALIA

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Editor:
Ian Curtis
iancurtis10@hotmail.com

Production and Advertising Manager:
Alan Jackson
Email: alan.jackson@lmrs.com.au

Proofreading:
Susan White
Greg Middleton
Joe Sydney
Jodie Rutledge

ASF: asfinfo@caves.org.au
For all ASF publications:
publications@caves.org.au
Editorial contributions are welcome!
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ASF

Contents

Queenslander Cave, Chillagoe, Queensland :Chillagoe Caving Club's Winfried Weiss views the "Sisters". Photo by Alan Pryke

ASF Executive

FROM THE EDITOR

Conferences

Although I have no scientific background I do enjoy the papers presented at caving conferences. It's not so much the scientific theories posited (which can cause my eyes to glaze over), it's the language in which they are expressed.

The last ASF conference at Sale was no exception: language was toxic, twisted and tortured in ways that would have brought scowls to the lips of Partridge and Fowler and a smile to our own Don Watson. Obfuscatory neologisms abounded. Science baffled. Let me share some examples with you.

Can you distinguish between actogenic and autogenic? Karst and epikarst? Would you recognize a fluvial intrusion or be able to name the low mobility metals? How about an anthropogenic compromise or a pseudosingular domain? Could you accurately explain the vadose theories of cave genesis and the syngenetic origin of caves to your mates as you hang around a squeeze?

If geology isn't your strong point, how about biology? Stygofauna? Opilones? Trinemura? No? Perhaps you can answer the questions listeners were asked: 'Why do you cave?" (Because it isn't there! Yes! Easy) or ask yourself 'What have stygofauna ever done for me?' (More difficult) What about 'Are you a cricket ball or a burning ship?' (I thought at this point I was perhaps at the wrong conference.)

I learnt about geekery and brochurese. I learnt about the world of pain (relating to the cave environment) and being on the moon (unusual, I would have thought, for a speleo).

As the conference wound down and participants were asked whether they would prefer proceedings on disk or paper, finally a comment was overheard that I clearly understood: 'At least you can take a hard copy to bed with you.'

I look forward to Chillagoe!

Ian Curtis
OSS

President's Report

ONE OF the policies that exists within the Federation is the very definitive one that outlines Minimal Impact Caving. This is in place to protect the cave and its environment as well as visitors to the cave.

I propose the introduction of a new policy: Maximal Impact for Cavers. I base this on the belief that cavers are inherently reserved. Cavers and their activities need to be more visible to promote caves, caving and all things speleological to the wider world.

Speleologists are notoriously passionate about finding, exploring and extending caves. Likewise they honour the tradition of writing trip reports, documenting and publishing cave information within closed circles.

Enough information to enable safety and management issues to be addressed is required on an ongoing basis.

Occasionally the media, in all of its many forms, approach us and want to tell a small part of our story to the "Great Unwashed". We take that opportunity and generally do a great job for them and satisfy the audience with a range of emotions. However, this information would remain under wraps if not asked for. Also from time to time, to meet obligations to sponsors, documentaries of specific expeditions are made and subjected to a very limited release.

What we as cavers don't generally do well is telling the story as it happens, from the inside out, at Ground Zero. Likewise we are inexperienced in the ability to continually advertise and promote clubs and club activities. Recruitment of new cavers is important to the future of clubs and to the science and art of speleology. So the challenge is there to be entrepreneurial and vigilant for opportunity. Let us make this a project to promote what we do well.

So as 2010 draws to a close I hope that you all have been successful in your endeavours and have found time to do the things that are enjoyable.

I hope that 2011 is a great year and look forward to attending the ASF conference in Chillagoe. I personally hope to finish off more projects that I have started and so far neglected to complete.

Remember that speleology may be a science for some but likewise it can be a philosophy, a religion and a lifestyle. It is always a journey without a defined destination. Keep well.

Yours in Speleology
Stan Flavel

WANTED
ARTICLES FOR *CAVES AUSTRALIA!*

Whether caving, cave diving or general exploration, *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.

Where do Cavers come from?

Stephen Bunton
STC

AS CAVERS AGE, the average age of ASF members increases. Like many other similar clubs, it appears we struggle to attract new members and various hypotheses are proposed to explain this phenomenon and offer some possibility to reverse this trend. There are plenty of clichés denigrating youth; "the kids of today have no get up and go", "no stick-ability" and "they don't put in the necessary effort to derive any satisfaction". Young people certainly are different today, possibly more discerning — I can understand why crawling around in mud, in the dark and through guano holds no great appeal for modern youth. So what was happening 30 years ago to attract a group of teenagers all from the same area to become attracted to this idiosyncratic activity?

DIRK STOFFELS

Mike Laurendet negotiating the roof-sniff in The Backyard, Mama Kananda, PNG

I started caving with the Scouts, itself an organisation that now struggles to attract members of the younger generation. I was lucky to have a very committed Venturer leader who was willing to take us away at weekends fairly often. We went canoeing, rockclimbing, bushwalking and caving. I was hooked on all these adventure activities but it was caving which became my main passion. The reason why caving became my major activity was thanks to the existence and enthusiasm of a group of scout cavers called the St George Area Caving Team (StGACT). They offered activities on a more regular basis.

The St George Area Caving Team was the brainchild of Peter Dykes. Peter realised that scout cavers suffered from an often well-deserved, poor reputation. The numbers of cavers, the lack of good leaders, the high ratio of novices to leaders, the sometimes dodgy safety practices and lack of conservation awareness were all issues that "real cavers" often complained about. Peter's vision was very pro-active; to take a group of competent cavers, train them as leaders and then volunteer their services to scout groups so that Venturer leaders could out-source their activities to "the Caving Team". My scout group was one of the first to partake of this offer and so I enjoyed a well-organised introduction to caving.

After several weekends caving over the following 18 months, I had accumulated more than 20 hours experience and was assessed for a Party Leader's qualification. After 50 hours I qualified as a Trip Leader.

STEPHEN BUNTON

Bryan Cleaver leaving Atea base camp in 1982

I was still under 18 and couldn't even drive, so I was reliant on the Venturer Leader of a particular group to organise the weekend for their group and other Caving Team members for transport. Once at the caving area our responsibility was the co-ordination of parties of Venturers and the leaders to take them underground.

Venturer leaders, the more enlightened ones, could see the value of this arrangement and availed themselves of this facility. Understandably, however, there was some antagonism to the perceived arrogance of a group of precocious youngsters who saw themselves as self-proclaimed experts in caving. In my opinion there was no denying that Peter's initiative led to an increase in safety and conservation standards. It set an example that was copied by other scouting districts.

Peter Dykes, like myself, grew up in Caringbah. He was (and still is) a person of boundless enthusiasm. He was not the sort of person who would take "No" for an answer. He was the ideal person, perhaps with a touch of the necessary arrogance, to instigate such a scheme. Peter's greatest contribution was the time he invested in other young people — the training of future leaders. I have the fondest memories of my trips to Jaunter. On one particular trip there were eight of us crowded into Peter's red Kombi

STEPHEN BUNTON

Geoff Innes (left) and Graeme Smith (right) arriving back at Mamo IV

van. Peter eventually bought the property at Jaunter that contained the caves and then moved to a place even further out in the sticks. As such he was very involved in the ASF NSW Speleological Council, keeping his finger on the caving pulse from the back of beyond.

Peter could not have done it alone. The core of the St George Area Caving Team consisted of a number of other cavers who were hooked for life. It was on an early StGACT training day when I first met Alan Warild, easily Australia's most accomplished caver; Al also grew up in the Sutherland Shire. Peter's right-hand man was Graeme Smith, another Caringbah native. Graeme accumulated a vast amount of experience caving. At Sydney University he studied entomology and after a serendipitous trip to Phoenix Cave (B-60) at Bungonia, he became involved in the study of troglobitic silverfish. Graeme participated in three trips to Papua New Guinea as a cave-biologist.

I attended 1st Taren Point Scout Group. Most of my colleagues, although they enjoyed the occasional caving trip, were more interested in surfing. I often thought that I would have been a better caver if I'd grown up in France or better climber if I'd grown up in Switzerland but chance doesn't work like that. I'm a crap board rider, despite living just two train stations from Cronulla Beach. I still enjoy body-surfing but there is something more enthralling about caving.

Another member of our scout troop was Chris Dunne who was not interested in surfing at all. Chris eventually became very interested in caving and formed a good working relationship with Peter Dykes. Chris became so enthused that he involved himself diligently with the administration of ASF serving as Secretary for a number of years.

Later when I was semi-involved in Rover Scouts I met Brian Evans from neighbouring Miranda. He lived a mere stone's throw from my home. Brian had done some caving through his scouting but really got inspired in the lead up to the Mamo 82 expedition to PNG, where he was privileged to be involved in the discovery and mapping of about a kilometre of cave every day, for over a month. After a long spell raising two energetic boys, Brian has rekindled his caving involvement with ISS and CSS.

I attended Caringbah High School and so too did my sister who is a few years younger than I am. In her year group were a couple of students who are still active cavers. Dirk Stoffels, now active with CSS, also participated in trips to NZ and PNG and distinguished himself as a cave photographer. Dirk's recent interest has been in the conservation of Dogleg Cave (WJ-13) at Wee Jasper. Dirk's best mate and companion on his photographic trips was Mark Laurendet, who hailed from nearby Jannali. Together, their high quality photos really conveyed the nature of expedition caving in the '80s.

STEPHEN BUNTON

Graeme Smith sorting invertebrate specimens at Mamo IV camp, PNG, in 1982

Mike Lake was also a member of my sister's year group at Caringbah High. I got to know Mike as a member of SUSS on numerous trips to Jenolan. Since then Mike has been a prominent member of ASF for decades and the driving force behind the web-based Karst Index project. He, like so many of the other cavers mentioned, typifies the long-term involvement of cavers from Caringbah during that era, who now play an important role in caving.

Another SUSS member who hailed from the area was Geoff Innes from nearby Gymea. Geoff and I caved together at Jenolan and on the ATEA 78 trip. Geoff later spent countless hours drawing the map of this 30-plus kilometre Atea Kananda.

Bryan Cleaver was a member of a mini-expedition to NZ and then Mamo 82. He later went to live in PNG working as a mining engineer. Well, it's almost caving. Bryan hailed from nearby Sylvania. The name conjures up images of a woodland paradise.

So what was it with the Sutherland Shire? Was it paradise? Is all this just a coincidence or was there something special about growing up as a late baby boomer in Sydney's southern suburbia? What was it about caving that attracted a group of working-to-middle class teenagers in the early 70s to stick with such an eccentric activity? Were they just a cluster group? Was it their stick-ability or conversely, was it that they lacked the imagination to extend themselves into other activities? There is no doubt that something special was going on there and then.

At the time the Federal Electorate of Cook was a swinging seat. It had a Labor member, Ray Thorburn, under the Whitlam Government. Ray Thorburn presented me with my Queen's Scout Award, which seems an old fashioned concept. Today Cook is a blue-ribbon Liberal seat. The quiet suburbia of yesteryear has morphed into home units and high-rise, the rich and famous (including several Australian cricketers) inhabit the more secluded bays around Port Hacking. No-one I know can afford to live there any more. "Sons of beaches don't live on the coast no more!" Times have changed.

Perhaps the demographers could reconstruct the Sutherland Idyll of yesteryear, perhaps they could put something in the water and give us a new generation of cavers, or perhaps the cave fairy waved her magic wand over the area, just the once, in a

Caving as a parent
Family caving

Amy Robertson
STC

INTRODUCTION

Yes, I have to admit that I'm a caver and a parent. The caving came first—chronologically—but somehow the family priority seems to have now relegated it to second place.

Caving has progressed in my priority list from the obsession of a young adult student to the recreation of a full-time professional to now the release of a working parent. I'm still passionate, but I'm weary.

It's made me wonder if I'll ever again be a devoted caver. And how would I go about regaining that devotion? Part of that involves considering how my family obligations may change in future, and part on how this all came round in the first place.

Oh, I should note that I've got no relevant qualifications at all in this field and that if pain persists, please see your doctor.

PARTNERS

Obviously, this is the first (but not necessarily a permanent) ingredient in the family recipe. I'm not going to deal with the issue of how to find one, but usually it doesn't involve a cave.

I'm constantly amazed by how many outdoorsy blokes I meet who 'put up with' indoorsy girlfriends/wives. I can say that 'cos I'm not one – either a bloke or indoorsy. And my other half shares my love of the world around us, though not so much where it involves getting wet or confined. So we have enough in common to share a lot of our recreation, but some differences that drive us to more individual outlets too.

'Put up with' isn't quite the right expression either, since suppressing the qualities that define and enthuse you will only lead to resentment. I think that any deliberate exclusion of your partner is also going to be counter-productive. The solution lies in respect—everyone's different and that's what makes life such fun—and in the communication that creates understanding of those differences.

JANE PULFORD

Me and Linda (aged 8 months) on Exit Track

From what I can see, the dual-caving couples out there use those sharing and difference principles to manage their relationships too. While they might make us jealous that they don't have to deal with a non-caving partner, each relationship will still have its differences to deal with (see the 'short' story in *CA*178:6 for an example). Everything's relative, and the bonus for those of us who hone our interpretation skills with a non-caving partner is that we'll also be able to apply those skills to most of our broader family, friends and colleagues.

CONCEPTION

This shouldn't be cave-related, and I'm not going to mention dark wet holes.

PREGNANCY

Begins with an oops or a yay, or occasionally both. I haven't known very many pregnant cavers, so this discussion is based on me. I found pregnancy challenging but not impossible to integrate with caving.

That first trimester—when some women see little else than the inside of a bucket—is unpleasant. There's the weariness of trying

to metabolise enough energy for the new alien taking over your body, the hormone-induced constipation weighing you down, and the unknown of whether you'll need to bring that bucket along. You are also probably not telling anyone about this, waiting till that 13th week when the belly shows and the miscarriage risk drops off. All grumpy and no sympathy to help.

The second trimester is great. As your body comes to grips with its hormone load, your systems resume normal function—or close to it. A friend called this the 'superwoman' trimester, as in comparison to what you've just been through you now feel like you could do anything. But a bump in your belly is changing your centre of gravity, so you're not as light on your feet as you used to be, and your trog suit doesn't do up so the ventilation makes you cold. Back to good news, your caving harness still fits round your bum and hanging in it actually relieves pressure round your belly, so you're still OK for a pull-through trip (I did the waterfall pitch in Growling Swallet's Yorkshire Drain at 21 weeks). And it's wonderful how peers now volunteer to carry your share of ropes and rigging gear, though you may not want to part from the bag of nibbles in your pocket to keep the fuel supply up.

Now I don't know much about the third trimester, since my daughter was born early at 27 weeks. My plan was to concentrate on surface work: supplying scones for morning tea at the entrance, encouraging hubby in his track-clearing endeavours, and drawing up long-forgotten survey data. The parasite dwelling in your core now steals your caver identity. It uses this for its final act of revenge, which earns you the pity and respect of all cavers, as you become the cave and bring into the world a new caver through their very first squeeze.

BABY

It was really all easy up to here, and maybe even fun at times. But now you're chief feeder, changer and settler of a real baby—or at least the partner of the chief.Babies are noted for their unpredictability and demands. Cavers with grand plans of scheduled 'me-time' are swiftly brought back to the surface by the rock-penetrating screams of a baby (or its mother). If only we could channel this into new Radio Direction Finder technology for use in cave rescues, following the path of other infant-derived caving equipment (e.g. nappy harness, fuzzy suit).

It's not just what comes out of a baby that is difficult to manage. While breastfeeding forms the best nutrition for an infant and is wonderfully portable, it's not entirely liberating. I had daydreams of lugging my pump along to 'deflate' as necessary during a trip, but in practice it's not that appealing to get your norks out in a cold and breezy cave. They're also bigger and more sensitive than they used to be, so though the belly bump is gone, big bazookas are now blocking your view of footholds and snagging in that squeeze.

And of course you may find yourself missing your bub. Despite all its tortures this critter attracts your love, and just as a partner may once have stolen some of your passion so will a child. The integration of family priorities is the key here, and adapting your cave trips to be shorter, less tiring and more efficient allows fulfilment of the passion while still leaving enough energy to cope with your family afterwards.

CHILD

Slowly but inevitably, the baby will become a child. Walking, talking and potentially caving now become part of its skill set. But there are some important differences between the child caver and the parent caver.

A child's smaller body can tackle the physical challenges of a cave in ways we only wish we could. With a relatively big head and short legs, a toddler's centre of gravity is close to the surface they're on, so it's not just play dough under their fingernails that allows them to do a great Spiderman impression. Conversely the older child whose legs and arms have shot outwards in Inspector Gadget style will make you jealous as they wriggle narrow abdomens through vertical squeezes with the greatest of ease.

Other differences in language, perception and responsibility may be more subtle and either useful or difficult to manage in a caving situation. Without having learnt a lot of the conventions and assumptions that adults use to guide—and constrain—their communication and problem-solving, a child can be a revelation as they honestly and openly describe their feelings and approaches to moving through the cave. But the explorative and naive child may also be more difficult for other cavers to manage, as they do the unexpected and rely to a greater extent on the care and attention of an adult for their needs.

I've met a number of cavers struggling with parent-child caving, in particular where they seem to discover a difference between the established behaviour of their particular relationship and the more flexible standards often present in peer caving groups. This difference can be difficult to reconcile—sometimes existing behaviours can't mesh with the peer caving context, and sometimes caving teaches much more than outdoor skills and becomes a defining part of a child's progression to an independent adult.

Learning to manage children can give you greater skills in managing adult cavers too – and not just the 'immature' ones. Seeing through assumptions and listening better to verbal and non-verbal communication can help us with adults who are out of their comfort zone, or in unexpected situations where improvisation and stress are influencing behaviours.

Indeed, risks and the dangers inherently present in caves, are an interesting topic where children are concerned. Safety is a—usually the—highest priority in a caving trip, and the unpredictable and potentially difficult behaviour of a child may be most safely managed by keeping them out of the cave. But experts agree that exposure to risk is an essential part of development, from gaining motor skills in early childhood, to learning the skill of persistence in the face of difficulty or uncertainty, if that learning is through taking control and creating our own outcomes.*

Safety for children lies not in removing the challenge or the risk, but rather in managing the severity of the consequences and keeping them closely linked to the child's own choices and control. In this sense, it's not much different from how we'd manage a beginner adult caver by running their first trip in a dry horizontal cave and letting them learn from some 'safe' mistakes. Kids, too, are learning self-care in an unfamiliar environment and tagging them along on a trip that's addressing your priorities rather than theirs is asking for just as much trouble as bringing a novice into Ice Tube. And experience and capacity in a child don't necessarily bring an ability to negotiate one's own care requirements, or the same priorities as you. Yes, you may know your child can do this, but you need to respect their choices and fears and to understand that they'll only really learn from their experiences if they recognise them as resulting from their own choices.

CONCLUSION

Everyone grows up eventually. And just as you did, one day your kid might grow up too and become a caver. Or not. Learning to evaluate, take and survive physical risks is an important part of a child's development, and caving can be a useful part of this. So get out (or in) there and practise your listening, negotiation and respect as you learn as much from a child as they do from you.

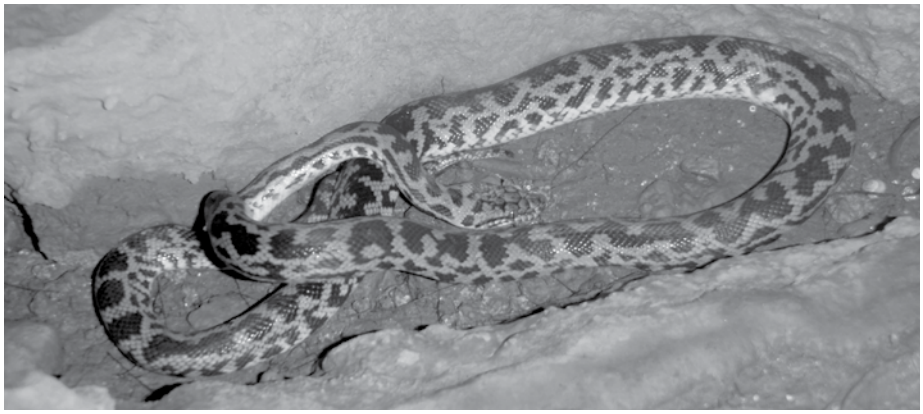
The next part of this story is about you ... we'd love to hear your stories or recollections of caving with, or as, a child. So please take a few moments to jot down your thoughts and send them to the editor.

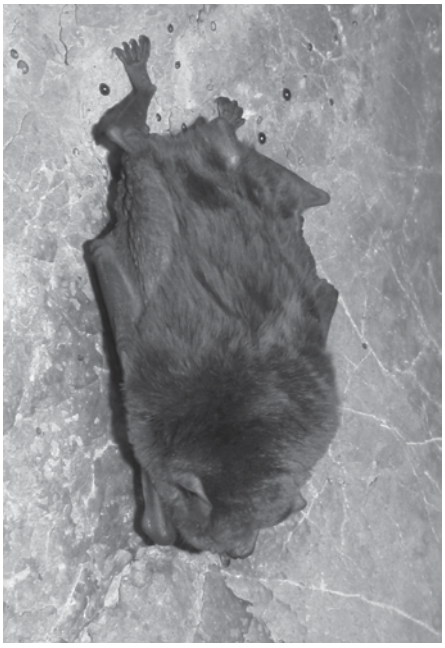
* Little, H., & Wyver, S. (2008). 'Outdoor play: Does avoiding the risks reduce the benefits?' A*ustralian Journal of Early Childhood,* 33(2), 33-40.

Chillicon: 28th ASF Biennial Conference

Chillagoe, North Queensland

17—22 April (Easter)





THE 28th Biennial Conference is organised by Chillagoe Caving Club. This week-long conference will include national, international and local speakers, workshops and A LOT OF CAVING!

If you're interested in caves, love them with a passion, or just want to find out what the fuss is all about, then you're invited! (The registration form was included in *Caves Australia 182)* or you can download one from the website. For more details contact:

Winfried Weiss

winfriedw@chillagoecavingclub.org.au

Find full details and download a registration form:

www.chillagoecavingclub.org.au

A field trial of common hand-held cave survey instruments and their readers

Bullita Cave system, July 2010

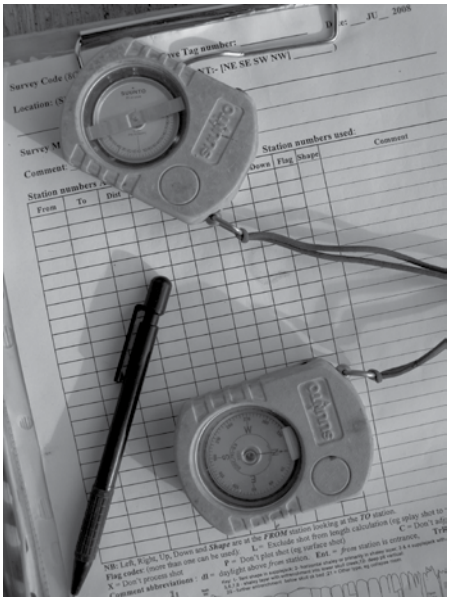
Deborah Hunter
MCCC and J-GKRSIG

DURING the annual ASF Gregory (now Jutburra-Gregory) Karst Research Special Interest Group expeditions to Bullita, Northern Territory, and in between times, issues of survey accuracy and errors in the field data have often arisen. More often than not, the instrument reader is blamed. The group decided to run a one-off trial out of curiosity to see how much variation there can be between instrument readers and their instruments under ideal conditions. The results were unexpected.

Other problems arise in big projects like ours concerning the software's compilation of the field data that affect the production of maps, but they are not considered here.

1. The basics: we survey caves to produce maps!

Normal field practice inevitably leads to inaccuracies: i.e. cave surveying using hand held instruments to the common survey grades used in Australia. The grade of surveys by the Gregory Karst Research SIG is 4.3 (Australian Karst Index, 1985). Although a SAP digital compass-clinometer (www.shetlandattackpony.co.uk/) and a Disto X (a digital compass, clinometer and distance measuring device) have recently made their appearance, we normally use separate Suunto or similar hand-held instruments for direction (bearing/azimuth) and dip (inclination/declination). For measuring distance, electronic rangefinders (e.g. Leica Disto) have progressively replaced fiberglass tapes in recent years. These data are recorded on data sheets, along with LRUDs (left, right, up, down distance estimates) to define the passage size and shape. Each survey leg is a straight line between two survey stations that are marked in situ with unique numbers on fluoro marking tape. The sketcher plots the survey legs on graph paper as we go, using protractor and ruler, producing field sketches at 1:500 or 1:1,000 scales.



DEBORAH HUNTER

The Compass® software (www.fountainware.com/compass) used to join the hundreds of individual surveys together to form the composite 1:1,000 scale map normally makes reasonable loop closures by evenly distributing small errors in bearings. However, sometimes substantial distortions occur that can be difficult to resolve when no obvious single specific error in that survey loop can be identified. Of course, the efforts of both the instrument reader and data keeper are instantly suspected (by each other or by the unfortunate person digitally transforming the data).

2. How do survey errors arise?

Data, including station numbers, may be incorrectly recorded on the sheet or may be ambiguous/illegible to the person making the entry in Compass, requiring guesswork to interpret and possibly leading to errors. The field sketches may reveal the error if the correct data were drawn but not recorded on the sheet. The actual bearings can be out due to errors in reading instruments or to magnetic interference. Compass reading errors potentially come in two forms: they may be consistent, systematic and cumulative e.g. somebody continually reads a compass so that their bearings are always either below or above the real magnetic bearing, or their errors may be random and therefore effectively self-cancelling i.e. somebody may read-off bearings with small, roughly equal errors that are sometimes below and sometimes above the real bearing. It is commonly assumed the second case usually applies. Gross errors can usually be identified either by the data keeper as the field sketch progresses or in the process of the transcription of field notes and sketches to the electronic medium (e.g. Compass program). Sometimes the reason for gross errors is due to who-knows-what, possibly a mischievous cave spirit. But usually, the bearing was mis-heard by the recorder or the instrument reader's light is found to be the culprit. Some headlights or a secondary helmet light or side-held light to illuminate the compass's card make a magnetic pull on the compass needle. In cramped or difficult conditions, an undetected tilt in the instrument can cause the compass's card to stick rather than freely float, giving an inaccurate reading. One time, we found it was the reader's prescription spectacles, magnetised for clip-on sunglasses, which were pulling on the compass.

3. Methods

For the trial, an "easy" setting was chosen to enable the most accurate readings i.e. to avoid the additional errors that might arise through trying to read instruments in less than ideal conditions. A total of five cavers and six compasses (all KB-14 Suuntos except for one Silva 4/54), two Suunto PM-5 series clinometers, three laser rangefinders and a fiberglass measuring tape took part. Two compasses were well-abused veterans of years of expedition work ("Old" Suuntos 1&2), while another (Suunto 1) was only two years old but had taken in dust, which had settled on the inside of the viewfinder.

DEBORAH HUNTER

The setting for the surveying trial at Bullita

A small cairn of stones marked the "from" station, and a red LED light marked the "to" station. A white card was held at the "to" station for the rangefinders. Each caver read each compass and clino in turn (to the nearest 0.5°), and the respective owners checked their own rangefinders against the distance measured by tape. Compasses were carefully read a few times before calling the bearing. The data were recorded by hand and later entered into MS Excel for manipulation.

4. What did we find in our trial?

It was evident the new SAP needed more careful calibration than we had time for (it gave different forward and back readings) so it could not take part on the day of the trial. Proper calibration was undertaken on a later day.

Distance:

The measuring tape read 14.28 m; one rangefinder read the same, while the other two read 14.27 m.

Dip:

Three of the cavers read both clinometers at 1.0°, while the fourth read both at 0.5° and the fifth read 1.0° and 2.0° respectively. The last caver also had trouble with the compasses.

Compass bearings:

During the trial, one caver's bearings (using his right eye) were substantially lower than those of the other cavers, giving a range in bearings of 7°. Checking for the "dominant eye syndrome," he then took readings with his left eye and his bearings were more consistent with the others' readings. Ignoring the right eye readings, the range across all bearings was 4° (Figure 1).

Compass bearings by operators:

The range in the cavers' average readings was 1.6° (37.2-38.8°). There was a similar variation between operators for some instruments and not others. The range in a caver's compass readings was dependent on which instrument they were reading, and

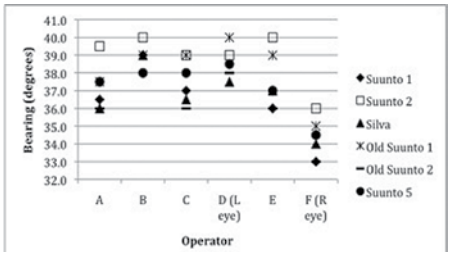


Figure 1: Variation between operators on compass readings.

compass readings varied ±1-2° of the caver's average.

Compass bearings by instrument:

Ignoring those right eye readings, the range in the instruments' average readings was 2.7° (36.8-39.5°). The range in bearings among the four instrument owners when they were reading their own instruments was 2.5° (Figure 2). The compass with the highest average reading (39.5°) was the new Suunto (Suunto 2), but the second highest average (38.9°) was from one of the old veterans while the other veteran had the lowest average (36.8°). Suunto 1 and the Silva had equal and greatest range in readings. The average reading from the Suunto 1 (Suunto with the dirty viewfinder) was just a little below the mean of all readings, but the variance in its readings was the greatest (SD=1.3).

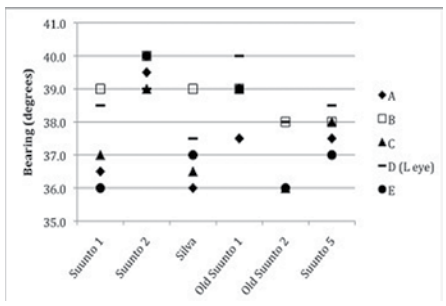


Figure 2: Variation between instruments.

Average readings for instruments and operators are shown in Figure 3.

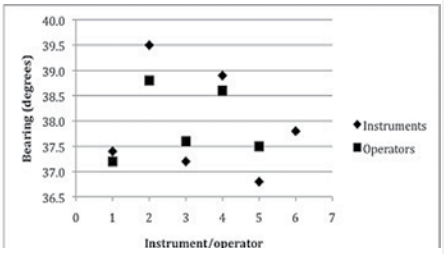


Figure 3: Average compass bearings.
Key: Instrument
1: Suunto 1
2: Suunto 2
3: Silva
4: Old Suunto 1
5: Old Suunto 2
6: Suunto 5

Back at camp, the caver with the highest average reading found his small new light that he'd forgotten about sitting in his top pocket. Holding it near a compass, he found it pulled strongly, enough to have some effect in a pocket about 40 cm from the instruments. On two further days of surveying without that little light in his top pocket, he checked several bearings with those of another and found he was now consistently within 0.5-1.0° of the others' bearing.

5. Discussion

The rangefinders performed well, within 1 cm of the tape measurement. This was because due attention was paid to correct positioning of the instruments and target. No obstructions were present in the trial setting.

The cavers read clinometers with better precision than compasses, but there were only two instruments to trial.

GUSTAVE VELA TURCOTT

It shouldn't be assumed that a careful compass reader will get better than ±2-3° of what the bearing should be. Both compass and compass reader were substantial causes of variance greater than 1° in survey standard grade 4.3. It is not possible to tell from this data what the true reading should have been i.e. were some of the readings way out or was the true reading close to the average of them all? There is not enough data to explain the variance. We can see that the difficulty in accurately reading an instrument with a dirty window is reflected in the range of its readings, while only one caver was familiar with using a Silva, and this may have contributed to the variation in its readings. The new compass having higher readings than the others doesn't necessarily mean that younger compasses necessarily outperform older ones. We should check the compasses against the SAP next year and check its variance and compare its performance with that of compasses. The Suunto with the dirty window could be serviced or exchanged.

While firm conclusions cannot be drawn from such a limited trial, it was interesting in

giving an indication of the performance of a range of compasses and instrument readers of varying age and accumulated mileage.

6. Reducing errors: conclusions

Some simple things can help reduce the frequency and/or magnitude of error of a cave survey. First, in data recording, write data clearly! It's a good idea for instrument readers not to rush the data keeper, who often tends to also be the sketcher. It's a good idea for the data keeper to repeat the data back to readers to confirm that it has been recorded and that it's recorded correctly. Correct station numbering needs to be checked constantly. To help avoid blunders, always write the next number on the station marking tape before tearing off the current station number. This enables cross-checks between the person out front and the data keeper.

We have also found it useful to regularly survey a leg (or three) in the opposite direction to confirm accuracy, using two or more instrument readers. This is especially useful if an instrument reader has a new headlight or glasses. If a compass needle is being pulled to left or right, or the eye used is weak, the problem will be revealed and can be corrected so the data can be taken again before leaving the section of cave.

Always make sure the card in the compass is floating freely and not sticking. Check by tilting it this way and that before giving your reading.

Always read off the compass with the same eye that lines up the survey station. If you read the target with one eye and compass with the other, the reading is subject to parallax error. This error is greater the closer the target. A compass can be read with one eye shut or both open, however, check your reading both ways and/or against another reader to identify the best method for you and stick to it. Line up the target with the vertical line in the viewfinder. And use your best eye, because they can differ.

Be careful of metallic or magnetised objects in top pockets or for use as side lights to illuminate the compass card. These can include plastic torches. Rest the compass on a flat table at home to check at what distance such objects might affect compass readings. Observe the distance at which they start to affect the compass needle, and use them appropriately during your survey.

Care of instruments

Hand held Suunto instruments are very robust, but most owners would consider the following: packing them in hand luggage when flying to avoid low air pressure, protecting them from possible dust incursion by applying silicon sealant around their window and protecting them from shock of impacts by using the separately purchased proprietary yellow rubber covers. Throw them out or have them serviced if dust gets in obscuring the viewfinder window. From personal experience, Suunto distributors have the facility to exchange compasses if requiring servicing (ask them). If a compass develops a bubble inside it, throw it out or have it serviced! It cannot be read accurately.

Note that we need our compass "balanced" for the world zone we are working in i.e. Zone 5 for Australia, New Zealand, Antarctica and some Pacific islands. (see http://www.prospectors.com.au/)

Other things to consider:

It warrants stating that there have been many settings in practice where, because of obstructions (e.g. speleothems, roots) or in tight rockfall routes, a fiberglass tape would have been much easier than a rangefinder but it was back at the packs or at camp, and a recent occasion when the only rangefinder's battery failed and so, that was the end of the story for the day. It's clearly advisable to have a tape with the group, more so if only one rangefinder is available.

Take your time! We often rush because we have limited time during expeditions or try to obtain maximum survey length. Get the readings right, the sketch correct and save the person constructing the final map the headache and time-consuming task of attempting to sort out survey blunders at home with copious amounts of red fluid!

Members of the SIG envisage a future article on comparing various electronic survey instruments for those who do not wish to search the internet sites.

This article has considered the uncertainty of survey measurements taken under ideal conditions. Such errors will increase even further in more difficult "real life" caving situations.

ACKNOWLEDGMENTS

Members of the SIG who took part in the trial were Deb Hunter, Peter Freeman, Lloyd Robinson, Mark Sefton and Bob Kershaw. I thank Mark and Bob for assistance with a draft of this article.

Are you a geologist?

Susan White
with thanks to Fons VandenBerg

A VERSION of this little snippet appeared in *The Australian Geologist Newsletter* 122, March 21 2002. It has some interesting points and perhaps could be modified for a speleological version! Geologists are amazing. They know hundreds of words for different sorts of dirt and hundreds of words for things it does when left alone for a few million years. You might be a geologist if:

- You own more pieces of quartz than underwear.
- Your rock collection weighs more than you do.
- Your rock garden is located inside your house.
- You can pronounce the word "molybdenite" correctly on the first try.
- You don't think of cleavage the same way as everyone else does.
- You have ever uttered the phrase "have you tried licking it" with no sexual connotation involved.
- You think the primary function of road cuts is tourist attractions.
- You find yourself compelled to examine individual rocks in driveway gravel.
- You find yourself planning on using a pick and shovel while you're on holiday.
- Your internet home page or screen saver has pictures of your rocks.
- You will walk across 8 lanes of freeway traffic to see if the outcrop on the other side of the highway is the same type of rock as the side you are parked on.
- You can point out where Tsumeb is.
- The baggage handlers at the airport know you by name and refuse to help with your luggage.
- You have ever found yourself trying to explain to airport security that a rock hammer isn't really a weapon.
- You never throw anything away.
- You have ever taken a 22-seater bus over 'roads' that were really intended only for cattle.
- You consider a "recent event" to be anything that has happened in the last 100,000 years.
- You have ever had to respond "Yes" to the question, "What have you got in here, rocks?"

Can anyone think up a speleological version of this?

GPS and its uses in caving

Chris Chad
STC

THE Global Positioning System (GPS) is a technology that has revolutionised surveying and how we use maps. It is essentially something that has been developed for military applications, and happily, civilians have been able to take advantage of it and apply it to everyday lives.

The technology has become so entrenched within everyday life I find it hard to imagine it ever going away. GPS uses satellites, extremely accurate clocks, and a complex system of transmitting signals, that receivers use to infer their relative position. Based on this, we can now use simple handheld devices to tell us where on the Earth we are located, and, with more complicated equipment and processes, get our positions so accurate that we have to worry about tectonic movement in our calculations. I have been involved with the application of GPS technology since its very early days, and have often marvelled at how it has been the type of technology where people can imagine what it could do well before a solution is invented.

Today, GPS manifests itself in smart phones and in our cars, telling us how to get to the shops. A lot of clever things have been done to enhance the technology, and today, fancy algorithms allow relatively inexpensive receivers to achieve things that 10-15 years ago was only achievable with high end receivers.

APPLICATION TO CAVING

GPS signals cannot pass through solid objects like rocks, tree trunks and your body. If you can't see the sky, then your GPS is just not going to work, so inside a cave a GPS is completely worthless. Outside, however, it can be very useful. Most caving clubs are likely to have a handheld GPS pressed into service somewhere in the ranks. These nifty little devices are handy for marking entrances, car parks, turn-offs and such. They perform this task very well (when they are working!), but GPS potentially has a useful role in surface surveying. It is my intention to point out some tips for using a handheld GPS effectively and discuss how they may be used to assist in surface surveying and mapping. I have avoided being too technical, and as a result some things I say may not be "technically" correct, but I hope the reader will get the gist! The author has an old Garmin Etrex Vista C, and STC has a Garmin GPSMAP 60CSx.

CHRIS CHAD

The author's Garmin Etrex Vista

LIMITATIONS OF GPS

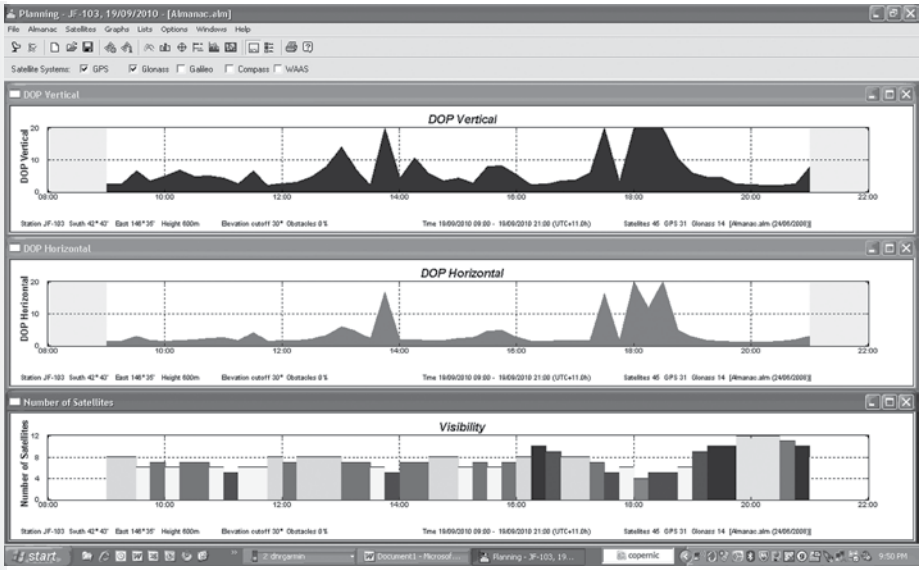
Due to the requirement to be able to see the piece of sky where the satellite is, GPS suffers from variable satellite visibility. This means there are going to be times when the GPS simply won't be able to see enough satellites for it to be able to figure out where it is. There will be even more times where the positioning of satellites makes it difficult to accurately determine its position, and outside influences, such as hills, canyon walls, trees, reflective surfaces, etc all conspire to block and confuse signals. Then there are atmospheric conditions and inherent limitations within receivers themselves. These limit how good a position you will get, and this can be highly variable.

Accuracy of GPS is not absolute, and this can cause frustrations. However, it is usually not an issue for the purpose of the data. There are things that can be done to increase accuracy, even with cheap units, but in reality there is often no need as even a waypoint in the general vicinity is usually enough to set you on the right track in the field. In particular, vertical accuracy can be a bit of an issue, plus the relationship with the Australian Height Datum (AHD) can be a bit dubious, so its application where elevations are important may be limited.

GPS is also a little technical and requires a knowledge of datums and projections and at least a basic knowledge of how the system works. I have seen countless blunders caused by incorrect use of the GPS. A GPS just blindly goes along with however you have set it up. It is important to verify it is giving the information you want, and that others will be able to interpret it. This is particularly an issue for shared units or for transferring information between units or mapping software.

SATELLITE VISIBILITY

In general terms, your GPS needs to be getting a signal from four or more satellites to be able to calculate its position. If it has a reasonable idea where it is, the GPS can limp along on three satellites but most units will simply tell you it has lost the signal and refuse to commit to a position. The strength of the signal matters, as does the position of the satellites, usually having a bearing on the achievable accuracy of the position. There is not much you can do about this, but you can plan for it and be aware of the consequences. If possible, use your GPS so that signals aren't being shielded. If you are



A screen shot of the Trimble planning software showing number of visible satellites, Horizontal Dilution of Precision and Vertical Dilution of Precision. This example shows the horizontal accuracy should be OK for most of the day with a couple of dead periods, but the elevation isn't too flash. 4:30pm looks like the best time for observations. After 6pm looks terrible.

trying to record a given position (e.g. cave entrance) then there is not much you can do except get the unit up as high as practicable and away from interference (including you!), whereas if you are simply trying to figure out where the heck you are, try to find an open and elevated position.

The satellite orbits are predictable, so it is possible to do some prior planning. If it is important (and it usually isn't), I use software[1] to predict how many satellites I will be able to see at a given location during the day. This tells me when the GPS simply won't be working, and also provides an estimate of Dilution Of Precision (DOP) which is a measure of how accurate the position achieved will be. Usually the important measure is Horizontal Dilution Of Precision (HDOP) and some units display this value, but most avoid confusing the user and estimate accuracy instead. The best time to use the GPS is when there are the most satellites visible and HDOP is low (below 5 is a reasonable limit).

In the field, other things come into play. Atmospheric conditions affect how the signals arrive at your position, and signals can bounce around and reflect off surfaces (wet leaves are a particular issue). This will affect what the GPS interprets, and will cause your position to seemingly wander around randomly. Most handheld units attempt to combat this with an averaging function, which averages a bunch of repeated measurements, increasing the probability the end result is right. Forest canopies are the most common issue for Tasmanian caving areas. There is not much you can do about it, but some brands of handheld GPS, particularly the Garmins, seem to be particularly adept at working under trees. I have no idea why but would guess it has something to do with the algorithms used. In any case, if you need to survey a cave entrance in a deep valley in a dense rainforest, then perhaps GPS is not the best way to achieve it!

ACCURACY

The best you can expect from any handheld device by itself is a position within 3 m of the actual position. Usually the accuracy is much worse, but I find it is usually in the order of 10-15 m and possible to get down to 5-6 m with averaging. Some units, if left to their own devices, seem to improve their accuracy by some means I don't understand and don't trust. In any case, if the purpose of the waypoint is to simply find your way back to that point, then that is more than adequate. I would suggest that if you can't find a cave within 10 m of your position, then it is either a very hard to spot cave or you are the sort of person who can't find your car in the car-park. Where this sort of accuracy becomes problematic is where the GPS position becomes a fixed point for a survey.

One of the beauties of GPS is that for simple point positioning and navigation, accuracy is not dependent on distance. Your accuracy of two points located 50 km apart is more-or-less the same for two points 50 m apart. This is not the case with a surface survey with traditional cave surveying instruments. Arguably for an ASF Grade 5 surface traverse with an assumed accuracy of 2% you would be just as well off using a GPS coordinate every few hundred metres. One difficulty is that most GPS positions never seem to be associated with any estimated accuracy, or information about the datum, projection or method used, so it can be difficult to use them with certainty. I suggest that if you go to the trouble of taking an averaged GPS position, you should mark the point (and possibly photograph it) so it can be found again, and write down the position along with estimated accuracy, datum, GPS unit and technique in your field notes. Of course, if this position is not tied into a traverse or cave survey then I probably wouldn't bother as anyone doing this at a later date will probably put in their own point anyway.

IMPROVING ACCURACY

The best way to improve GPS accuracy is to do a bit of planning. Try to take a position when conditions allow a more accurate solution, and try to take it away from signal blockers (sit the unit on top of that rock, not beside it!). Aside from that there are a number of techniques available to improve your accuracy even for cheap handheld units, but they require a bit of mucking around.

The main solution to GPS accuracy involves having two receivers, one measuring the position you are trying to determine, and a second sitting over the top of a known point. By knowing how far off from actual the Base Station receiver is, the correction can be applied to the roving receiver, improving accuracy significantly. Certainly I've used systems that could happily achieve 1-2 cm accuracy moving, and others which were, with a lot of mucking around, achieving accuracies in the order of 1-2 mm for a static system. These systems are expensive, so can we apply the principles to cheap handheld units? Sure!

Happily there are a lot of nerds in the world and some of these haven't been able to resist tinkering with the proprietary Garmin system. I use a handy little program[2] that allows my computer to talk to my GPS, transfer waypoints, tracks and routes to Google Earth or ArcGIS. This can also allow me to log the output of my GPS, which allows me to perform a statistical analysis on the probability of my derived position actually being right and the associated accuracy. Big deal I hear you say, as the unit does that itself as it goes along. True, but the potential is to extend the statistical analysis by logging for extended periods (30 minute minimum) and preferably over several days with different satellite configurations.

There is also the potential to use the network of eight very accurate GPS receivers dotted around Australia that form the

1. I use free software from Trimble which can be found at: http://www.trimble.com/planningsoftware.shtml However, there are numerous alternatives available on the internet.

2. I use DNRGarmin which is a nifty little free program developed by the Department of Natural Resources, Minnesota. The program can be found at: http://tinyurl.com/25ryxog

Australian Fudicial Network (AFN). These are constantly logging and form part of the very accurate global system. The beauty of this system is that these data are available to the public if you know what to do with it. This means that if you can extract the right sort of data from your handheld GPS, it can be post-processed against this very accurate receiver, greatly improving accuracy and removing the need for a second GPS. The trick is getting the data, because this system uses sophisticated data from the realm of professional level survey instruments, and most certainly not displayed by your average handheld GPS. Luckily the nerds have taken a crack at that too, and have managed to hack the Garmin system to retrieve what is called RINEX data. This RINEX data can be processed to achieve a fairly accurate result. I, many years ago, used this technique with my handheld receiver and was able to determine a fixed position with an accuracy approaching 0.25 m. Unfortunately, it seems that the software[3] I used is no longer available, but alternatives (though not as neat) may exist out there on the internet. The closer to an AFN station the better. For example, the Junee-Florentine karst area is about 100 km from the Hobart receiver, which is close enough that degradation over distance wouldn't be appreciable.

Either way, I suspect it would be much easier to simply hire survey grade equipment with a competent operator and plan a day long assault on a karst area and pepper it with known survey points.

PIMP MY GPS

Usually the biggest issue with a handheld GPS is signal strength and interference. One solution is to buy a more expensive model with a more sensitive antenna. This certainly makes a big difference. An alternative is to buy an external antenna. The early units all used to have the option to plug in an external antenna, usually mounted to the roof of your car. These days, they don't seem to have this option, but never mind because reradiating antennas have been invented! These work as a self powered antenna which rebroadcasts an amplified signal. This means you can walk around with your GPS safely in your pocket whilst receiving the signal from a conveniently placed external antenna. You could position it on a pole, on your pack or even on a helmet. Buy one off the internet for $504 and snort derisively at your fellow club members who blew their dough on the expensive high sensitivity models. Beware that external antennas may not be ideal in wet forests.

3. I was using a program called "Gringo" by the University of Nottingham. This is apparently no longer available. Perhaps chicks don't dig handheld GPS hackers.

CHRIS CHAD

Toby Chad demonstrating poor technique

DATUMS AND PROJECTIONS

By far the most monumental stuff-ups occur as a result of getting the datum wrong. If you seem to be about 200 m away from where you should be, chances are this is your problem. Knowing what a datum is and what projection you are using is very important but is a concept that seems to confuse many.

If you are still resisting the idea the world is round, then you're right. It actually bulges at the equator due to the spinning of the earth so it is more like an ellipsoid. To complicate things, the Earth's mass is not particularly evenly distributed, so it has whumps and bumps all over it. Surveyors attempt to define the shape of the Earth by using a best-fit ellipsoid. A datum is simply a framework that allows us to define coordinate systems based on a defined ellipsoid and origin.

There are two datums for Australia in use. One is the vertical datum or Australian Height Datum (AHD). This hasn't changed since it was developed and is based on sea level. It doesn't very neatly fit with GPS elevations, so I prefer to ignore the height component from the GPS. I figure my feet tend to be at roughly ground level most of the time anyway! The other datum is the horizontal datum, and this has changed over time and is where the issues typically creep in.

The current datum for Australia is the Geodetic Datum of Australia 1994 (GDA94). You should use this datum if you are surveying fixed points in Australia. Prior to this, the datum of choice was the Australian Geodetic Datum 1966 (AGD66) and later AGD84 (which was essentially the same). This datum was a 'best fit' ellipsoid of the Australian continent but had an origin that was 200 m away from the centre of the earth. Subsequently, when GPS was invented with its associated Earth-centric datum, AGD66 was roughly 200 m out of whack with GPS coordinates, and the massive blunders from amateurs began to flow! In an effort to stop the stuff-ups, an Earth-centric datum was developed that fit Australia but also had a high level of agreement with the international datum. The international datum used by GPS is the World Geodetic System 1984 (WGS84). Therefore GDA94 is equivalent to WGS84 for our purposes.

A projection defines how you represent the curved surface of an ellipsoid on a flat piece of paper. To define a position, coordinates are used; either Cartesian coordinates (Eastings and Northings) or Geographic coordinates (latitudes and longitudes). In Australia the Universal Transverse Mercator (UTM) projection of GDA94 geographic coordinates results in Cartesian coordinates known as Map Grid of Australia 1994 (MGA94). The same projection was used for AGD66 and AGD84, but the coordinates are different because the datum is different: roughly 200 m different but variable depending on where you are.

Your GPS will probably be a bit vaguer about all of this. Somewhere in the setup menu (under "Units" for the ones I've used) there will be a place to select datum and projection. Projection is sometimes called "Position Format" other times it may be called "Coordinate System". Select UTM UPS (unless your GPS has MGA to choose from). The datum should be more obviously named; either "Datum" or "Map Datum". Select either WGS84 or GDA if your unit has the option (remember these are effectively equivalent in the horizontal plane).

GPS FIELD PRACTICE

In summary, I offer the following recommendations:

- Be consistent with what projection and datum you use. GDA94 has been around for 16 years now. Use it!
- Always associate the datum with your records to remove all doubt. Write it down!
- Write down the accuracy of your reading when you record a waypoint. These aren't recorded in the unit. It's a good idea to record your coordinates in a notebook anyway in case they get lost.
- Try to have maximum satellite coverage and signal strength where you can.
- Don't put waypoints in a shared GPS that could be construed as being a measured point. For instance, don't get a bodgie grid reference off a mate and assign the waypoint the cave number. Give it a temporary name until you find and record the actual location. Otherwise you could well waste someone else's time.
- Use the averaging function to improve the certainty of your position.
- Ignore the elevation data. Chances are it isn't very accurate. A topographic map will often give a better result

Milwaukee and Pelican

A children's story

Chalky Thomas
VSA

CRASH, bang, thud, splash. Where is Pelican taking me now? This second journey is far rougher than the first and Pelican isn't enjoying it either.

He is getting bashed from rock to rock, dragged over lots of slimy mud and now is covered in a very thick layer of sticky clay. His Handlers are starting to complain also about how much heavier he was weighing.

Now Pelican is swimming in a creek and I am scared. If Pelican opened and dropped me in the creek I would sink to the bottom. Water would get inside me and damage all my bearings and electrical bits. Pelican reassured me that his latches are all OK.

The clay is also helping to keep the water away from his seal. We stop at last and the sticky clay is scraped off Pelican. His lid is opened and five Handlers all stare at me. I'm not wet and they are very pleased with how well Pelican has looked after me. It's now my turn to do some work. I'm needed to drill some holes but somehow this job is different from the first job earlier today. I'm not carefully handled with clean hands or nice smelling vinyl gloves. Instead, I'm passed from one pair of dirty hands to the next.

CHALKY THOMAS

Milwaukee and Pelican together

There's lots of talk about where I should drill. They aren't happy that the wall I was supposed to drill is made of mud and not rock. It's finally decided that I'm drilling holes in some rock boulders that stack on top of each other. I'm passed up and drill my first hole. It's an easy job as the rock is very soft and I'm finished within 30 seconds. Then I'm passed back down.

A smooth steel spike is hammered into the hole that I have just drilled. The Handler stands on the spike and grubby hands again lift me up to drill another hole. Four holes are drilled before I'm taken back and allowed to rest with Pelican. The Handlers climb up and down the spikes. They are happy with the work that I have done.

There is talk about a tricky down climb above a waterfall. A spike and rope would make it easier.

I'm sent off to drill one last hole and my work is done. It's time to go home. I'm very dirty and given a quick wipe with a rag and placed inside Pelican.

There's lots of fuss with Pelican and his seal. Eventually his lid is closed and the return journey begins. It seems to take forever and sometimes I hear the Handler complaining about aching arms.

Finally, Pelican's lid opens and we are back at the motel car park. Caring hands carry me into a motel room. I'm gently wiped clean with a damp cloth and carefully returned to a clean location inside the motor car.

I look at Pelican. He is very sad because he is covered with lots of mud both inside and out. It will be a couple of days before his friend Milwaukee will again be with him.

ASF Grants 2011
Call for applications

Fiona Beckwith
Chair, Grants Commission

AS ADVISED in *Caves Australia* 182, ASF has instituted a range of grants in support of speleological work, including projects related to conservation, education, research, exploration and conference attendance.

The aims of the Scheme are:

1. To encourage, assist and financially support projects promoting the exploration, study and protection of caves and karst and the dissemination of such knowledge at ASF Conferences and through ASF and kindred publications in a manner consistent with the Aims of the Federation.
2. To cooperate with other ASF programs and with other institutions in the pursuit of these aims.

Applications are now invited for the inaugural round of grants commencing in 2011. The closing date is 31 March, 2011. However, applications for the 2011 conference attendance grants should be forwarded as soon as possible and not later than 28 February.

WHERE TO SEND APPLICATIONS

Applications in electronic form are preferred. Conference attendance grants only should be forwarded to Alan Cummins (alan@thecumminsfamily.net). Applications for all other categories should be forwarded to Fiona Beckwith (finitschke@yahoo.com).

Prospective applicants are strongly advised to read the details on pp. 5-6 of *Caves Australia* 182 or on the ASF website www.caves.org.au. In particular, please become acquainted with eligibility criteria, how to get started, in-kind and partner support, selection procedures, and our expectations from successful applicants for the specific type of grant that you seek. Note that some of these requirements vary according to the type of grant sought.

As time did not permit an inaugural round in 2010, the Grants Commission has been authorised to award not more than twice the normal budgeted amount for this purpose in 2011.

However, in each category grants will be made only if sufficient meritorious proposals are received. Depending on initial responses, and at the discretion of the Commission, a second round may be conducted later in 2011.

FORM OF APPLICATION

There is NO formal application form. Applicants should submit not more than a 3-page proposal describing:

- Name, postal address, email address, telephone number, and (where appropriate) ASF affiliation of the applicant. In the case of a club or group proposal, please provide these details for an identified group leader who can serve as a point of contact.
- Where relevant, the position, qualifications and relevant experience of the proponent individual or group.
- The speleological merit of the project —how the project will benefit ASF and speleology generally.
- Objectives of the project, how it will be conducted, and how the results will be shared.
- Whether the project will be carried out in association with any other club, organisation, institution, university, management authority or other agency. Proposals forming part of a tertiary qualification should include the standard preliminary research plan and name of a course supervisor who supports and can comment on the project. The property owner's agreement to the project should be indicated.
- A budget for the amount sought, plus an indication of in-kind assistance to be provided by the proponent or partners and whether funds are being sought or have been obtained from other sources.
- An undertaking should be added agreeing to conduct the project in accordance with ASF codes of practice and any conditions imposed by landowners, and confirming that the applicant understands the obligations of recipients for acquittal of the specific type of grant sought.

GIVE IT A GO!

Most ASF member clubs and most individual members at various times carry out projects in the five fields in which the Grants Scheme can assist, sometimes in a relatively informal manner. Four member clubs have received grants from the ASF Karst Conservation Fund (KCF) in the last few years for cave cleaning (see *Caves Australia* 182, pp. 27-28), track marking in sensitive caves, purchase of equipment for a conservation project, and construction and installation of a cave gate. We have now incorporated the KCF grants into the overall ASF Grants Scheme, although they are still administered by the KCF. If you have a good proposal, even a modest one that a few hundred dollars could assist, please do not be deterred by a misplaced feeling that your idea may not qualify. New, younger and student members are especially encouraged to consider grants for which they may be eligible. Think it through, talk with your colleagues, consult one of the people below and give it a go!

ENQUIRIES

Please contact any of the following: Nicholas White (nicholaswhite@netspace.net.au) (particularly for conservation and research projects), Susan White (susanqwhite@netspace.net.au) (research proposals), John Dunkley (jrdunkley@gmail.com) (general enquiries and particularly those likely to involve the ASF Karst Conservation Fund), Alan Cummins (alan@thecumminsfamily.net) (for the 2011 conference attendance grants), or Fiona Beckwith (finitschke@yahoo.com) (for enquiries relating to administration of the Grants Scheme).

The humble footloop

Ross Anderson
WASG

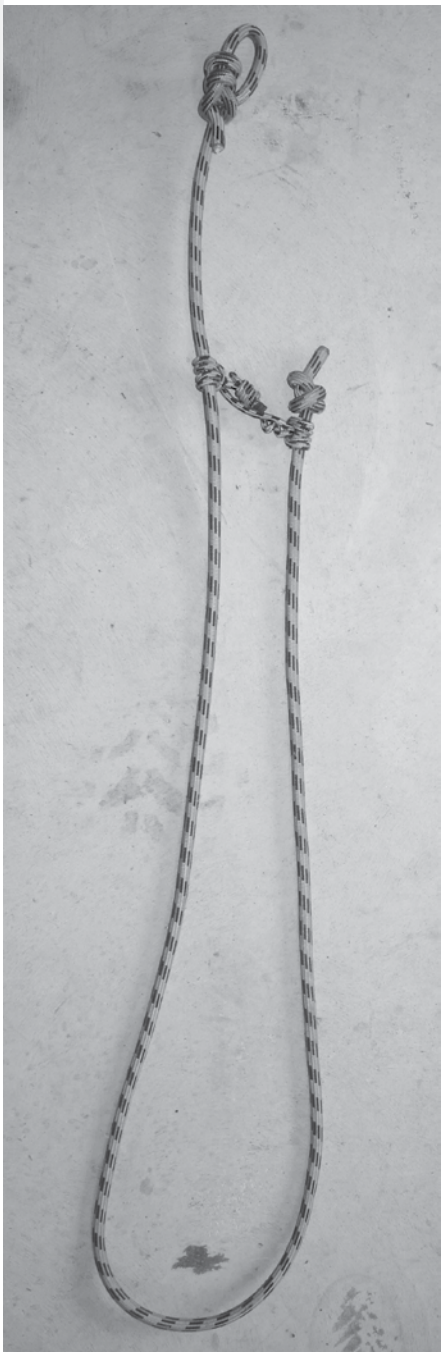


Figure 1
The Humble Footloop –
Who would've known …?

IF YOU'RE a little like me, you probably consider that you know a little bit about moving around on rope.

Well, every now and then a modification of a bit of kit comes along or someone suggests you use a bit of kit a different way.

This article is both, a bit of a modification to the way you make and use your trusty footloops.

Most cavers like to know that they can use their various pieces of kit in several different ways. This setup for the humble footloops is very adaptable.

What do you need?

About 3 metres of 8-9 mm accessory cord.

About 1 metre of 4 mm accessory cord, the knowledge of how to tie a Yosemite bowline, barrel/ double fishermans/ stopper and prusik knots.

Total cost about $8.00 (Hey, big spender!)

Construction

Step 1) As seen in figure 1, tie a Yosemite bowline in one end of the 9 mm with a small bight (it only needs to fit a karabiner).

Step 2) As shown in figure 2, (do not immediately make the 4 mm cord into a prusik loop) tie a prusik knot onto one leg of the footloop, then thread/ build a second prusik knot on the other leg. Minimise the distance between the two prusik knots and then tie a double fishermans to complete the prusik loop out of the 4 mm accessory cord. I use two-wrap prusiks but three may work better for you.

To finish the footloop tie a barrel/ stopper knot on the tail of the 9 mm cord.

Use… the fun part

See Figure 2 (right)

To lengthen, slide the prusik on the left side down

To shorten, slide the stopper knot further away from the right prusik knot.

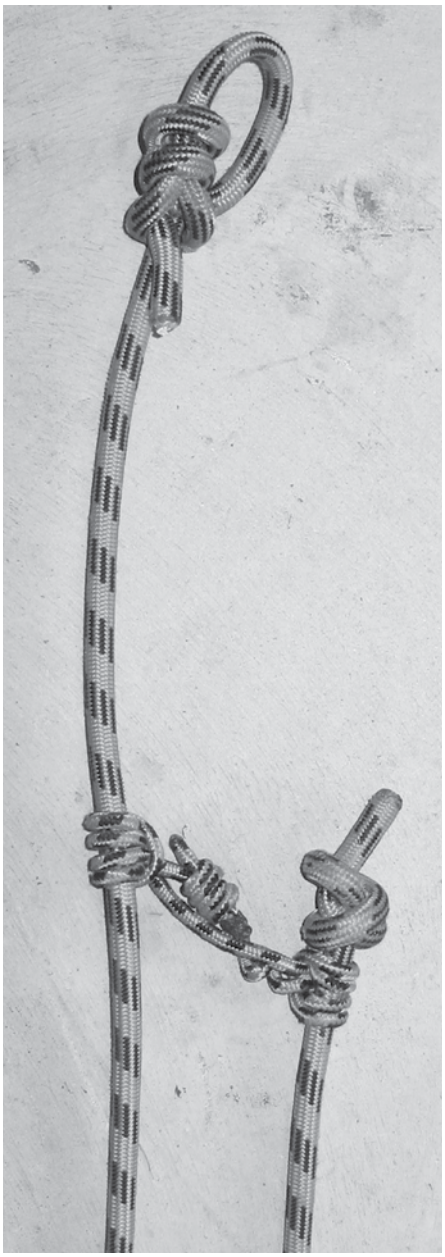


Figure 2: This footloop is easily adjustable

The advantages of easy adjustment include being able to step up way higher than with traditional fixed footloops—say your hand ascender is up against something and you want to step up higher—easy, shorten

Figure 3

Figure 4

the footloop! (see Figure 3).

If you want to ascend a narrow solution tube or crack and you cannot bend your arms or knees properly to take a full step—push your hand ascender up high for a straight arm hold and lengthen the footloop so that your foot can still get into the loop and so you can do a short "ankle rotation" step up (See Figure 4).

Figure 4

Last but not least: rescue.

Nice if you have a versatile footloop but what if you could use it for rescues as well?

Counterbalance or pick off rescue the easiest setup rescue, quickest and if done correctly, very efficient.

Figure 5

Take a look at Figure 5. If you turn the top of the footloop back through a karabiner/pulley downwards and attach it to the patient, or to the rope going back down to them, you have a counterbalance—all you have to do is stand in your footloop and pull up a bit on the patient side and up they come… easy—really it is! I can manage to pick off a 100 kg patient and I only weigh 75 kg—honest!

The top anchor point may be:

Figure 5

- anchors at the pitch head,
- the adjacent rebelay anchors — if the patient has fallen into a rebelay,
- a suitable rope grab attached to the rope mid pitch—preferably not a sharp-toothed ascender (they damage the rope at relatively low loadings).

However, never ever, ever never ever ever detach someone from their ropes whilst at height without having made another attachment that will take its place.

Figure 6

See Figure 6. Utilising the anchor you have established for the haul system (counterbalance), attach a lower-off system to the patient.

The rope for the lower-off system may be the rope from under the patient pulled up with the tail attached to the patient and the rest used to lower the patient to the bottom of the pitch.

Pull the rope through the lower off device as tight as you can and lock it off.

Then stand in the footloop, pull the patient upwards, release their chest ascender and lower them down to be supported by the lowering device, as seen in Figure 7.

Once the patient is released from their ascenders and is hanging from the lowering device, lower them to the bottom of the pitch where your caving buddies can initiate first aid and you can head out to raise the alarm and set up a haul system to recover the patient.

Alternatively, if you are at the pitch head you can use this method to "break into" the tight rope on which the patient is hanging and gather up slack to quickly create an in-line haul system.

So many options from the simple footloop!

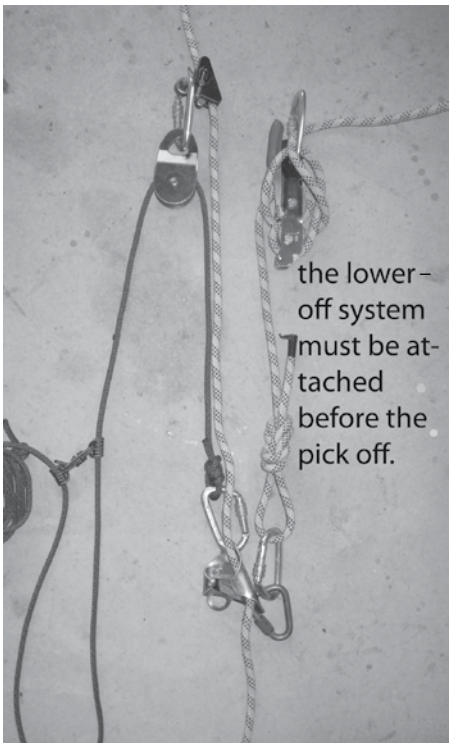


Figure 6

Figure 7

Notes about this article:

The purpose of this article is to encourage you to try out another type of footloop and get you to go to your next club roping practice session and play around with this new toy.

In the rescue section, I have not detailed the attachment of the rescuer in this system due to the multiple locations were this technique may be applied. Discuss and practice top of pitch (hanging), rebelay and then mid-pitch use of this technique with your caving buddies — mid-pitch is the hardest to get nailed… the use of a non-aggressive camming device such as a rescuecender or microcender means that you can place the weight of two people on one point and not damage the rope even with a fairly significant shock load if something goes a little astray.

Pulleys are not necessary, in fact they are a pain when you lower the patient onto the lowering system as they want to go fast!

The type of descender doesn't matter, as long as you can take up the slack and lock off.

Once you have played with the counterbalance, try this; the footloop should be long enough that you have adequate rope to actually make a 2:1, with a re-direct at the top, instead of a counterbalance. This reduces the required lifting effort even more.

The 14th International Symposium on Vulcanospeleology

August 2010

Susan White

SOME years ago a small group of us agreed to support the hosting of a vulcanospeleology symposium.

After a false start when the meeting went off to Korea for the Jeju meeting 2 years ago, Australia hosted the 14th International Symposium on Vulcanospeleology under the auspices of the International Union of Speleology's Commission on Volcanic Caves. The symposium had formal sessions and associated field trips from 12—17 August in the McBride Volcanic Province, at the Undara Volcanic National Park and Undara Experience (Lodge) some 300 km south-west of Cairns. This was preceded by a four day pre-symposium excursion in Western District Volcanic Province of Victoria.

So on Saturday 7th August we collected a motley crew of volcanic cave enthusiasts (see photo for the participants) from Melbourne airport and headed west. The theme for the excursion was "Small is Beautiful" and using a base in Hamilton, we visited a range of volcanic caves and features in the extensive Victorian Western Volcanic Province.

Day 1 saw a visit to Mt Hamilton Cave (H 2) on private land. The following two days were spent visiting volcanic caves and associated features at both Mt. Eccles and the Byaduk Caves.

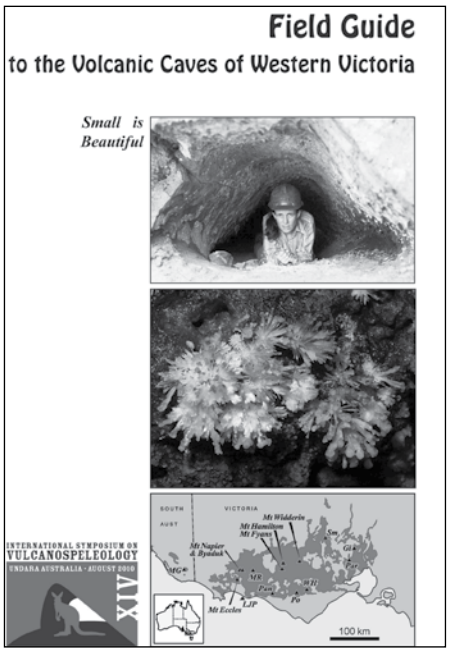
This included the line of craters, associated lava canals, and various caves at Mt Eccles and several caves at Byaduk Caves. A small group was able to descend The Shaft as well as look down the throat of The Shaft at Mt Eccles. Being mid-winter, the weather was quite cold but reasonably fine for these three days.

This changed on day 4 as we headed back east towards Melbourne. By the time we got to Mt. Widderin Cave it was raining in earnest with the cold wind that results in horizontal rain. Everyone, even the Icelanders, appreciated how lucky we had been for the previous three days. Participants were very interested in the large array of lava features visible in the caves. The excursion was organised by Ken Grimes, assisted by members of VSA and the Victorian Scout Caving Team. Ken also produced an excellent guidebook explaining the delights of the area.

KEN GRIMES

A motley crew

The main symposium was held in North Queensland at Undara. The program of talks in the morning and cave visits in the afternoon meant that we all saw the very different lava caves of the McBride Volcanic Province. The accessible ones are much larger but not as complex as those we saw in Western Victoria. The comparison was interesting. A wide range of papers were presented on the volcanic caves of Undara, Hawaii, UK, Hungary, Iceland, The Azores, China, Comoro Islands, Jeju in Korea and Jordan. There was geology, speleology, cave management, air quality, bacteria and cave fauna, all of which provoked a lot of discussion. The most unusual presentation was a pictorial history of Fingals Cave on the island of Staffa in the Inner Hebrides, Scotland, viewed whilst listening to Mendelssohn's music. One day involved a trip to see a section of The Wall, Tallaroo Hot Springs and a train trip to Einasleigh and Copperfield Gorge. Proceedings will be produced on DVD as soon as possible.



Ken Grimes' excellent guidebook

The meeting of the UIS Commission on Volcanic Caves was convened by the Chairman, Jan-Paul Van der Pas. The decision for the next meeting is for it to be in Jordan in March 2012.

Overall, an excellent meeting and a great opportunity to meet with and show volcanic cave enthusiasts Australian volcanic caves.

New caving movie: *Sanctum*

Joe Sydney
HCG

BACK IN 2008 Keir Vaughan-Talyor (SUSS) took a group of cavers and film writers on a field trip to Barralong Cave, Jenolan.

Their aim was to gather ideas for a potential caving movie.

Well, it has now been announced that Australia's own Andrew Wight has put pen to digital celluloid and produced a 3D action thriller, *Sanctum,* with James Cameron of Titanic movie fame.

In the words of Aceshowbiz, "The film will focus on underwater cave divers' efforts to survive after their expedition to the cave is ruined by a tropical storm. Forced to go deep into the caverns, they must fight raging water, deadly terrain and creeping panic as they search for an unknown escape route to the sea."

Alister Grierson serves as a director for *Sanctum* with a script provided by Andrew Wight and John Garvin. Richard Roxburgh, Alice Parkinson, Ioan Gruffudd and Rhys Wakefield ('Home and Away') are among the cast ensemble of the adventure thriller, which is due February 4, 2011 in the U.S.

Some of the international cave footage is spectacular, including digital footage taken in an artificial tank on Australia's own Gold Coast and dropped into a digital setting to make it look more realistic.

Film critics even go as far as saying, "nothing good ever happened in a cave", writes one claustrophobic writer. Yeah, but what do film critics know, eh?

Well, I am hanging on to my seat edge for this one, as the trailer looks great. Well done Andrew Wight and James Cameron and I hope you guys make a prequel.

Movie trailer and photos

http://trailers.apple.com/trailers/universal/sanctum/

Discovery Channel goes underground

IT'S finally happened. Discovery Channel is airing a new show on caving called Deadly Descent. There are concerns about the communication of safety and conservation. The title is certainly oriented towards sensationalism. From their promo:

Descend Into the World of Cavemen

"Sometimes the biggest scientific discoveries happen two miles under the Earth's surface. In Science Channel's brand new show, 'Deadly Descent', you'll meet the only guys who can get there.

"Scientists believe caves hold the secrets to solving many of mankind's biggest challenges, including offering clues to understanding climate change, and discoveries that could lead to revolutionary new cures in medicine. But many scientists aren't physically—or mentally—able to endure the treacherous underworld of deep cave exploration. Instead, scientists depend on the 'cavers' who descend into deep caves to complete these missions. Meet this elite group of cavers, who literally risk their lives in the name of science."

First broadcast Thursday, November 25 at 10PM E/P (in USA).

Rescue for cave fauna

Rainwater pumped into Lake Caves in South-West WA

CAVE RESCUE MISSION: Scientists have begun pumping rainwater into the popular Lake Caves in the South-West.

Officials have begun pumping harvested rainwater into the South-West's intricate network of caves in a desperate bid to save its rare inhabitants following the driest winter on record.

More than 150 caves sit beneath the karri forests from Yallingup to Margaret River and Augusta, some of them accessible to visitors who come to gaze at the complex stone formations and intricate stalagmites.

But the driest winter on record in the South-West combined with a parched start to spring has forced the Augusta-Margaret River Tourism Association to launch a "hydrology recovery project" for Lake Cave, one of the most popular underground sites.

A rain harvesting and irrigation system will pump water into the cave to ensure the survival of tiny, cave-dwelling invertebrates called stygofauna.

Caves House at Yallingup as well as Caves Rd, the popular scenic drive linking Yallingup with Augusta, were both named after the caves that have formed along the spine of the Leeuwin Naturaliste Ridge.

"Halting the decline of the water level aims to protect the critically endangered stygofauna that inhabit Lake Cave," the tourism bureau's attractions manager Jayme Hatcher said.

"This system will buy us time while further research is being undertaken into the reasons for the declining water levels."

Ms Hatcher said the project would ensure the preservation of one of the South-West's most iconic tourist attractions.

She said harvested rainwater would be streamed into the chamber for an hour a day, and the chemical properties in the water have been tested to ensure that they mirror the existing water quality within Lake Cave.

"It will be a very slow process with only 150 litres per day trickling into the cave for an initial period of eighteen months" Ms Hatcher said.

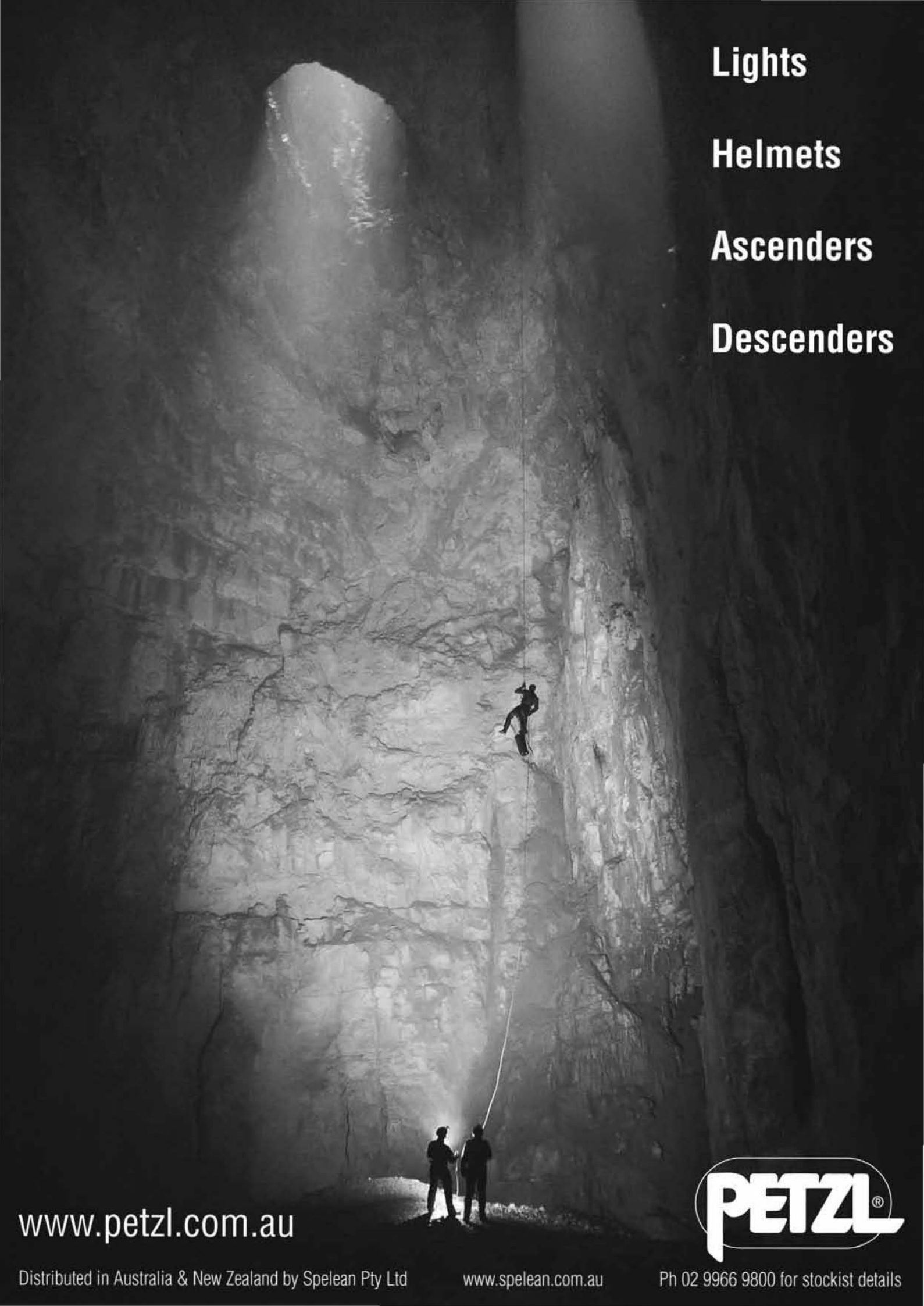
Agriculture Minister Terry Redman said it was the first time the irrigation technology had been used to preserve a cave ecosystem.

A State Government grant made the project possible, paying for a team of hydrogeologists, biologists and officers from the Department of Environment and Conservation.

Ms Hatcher said the next stage of the project is to install bores to better understand the Lake Cave catchment area and water sources.

Source: http://www.perthnow.com.au/news/special-features/rainwater-pumped-into-lake-caves-in-the-south-west/story-e6frg19l-1225937723274

Reporter: Trevor Paddenburg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