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Cover: From bottom left: Geoff McDonnell, James, Bob Leys, Mark Sherman Matt Fisher and Peter Bauer. Photo courtesy of Julie Bauer

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Harness Hang Syndrome: Facts & Fiction

Joe Ivy

Abstract: There are some myths about Compression Avascularization/ Re Perfusion Syndrome (CARP), also known as Harness Hang Syndrome. These myths distract cavers from the fact that this is a medical emergency and that most cavers are unable to deal with it as they consider the pick off an unnecessary skill.

Originally, members of the French Speleological Society suspected that some caver fatalities attributed to exposure might have been caused by something else. The group undertook informal experiments where volunteers hung limply in harnesses. The volunteers quickly became ill so testing stopped. Later, the group pursued formal, controlled testing, so that volunteers' vital signs could be monitored. The testing showed that hanging immobile in a harness caused problems in as little as ten minutes. They tested numerous harness designs and various body positions but the results were all similar. Recently, testing done by German industrial safety group showed similar results from hanging immobile in a full body harness.

CARP Syndrome occurs when a person hangs in a harness and the venous blood in the legs in unable to return to the torso while arterial blood continues to flow downward. The result is identical to hypovolaemic shock. Even if the subject is released within ten minutes, there may be additional complications caused by reperfusion of the legs. Like shock, CARP Syndrome is difficult to treat in the field and must be prevented by rescuing any caver hanging immobile on rope.

Recently, there has been a lot of information disseminated about Harness Hang Syndrome (HHS) resulting in the impression that some ascending systems cause HHS and others do not and that HHS is not of general concern. To clear up this confusion, we'll cover the history of the testing that has been done, the results of those tests and the conclusions obtained. HHS, the rapid loss of consciousness followed by death due to hanging immobile in a harness, happens in ALL harnesses and ascending systems. Someone hanging immobile in a seat harness is a serious medical emergency that must be dealt with immediately.

In 1978, Maurice Amphoux, a doctor involved in industrial safety research in France, performed a series of short tests in order to determine what harnesses would be best for workers to use when working at height. At the time, it was a standard practice for workers to use simple waist belts even when a significant fall was possible. Dr. Amphoux was using a parachute harness for the tests and found, much to his surprise, that the test subjects lost consciousness after a few minutes of hanging in the harnesses. One subject lost consciousness in only 3.5 minutes! He performed some more tests a little later under better controls and found that the subjects experienced cardiac arrhythmias at the time they lost consciousness. Dr. Amphoux discontinued the tests because of concern for the safety of the subjects. He then published his findings, trying to get the word out about HHS. The French caving community was notified but the news was greeted with scepticism.

In 1984, the newly-formed Medical Commission of the French Federation of Speleology (FFS) decided to do some informal HHS testing to see if Dr. Amphoux was right. The Commission had two subjects hang immobile in their standard caving vertigear (Frog systems) with no particular controls. One subject lost consciousness after about 30 minutes and the other lost consciousness after only 7 minutes! The testers were horrified and discontinued testing out of fear for the safety of the subjects. The Commission decided to fall back and come up with some new protocols for the testing. After seeing what happened, the Commission began to suspect that some fatalities that had been formerly attributed to exposure might have actually been caused by HHS.

Two years later, the FFS medical Commission approached HHS testing a little more seriously. Utilising the facilities of the Sport Physiology Lab at the University Hospital of Besancon, the Commission had three volunteers in excellent physical condition participate in more HHS testing. Using the new protocols, the subjects' vital signs were monitored with EEG, ECG and blood gas sampling equipment. The tests were also video-taped.

The first subject was positioned as if he had been ascending (with a Frog system) and simply stopped and became relaxed (as if completely exhausted) with neck in hyperextension, arms dangling at his sides, legs extended and feet in the footloop. The subject complained of extreme discomfort from the neck position just before HHS symptoms set in. The subject's head was then supported to see if the HHS symptoms could be alleviated. The symptoms did subside but then reappeared within a couple of minutes and progressed until the subject lost consciousness.

The second subject hung in the same position as the first but with his head supported by a padded stand. HHS symptoms began to appear anyway. At the onset of symptoms, the testers had the subject move his legs some. This caused the symptoms to subside. However, once the subject became immobile again, the symptoms reappeared rapidly and progressed until he became unconscious.

The third subject hung with head supported but with legs pulled up, feet even with his butt as if he had been about to take a step up with his Frog system. Even with the legs much higher than with the previous two subjects, HHS symptoms appeared and the subject lost consciousness. Further, even though this subject was lowered and released before the symptoms got extreme, he lost consciousness anyway.

More testing was done in 1986 by Jim Brinkley at the Aerospace Medical Research Lab, Wright-Patterson Air Force Base, Ohio with better controls than those used by the FFS Medical Commission and the results were the same. Brinkley used Class III industrial harnesses (very similar to a parachute harness) and found that HHS occurred very consistently in all test subjects.

So what are the symptoms of HHS? The FFS testing showed that HHS symptoms appeared in no more than 10 minutes with healthy subjects. Brinkley's research showed that 6 minutes was the normal onset time. Keep in mind that Amphoux's tests had one fellow lose consciousness in 3.5 minutes. HHS symptoms begin with an overall feeling of illness (as with a flu bug) followed by excessive sweating, nausea, dizziness and hot flashes. Testers noticed that the subjects had obvious brain function impairment with the initial onset of HHS that worsened very rapidly. As HHS progresses, the symptoms worsen with difficulty in breathing, increasing heart rate, progressively worsening cardiac arrhythmias, an abrupt increase in blood pressure followed by unconsciousness. Death would follow in minutes if the subject were not released quickly.

What causes HHS? No one is entirely sure. First thoughts were that pressure on the neck from the chest harness shoulder straps might be a cause but testing ruled that out. Some testers believed that it was the type seat harness, but the fact that caving harnesses, parachute harnesses and Class III industrial harnesses all cause HHS indicates that this is not true as well. Another theory was pulmonary impairment, but blood gas testing ruled this out, too. Most of the testers believed that HHS is caused by blood being trapped in the legs so that the net results is similar to hypovolaemic shock. No blood is actually being lost, but the amount of blood available in the torso to keep the brain and vital organs sufficiently perfused with blood in inadequate nonetheless. There are likely some blood chemistry problems occurring as well. Until more testing is done with state-of-the-art equipment, no one will be absolutely certain. However, there are some conclusions we can make now.

First, hanging immobile in a seat harness is the root cause of HHS. Any caver who has done much vertical work has hung in his harness for much longer than 10 minutes and had no problems. But he was not immobile. As long as you are squirming around, shifting your weight and keeping busy, HHS is not an issue. The problem occurs when a caver, perhaps exhausted or cold, tries to ascend a pit and gets hung up somehow. Most of the French fatalities were inexperienced cavers who had technical trouble with their gear and were not knowledgeable enough to correct the problem. Already tired from caving, the cavers struggled with the gear until completely exhausted, then HHS set in and they died.

Second, someone hanging immobile in a harness - any harness - is a dire medical emergency. The FFS testing showed that 10 minutes was the usual onset time in a healthy subject. If someone is stranded on rope underground, it's likely that they are tired and cold so you can expect HHS to set in much more rapidly. Cavers that witnessed two of the French fatalities said that once the caver on rope stopped struggling, unconsciousness and death occurred in less than 10 minutes.

Third, preventing HHS is the best course of action. The articles on the testing done by the FFS were unclear as to how much effort was needed to revive the test subjects once they lost consciousness or what their condition was once revived. Certainly, the best thing is to make certain that it never happens in the first place.

- You should never cave alone in a vertical cave.
- Make certain that everyone on a vertical caving trip is competent. Everyone should know how to change from ascent to descent and vice versa.
- A caver who is exhausted or badly hypothermic should not be allowed to attempt a climb. An important note here is that some of the French fatalities occurred in pits of less than 20 metres depth with one occurring on an 8-metre pit, so pit depth isn't necessarily an issue.
- Cavers should not get left behind in a vertical cave as the group heads for daylight.

Finally, most cavers on a vertical caving trip should know how to do a pick off (single rope rescue), if not everyone. If someone in the caving group does get hung up somehow, do not allow them to struggle for any length of time. If the stranded caver can't correct the problem on the first try, he probably won't get it on the second or third. Remember that the FFS subjects experienced progressively worse brain function impairment as the HHS symptoms began to set in. This means that not only is the exhausted caver getting more exhausted, he's also getting more stupid. Someone should be headed up (or down) the rope to

Cataloguing Helictites and other capillary-controlled speleothems

Jill Rowling

Abstract

In the 2nd Edition of Hill & Forti's book, *Cave Minerals of the World*, helictites are described with three subtypes. Other capillary controlled speleothems described by Hill and Forti are Cave Shields and Welts.

This article suggests the addition of some other capillary controlled speleothems to the list, then attempts to sub-divide the speleothem type *helictite* into further sub-types.

The reason why is because there are several sub-types which can be recognised around the world as being of the same form, however there is no specific name given to them. Possibly this consistency of form is due to a common chemical or biological influence and cataloguing the forms is the first step in understanding what causes them.

Forms include ribbon helictites, saws, rods, butterflies and hands. Influences include multiple canals, gravitation, possible chemical changes, and crystal twinning. Materials include calcite needle-form, calcite and aragonite. Vaterite is touched-on however it generally occurs in caves as the result of human intervention (pollution).

Finally I suggest that a better classification scheme could be done using a database rather than attempting to force a hierarchy onto disparate objects.

1. Project Aims

The short term aims of this project are to attempt to describe the varieties of helictites and related speleothem forms. The long term aims of this project are to:

- Determine the internal structure of each form
- Determine what the object is made of
- Determine what factors lead to the deposition of this form
- Develop a catalogue of helictites and related forms

2. What is a Helictite?

Helictites are a type of speleothem (cave decoration, spelean chemical sedimentary deposit) which are found in the limestone caves of most countries of the world.

Although usually described by many tourist cave guides as "mysterious" and of "unknown origin", the basic structure of helictites has been known for a long time, the earliest detailed description being by Olaus Worm in 1665 (Shaw, 1992).

A typical calcite helictite is a twisted, long cylindrical structure with a fine central capillary of about 0.2 - 0.35 mm diameter. Side micro-canals (canalicules') result in a somewhat porous structure. Typically the helictite has radial symmetry.

A discussion of subaqueous helictites from Lechuguilla Cave, New Mexico, by Davis, Palmer & Palmer (1991) showed a sectioned sample with its radial crystal growth and central canal.

3. What is a Related Form?

One of the key features of helictites is their capillary tube which can be straight or branched. Other speleothems have capillaries, too. Examples:

- cave shields (capillary sheet)
- welts (capillary ring)
- anthodites (fibrous channels on surface)

Possibly popcorn and coralloids could be classified as a related form because of the effect of the surface capillarity.

4. Some additional forms of capillary-controlled speleothems

There are some additional speleothem types which appear to be capillary-controlled.

In Lucas Cave (Jenolan Caves, NSW) and Fig Tree Cave (Wombeyan Caves, NSW) there are hard white hemispherical deposits on the roof and walls of areas which have high air flow. They appear to be made of calcite. They deposit on bedrock, at joint intersections. Possibly they are made in the same way as masses of helictites, ie by seepage along capillary channels, but due to the high air flow, precipitation of calcite occurs before the structure has a chance to develop a tube. Further investigation is required.

In Chifley Cave, Jenolan, there are some cauliflower-shaped deposits on the floor and walls. They are made of a mixture of calcite (including lublinite), silicates and phosphates (like a soil) however it could be argued that the form, as such, is the result of capillary action in a porous medium. It could also be argued that they form like cave caps (Hill & Forti, 1997) where new material is being deposited at the base of the deposit, locally raising the surface. More study needs to be done on these before deciding whether they are a capillary structure or not.

5. Present Classification System for Helictites

Hill & Forti (1997) have classified helictites as follows:

Type
: Helictites

Sub-types
: Subaerial, subaqueous

Varieties
: filiform, beaded, vermiform, antler

Heligmites are classified as simply helictites that grow upward from the cave floor. Helictites are further classified into varieties, again based on form (morphology) which can be identified in the field, as seen below in Table 1.

Table 1: Hill & Forti classification of helictite varieties

Variety	Further classifications
filiform	thread
beaded	unbranched branched sea anemone
antler	antlers rod helictites
vermiform	worms corkscrew jag at right angles combined with straws butterfly bell tomahawk pigtail hook tangled masses unicorn horn

6. Problems with the existing classification system

Just as there have been difficulties with cave classification schemes, there are difficulties with classifying speleothems, especially oddball things like helictites.

- The variety classification gives no hint as to structure.
- Structural classifications are only in their infancy
- Helictites deposited from different materials may have different forms
- There are additional varieties yet to be classified.

7. Some additional forms of helictite

In NSW caves and elsewhere I have noticed some helictite forms which aren't well described in the latest edition of Hill & Forti.

The same forms occur in several caves both in Australia and elsewhere in the world.

They have consistency of form: that is, if one looks for a particular shape of helictite (eg butterfly) one can find examples in other caves around the world. Often where they do occur, all the helictites in the one area are of the same form. Presumably the same set of influences occurs at each site for a given form.

Table 2: Some descriptive names

Name	Location	Comment
saws	Orient Cave Jenolan	straight, gravity effect
rods	Ribbon & Baal Jenolan	long, maybe fibrous
butterflies hands	Orient Cave Jenolan	twinning effect
upturned helictites	Tantanoola Cave South Aust.	gravity effect
peripatus	Sigma Cave Wombeyan	fractal appearance
ribbon helictite	Jubilee Cave Jenolan	needle form calcite
intermediate forms	Cliefden Main Cave NSW	curved flattened

Unfortunately, I have no way of telling (without a picture) whether the forms described above are actually the same as what other people have described. For example, are the rod and butterfly forms in Table 2 the same as those of the same name in Table 1? Is the butterfly form in Table 1 the twin version of the tomahawk form?

The helictite form taken by vaterite in carbide dumps is also unusual; it is an inverted horn shape (carbidimites) and is unstable: the form changes over months. Carbidimites are discussed in Hill & Forti (but not in the section on helictite forms).

Another form, again in Hill & Forti is the pseudo-helictite as photographed by V. Maltsev. This is a concentric tube of calcite over an aragonite core, with dolomite between the two: a triple layered speleothem.

Names may help to describe helictite forms. Some are described below. A better way of classifying these forms is discussed later.

7.1 Saw Helictites

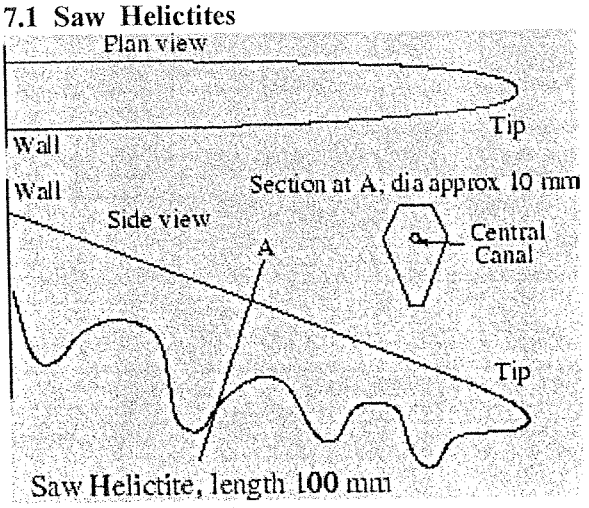


Figure 1: Saw Helictite

Saw helictites are generally straight (see Fig 1). The lower edge appears to have a row of prototype straw stalactites along it. The cross section shows the helictite has a central canal and is symmetrical. Its development is influenced by gravity. Saw helictites appear to protrude from the wall at fixed angles, typically about 35^0 with respect to the wall. They have a central canal and appear to have minor side canals. If a laser pointer is used to light up the tip of one of the stalactites, the light also appears to be conducted along a curving, cone-shaped portion of the main part of the helictite. Some saw helictites appear to be composed of a series of half-butterfly helictites (see Fig 3) with well-developed "wings" and "tails" (ie the stalactites). More work needs to be done on saw helictites.

7.2 Rod Helictites

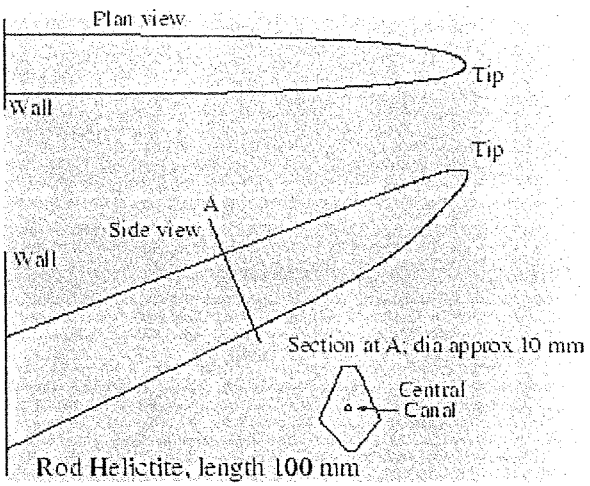


Figure 2: Rod Helictite

Rod Helictites are generally straight, similar to saw helictites but without the saw edge. They are often found protruding upwards from walls or columns, making an angle of about 30 or 60 degrees to the vertical. Their cross section is almost the inverse of that of the saw helictite. They appear to be made of en-echelon stacks of calcite crystals, although this could be just the surface coatings. Rod helictites can be quite large, with a total length of about 1 metre and a diameter of about 20 mm. They can be seen in the Temple of Baal, Orient and the Ribbon Caves at Jenolan, NSW. They are often associated with deposits of aragonite and hydromagnesite, however they are also sometimes found partially engulfed in flowstone. Although rod helictites are usually straight, both bent and branched ones occur. This may well be the rod variety described in Hill & Forti.

7.3 Butterfly Helictites

Butterfly shapes can occur either singly (imagine a resting butterfly with its wings folded together) (see Figure 3) or twinned to form a pair of open wing shapes. The single wing shape may be the tomahawk as mentioned in Hill & Forti. Close inspection of this type of helictite shows that it appears to be made of a number of segments, each optically continuous but with optical discontinuities at the segment boundaries.

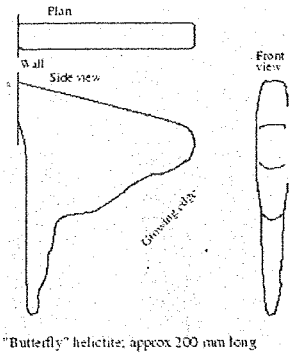


Figure 3: Butterfly Helictite

This can be seen using a laser pointer. The segments appear to be recrystallised. They appear to have a number of micro-channels rather than the usual single canal that most helictites have. Possibly what happens is the micro channels may fork, so the speleothem develops a broad wedge shape. Growth seems to occur predominately in one plane. It is clearly influenced by gravity (the stalactitic deposit forming the butterfly tail). The open butterfly shape appears to be due to crystal twinning, where each half shares a common attachment point to the wall, and whatever influences one side will influence the other side. They occur in Orient Cave at Jenolan, Wyanbene Cave and numerous other caves around the world.

7.4 Hand or Shell Helictites

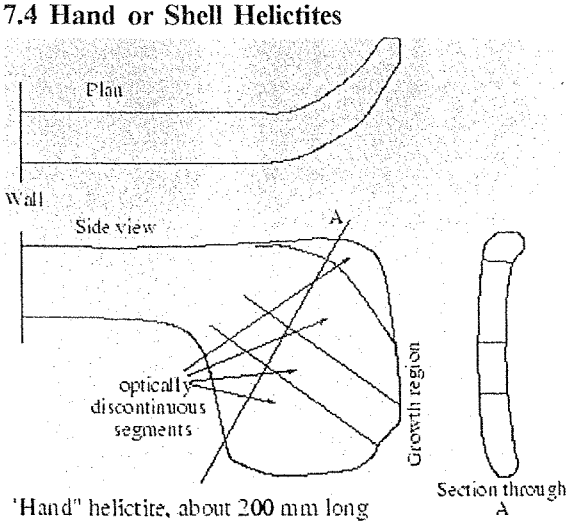


Figure 4: Hand Helictite

Similar to the butterfly helictites, hand (or shell) helictites are planar structures. They generally lack the stalactitic tail that the butterfly helictites have. They also occur as twinned pairs. They are made of segments, as can be seen with a laser pointer. Hand helictites look like a pair of hands in mittens; there is

a distinct wrist and the hand section is translucent. It can be curved. One hand helictite is shown in Figure 4. They occur in Orient Cave, Jenolan.

7.5 Intermediate forms

Some other intermediate forms are like a ribbon helictite but with diagonal spikes (like aragonite) leading to a saw edge. These can get fairly large. They occur in between Orient Cave and Ribbon Cave, Jenolan Caves, NSW. Another intermediate form is like the saw helictite, but with a smaller zigzag edge. They curved regularly forming loops and occasionally a spiral, with a diameter of about 10 cm. This form is fairly common at Cliefden Caves, NSW, forming large clumps of similar helictites.

7.6 Ribbon Helictites

Ribbon Helictites are flattened helictites. They are generally fairly small, typically 5 mm wide, 1 mm thick and 20 mm long. The type locality is Jubilee Cave, Jenolan Caves NSW Australia.

Figure 5: Ribbon Helictite

Ribbon helictites appear to be made of calcite in the lublinite form, although individual crystallites appear to be an order of magnitude larger than those of lublinite. A detailed description of ribbon helictites is in Rowling (1998). Basically, they have a short stem made up of a twinned pair of crystallites with the central canal developed between the pair. Crystallites are made of pseudo-hexagonal columns of calcite in the lublinite form. At the end of the stem, the ribbon develops. This is a flattened structure made of twinned sets of crystallites, aligned with those of the stem. The central canal is usually visible in the centre of the ribbon as a thin white line. At Jenolan Caves, they are usually associated with ancient gravel beds which appear to have reacted with the limestone.

7.7 Heligmites

Heligmites are generally classified as helictites which simply develop on the ground rather than on a wall or roof. However there are some exceptions where the heligmite should be classified separately.

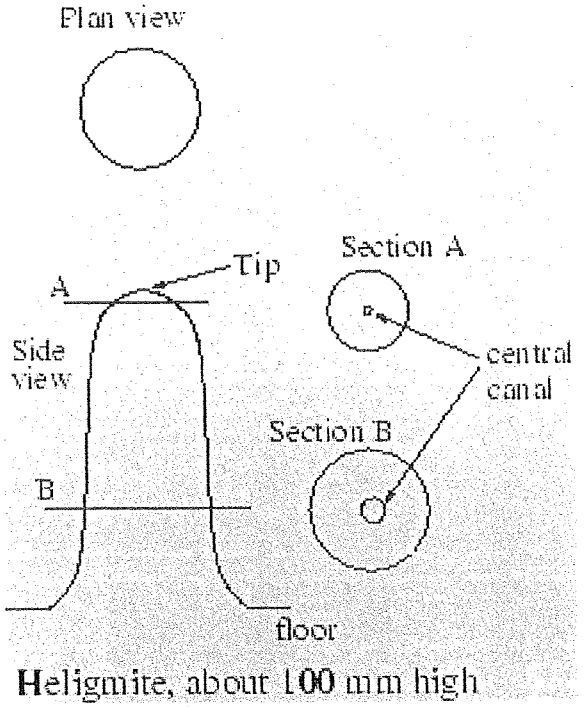


Figure 6: Heligmite

In this case, the heligmite is a fairly large structure resembling a stalagmite. They have a central canal. In large heligmites (say 30 cm tall and 5 cm diameter), the central canal can be about 5 mm diameter in the main part of the heligmite but microscopic at the tip.

In this type of heligmite, the central canal appears to be filled with a sticky, fine mud. Large examples can be seen at Tantanoola Cave, South Australia, where they have developed in a dolomite cave. Lesser examples can be seen at Jenolan Caves. They can have side branches.

One of the Jenolan Caves heligmites (Dwyers Cave) appears to have dark material deposited along with the clear calcite; possibly manganese dioxide. The Tantanoola heligmites also seem to have this dark material.

One could argue that these large heligmites are actually geysermites, however the definition of geysermites in Hill & Forti specifies that geysermites have thin walled sides and a crater-like central hole whereas these heligmites have very thick sides and no apparent central hole at the tip, ie they are more like a normal helictite.

At both these sites, the speleothems are developed in an area which does not have geysers or thermal springs. Swelling clay, however, may be a contributing factor.

7.8 Upturned Helictites

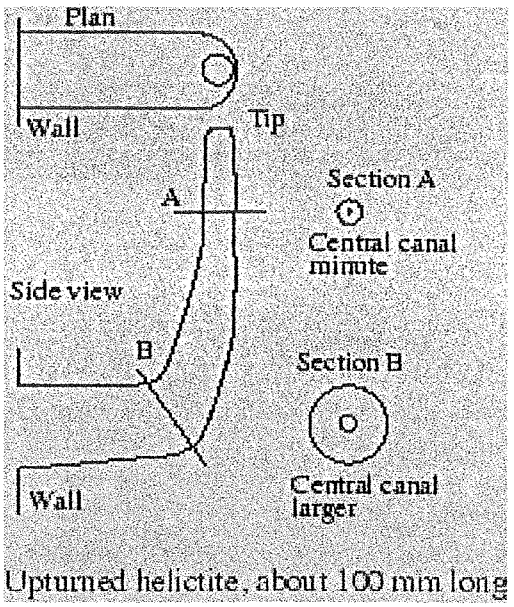


Figure 7: Upturned Helictite

Upturned helictites are usually vermiform helictites which initially develop with a horizontal orientation, then they develop in a vertical (upward) orientation. The horizontal development is usually only about 5 cm length, however the vertical development can be metres long.

Some of the best examples can be seen at Tantanoola Cave SA, where they can be seen attached to stalactites and columns; they resemble electrical wiring in some places. A smaller version can be seen in the Wollondily Cave, Wombeyan Caves, NSW, where they appear to be associated with magnesium deposits. At the bend, the central canal appears to be enlarged. More work needs to be done on this type of helictite.

There is a similar form of upturned helictite which appears to be common in caves all round the world. This form however rarely reaches the size of the Tantanoola helictites and may either stop developing once a certain size is reached, or may become engulfed with flowstone.

7.9 More forms - subaqueous

After the ASF conference, I was alerted to some more new forms of helictite, this time underwater in Nurina Cave on the Nullarbor. Paul Boler (pers. comm.) has shown finger shaped heligmites, as well as a crested form and a conical form. Again, these are not one-off; where they occur there are a lot of similar ones nearby. They appear to be actively depositing.

In McCavity, Limekiln Cave, Wellington Caves, NSW the divers have found large helictites under water. However these appear to have been deposited originally in air and the cave has subsequently filled with water. The helictites in this case have a clear crystalline core (possibly aragonite) and a thick dark coating (possibly a mixture of calcite and manganese dioxide). They may be still active.

I have seen what appears to be a subaqueous helictite under a baldacchino canopy in Croesus Cave, Tasmania. This was not an unusual form, though, and would be normally classified as the vermiform variety. Possibly there are more of these around if we look for them.

7.10 Peripatus Helictites

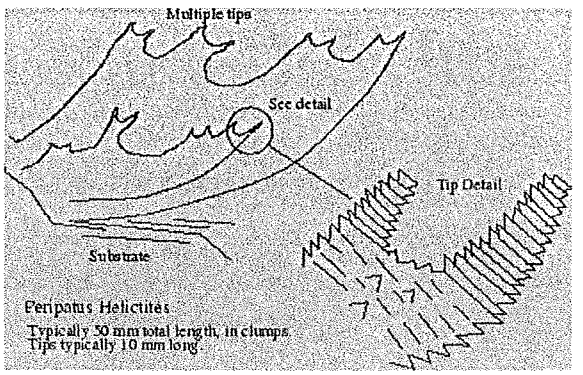


Figure 8: Peripatus Helictites

Peripatus helictites were discovered in Sigma Cave, Wombeyan, NSW, during a cave survey. At first, they were thought to be simply corroded helictites. After developing the photographs, it was apparent that they were yet another undescribed form.

They have a very rough surface, composed of small crystal terminations. This makes them difficult to photograph as they tend to absorb light.

They appear to form horn shapes, where each horn forms part of a larger horn (see Fig 8). The angle that the horn axes make with each other is similar to the angle at which aragonite tends to develop (split).

They occur on flowstone (as shown) and in a stalactitic form, associated with a white deposit (possibly hydromagnesite). The general form is fractal in nature, in that the closer you look, you still see similar shapes (paired horns). The name "Peripatus" is after a fancied resemblance of the fine structure to the rough skin of the velvet worm, Peripatus.

8. Proposed Classification System for Helictites

The system being proposed should take into account the various factors involved in the development of helictites and other capillary-controlled speleothems.

Unfortunately for the general caving community, it does not classify helictites into neat pigeonholes.

One of the interesting things about helictites is that there are indeed consistent types. They are not just random aggregates. Ribbon helictites, for instance, are fairly rare throughout the world but locally common where they do occur.

Helictites of a particular form often occur in groups of all one sort, inferring that there is something that has caused the helictites to take on the particular form. Here are some of the factors that should be taken into account:

8.1 Gravitational effects

Gravity may affect the alignment of the helictite. It may affect the long section or the cross section.

•Is the helictite aligned with respect to gravity? This may occur if the helictite has a large central canal where capillarity is balanced by gravitational force (eg drips or density of liquid / mud). In the case of subaqueous helictites, there may be a difference in the density of the liquid within the helictite compared to the water in which it has developed.

•Does it develop at a specific angle with respect to gravity? This can occur if calcite polysynthetic twinning is involved. This is a feature of calcite whereby sufficient pressure along cleavage planes causes the calcite to move along the planes in a regular way (like a deck of cards) without breaking.

•Is its cross section aligned at a specific angle with respect to gravity? If a cross-section is meaningful, one may notice that it is always aligned one way. Again, this infers that there is a density effect or water may gather at one end of the helictite.

Examples include rods, saws and hands in Orient Cave, Jenolan; heligmites, stegamites and helictites in Tantanoola Cave (SA).

8.2 Crystal twinning effects

•Does the helictite display any symmetry either by itself or as an aggregate? Ribbon helictites are highly symmetrical. They have four fold symmetry.

•Are there any identifiable repeat patterns in the form? For example, with some branched helictites, one notices that every branch occurs at a certain angle and at every branch there is only one fork.

•Does the form appear to be fractal in nature? That is, is the helictite made up of miniatures of the same shape? Does it look as though it is made of repeat patterns?

Examples: Peripatus . helictites in Sigma Cave (Wombeyan, NSW), ribbon helictites, butterflies.

8.3 Environmental effects

•Does air or water flow appear to have influenced the helictite's growth?

•Carbon dioxide levels in air, water and substrate?

•Humidity in both air and substrate?

•Temperature of air, water and substrate?

•Presence of water (subaqueous or subaerial helictites)?

•Groundwater (rainfall), climatic changes?

8.4 Trace element effects

•Presence of metals such as magnesium, iron, copper, lead in the helictite or in water? Ribbon helictites, for example, contain about 0.5% Fe (iron). This does not colour them (they are clear) however it may influence the crystal growth by causing regular crystal lattice defects.

•Presence of sulphate and phosphate in helictite or in water

8.5 Crystal system effects

Is the helictite composed of all one type of material or are there influences from different minerals and their polymorphs?

•$CaCO_3$ polymorphs: Calcite / aragonite / vaterite

•Halides and sulphates

•Crystal and crystallite alignment with respect to helictite development

•Crystal size ranges

Example: Vaterite helictites associated with carbide dumps; beaded helictites.

8.6 Biological effects

•Presence of calcite as needle-form calcite (lublinite)

•Association with sulfuretums (sulphur cycles)

8.7 Substrate effects

Th porosity of the substrate may affect the development of helictites.

•Gravel substrate

•Clay substrates

•Ochre substrates

8.8 Canal effects

•Single central canal

•Multiple central canals

•Side-branching canals (canalicules)

•Surface capillary channels

•Shape of canal: Circular, flat, U-channel, hexagonal, spherical etc?

•Size of canals

For example, most vermiform helictites have circular central canals whereas the capillary channel in a cave shield is a flat sheet. Welts and turnips have spherical hollows. Some of the helictites described in this article have branching canals.

8.9 Activity

Is the helictite active or dead?

•If dead, when was it formed and under what conditions (U-Th dating, etc)?

•If live, what is its growth rate?

8.10 Development habits

Additional information may be useful in describing the heictite.

- Presence of active/inactive drip points at regular or irregular intervals
- Straight habit (like a rod)?
- Curved habit, spiral habit, radius of curvature?
- Shape of cross section(s)
- Overall length and widths
- Fracture habit
- Colour
- Surface texture and pattern
- Forking habit and angles of forks
- Bending habit and angles of bends

9. Summary

There is really no way we could give individual names to each of the combinations and permutations of influences as listed above. Although the classification scheme by Hill and Forti serves well for the general caver, a more comprehensive classification scheme is needed if we want to explain what causes the development of helictites.

Possibly this could be addressed by developing a catalogue of helictite types rather like a smaller version of *Cave Minerals of the World.*

This would be huge undertaking however it could be started as a set of tables, at least defining those influences relevant to helictites and lead to a useful, publically accessable database of helictite forms.

One of the nicer features of databases is the information is not stored in a hierarchy, so one is not forced into classifying things first. Rather, that becomes the responsibility of the *application* rather than the database itself.

One could query the database for all helictite forms which were found underwater. Or all helictite forms containing aragonite. Or all helictite forms at Jenolan Caves. Or those that had single central canals. Or whatever. It also makes it possible to visualise the helictite without having a photograph of it. Possibly the shape could be described in terms of parameters to an equation, which could then be displayed by an application. If and when an exact explanation can be found for the development of a particular helictite form, that can be added to the database (or at least a reference to it).

The concept can also be used for conservation. For example, if it is found that a particular helictite only occurs with certain bacterial colonies, then it would be inadvisable to clean up a tourist cave containing such helictites using an antibacterial cleaning agent.

Also if a particular helictite form is known to have small water reservoirs as part of its make-up, then it would not be advisable for a tourist cave operator to put strong, high powered lights on the speleothem otherwise the water can boil and fracture the helictites (cave photographers take note!).

References

Davis, D.G., Palmer, M.V. & Palmer, A.N. (1991) Extraordinary Subaqueous Speleothems in Lechuguilla Cave, New Mexico. *National Speleological Society Bulletin* 52: 70-86.

Hill, C.A., and Forti, P. (1997) *Cave Minerals of the World.* National Speleological Society, Huntsville. 2nd Ed.

Rowling, J. (1998) Ribbon Helictites: A New Category *Helictite* 36(1), 2-10.

Shaw, T.R. (1992) *History of Cave Science* Sydney Speleological Society. 2nd Ed.

...continued from page 2

Harness Hang Syndrome: Facts & Fiction

Someone should be headed up (or down) the rope to assist the stranded caver shortly after that first attempt at correction. The would-be rescuer might be able to simply assist and thus correct the problem. Or the rescuer may have to pick the stranded caver off and get them back to the bottom of the pit. Either way, knowing how to do a pick off should be mandatory and all cavers on a trip should be ready to use that knowledge quickly.

References:

"Sensibilisation a la Pathologie Induite Par L'Utilisation Du Harnais" by Jean Bariod, presented at the 1992 European Conference of Speleology. Translated from French by Melonie Alspaugh.

"Le Point Sur La Pathologie Induit Par Le Harnais" by Jean Bariod and Bruno Thery, published in Spelunca #55, 1994, pp.39-42. Translated from French by Melonie Alspaugh.

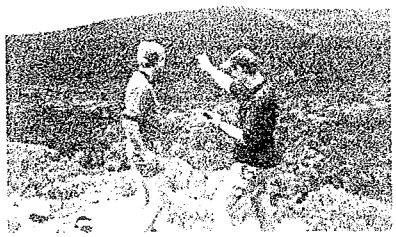
"Hanging After a Fall: An Extremely Urgent Rescue" by Dr. Maurice Amphoux, presented at the International Fall Protection Symposium, Germany 1998. Translated by Peter Ferguson.

Caption Contest 2. What did Joe say to Peter?

Sorry no captions were sent in for Contest 1 that appeared in Calcite 40.

GPS UNITS
(WHERE ON EARTH AM I?)

Joe Sydney



Gee, I'm glad I brought the GPS: it's out there somewhere!" Peter Bauer and Joe Sydney checking their location near Hole in the Wall canyon

Have you ever been to a caving location, found an entrance on a previous trip, returned and wondered where the hell that cave entrance is? Well, if you have, or have been given grid co-ordinates, a GPS may assist you. But before you head off into the karst field or bush there are a few things you need to know.

GPS units are complex pieces of electronic gadgetry with, at times, difficult to learn software. There are lots of things people don't tell you about GPS units and you may find information and GPS jargon complex or even baffling. Let's see if we can simplify a few general points. Also included are some very good GPS/DGPS web sites.

The following information is for use if you wish to plot details onto a topographical map - Preferably 1:25,000.

What is a GPS unit and how does it work?

Basically it tells you where you are by providing co-ordinate figures. The trick is learning how to use the GPS and reading the information it gives you.

All GPS units have complex inbuilt receivers that pick up satellite signals from geo-stationery orbits high above the earth (fig. 1) or from a ground station known as a DGPS Beacon (Differential GPS) (fig.2).

Satellite Reception

Signals received from a number of satellites are triangulated to give you a reference point figure. This, in turn, can be plotted onto a map. GPS receivers have a page showing locations of satellites and the signal strength being received from that satellite.

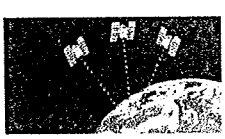


Fig.1 *A number of satellites triangulated to give a reference point.* Source: Trimble

Satellite reception is usually shown as a solid bar on a graph (Fig.3) that indicates the unit has a good lock onto a satellite\s, an outlined bar shows that it is receiving but does not have a lock yet! It takes three good lock-ons to achieve a minimum triangulation and to provide a reasonable location or reference point. The longer you remain in that location and the more lock-ons\solid bars it shows, the greater the accuracy of the given location or reference point! Signal strength can be affected by a number of factors: medium to heavy tree cover, valleys and canyons, buildings and even adverse weather!

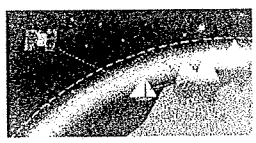


Fig.2 DGPS - beacon and satellite! Source: Trimble

DGPS

DGPS beacon transmitters emit the same type of signals as satellites. The difference is that they are usually land, as opposed to satellite signals (fig.4). The combined benefit of both satellite and fixed ground signal provides an even more accurate reading and is especially helpful when signals are affected by adverse weather conditions. Some GPS models come with the DGPS feature and some have optional connection to allow DGPS reception. At present DGPS may be more suitable for marine use than searching for caves because beacons are located along the Australian coastline and have limited range.

Locations of DGPS beacons may be found on the web.

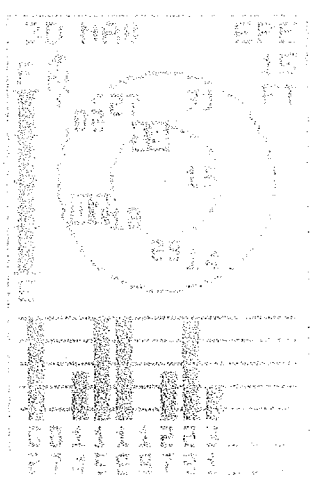


Fig.3. A good lock-on

Map details:

It is extremely important to know what map datum to set your GPS into. Most GPS instruction books will provide a list of countries with relevant map datum's. Australia is currently undergoing changes to it's mapping system so this will affect the accuracy of the

location given from map to map. Take a look at an old map and compare it to a new one and you will see the differences (see fig.5).

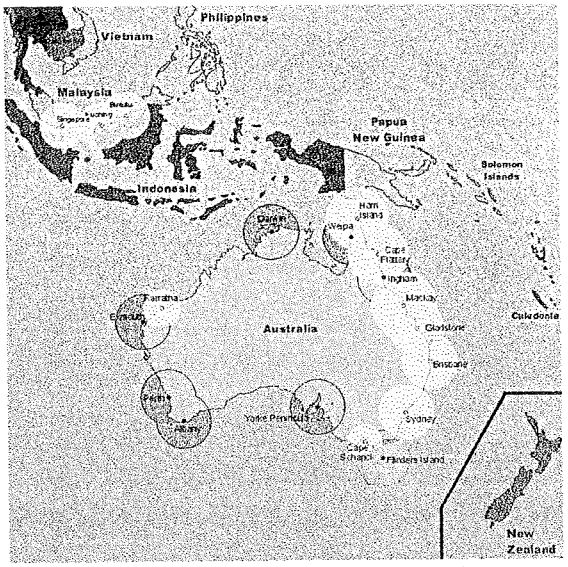


Fig.4. Location of DGPS beacons around Australia

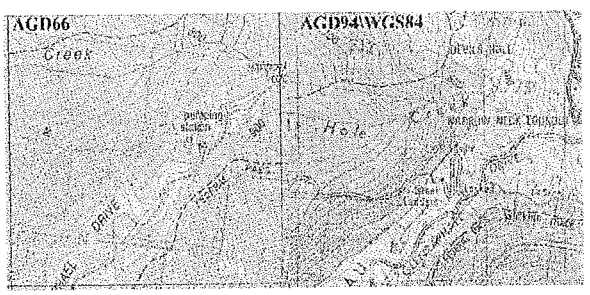


Fig.5. Note the position differences between the old AGD66 and the new Katoomba (AGD94\WGS84) maps.

What most people & books don't tell you are how and to what Map Datum to set your GPS. First, look at your map legend and see what is shown – Australian Grid Datum 1966 (AGD66), Australian Grid Datum 1984 (AGD84) or Australian Grid datum 1984. Then set your GPS to the Grid Datum shown on that map! Your GPS should have a range of international and Australian Grid Datums.

If your map is of the new format and conforms to AGD94, and your GPS does not have this selection, then you can use the World Geodetic System 1984 – WGS84 in this instance only. By using the correct datum, the GPS will give you a better and more accurate reading.

Warning! Selecting the wrong grid datum will result in substantial position errors!

Which North?

There are three norths – magnetic, grid and true (Fig.6). Usually, most people want the reference point to plot onto a map given as a Grid Reference. If you want the location of a Grid Reference on a 1:25,000 topographical map, set your north to 'Grid'.

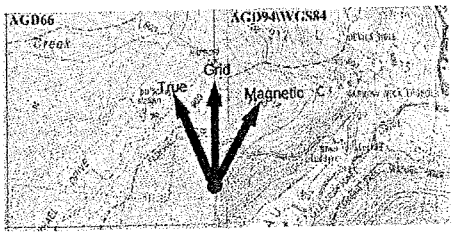


Fig. 6 Which North to use – Grid, True or Magnetic.

In what format is your position provided?

All GPS units will provide position information in two ways (Fig 7) – Grid references (for topographical maps), and Longitude and Latitude (for marine). Be sure that you know which you require.

For Australian topographical maps, set your GPS unit to UTM (Universal Transverse Mercator) and it will let you navigate on the grid and co-ordinate system (Grid Reference).

Grid Reference (for topo maps- 62**6450** 02**4870**
Latitude/Longitude for marine use- N 38 51 480' W 094 47 607'
Fig. – Grid Reference or Latitude/Longitude?

Altitude

If you happen to be near or are often passing a known altitude such as a trig point or contour, then setting or calibrating your GPS to this height (whenever you get the chance) will provide you with a more accurate altitude reading. Do this every so often.

Time

All GPS units have an inbuilt clock and some come with additional features such as sunrise and sunset times. Don't forget to change your clock for daylight saving time if needed.

Waypoints and Routes

When the GPS provides you with a reference point or known location grid reference it can be saved in the GPS as a 'Waypoint'. Some units also offer you the feature of recording Waypoints with numbers or names for easy recollection.

If you have two, three or more Waypoints from point to point such as a walking trail, they can be saved as a 'Route'. These can be recalled at anytime. This can also make navigation easier if someone provides you with a series of (grid) reference points.

Selective availability!

Up until a few years ago, the US Military controlled GPS satellites transmitting signals. Within these signals, satellites transmitted a sort of 'fudge factor', which gave the non-military user, less accurate reading. Today, this has been turned off providing GPS users with greater accuracy!

General features

All GPS units are basically the same when it comes to functions and features such as those outlined. Some have many more useful features: Track plotter – marks a trail on your screen, MOB or Man Overboard location function, Navigation page – shows a compass with directional arrow, Speed in kilometres per hour, Average speed, Track Back Navigation –allows you to retrace your path, Course deviation alarm, Trip odometer, Battery life indicator, DGPS ready – Differential GPS gives your position with greater accuracy, Backlighting, Colour or B&W screen, maps (usually optional), External antenna, PC download socket and more.

Summary

The best way to get to know your GPS is to actually use it - preferably before you intend to go bush! Some models have in-built tutorials with ready to use co-ordinates. I've found that if you set your GPS to the basics as outlined you get the accurate reference point you require. In time, you should be able to work out what all the others features are.

If you fail to work out any of the features, try consulting the obvious – the manual, or asking someone who may be familiar with GPS units. Some GPS companies provide on-site tutorials! The web is also another excellent source of information.

I trust that this offers a general insight and understanding of how a GPS works and the basics of how to use one.

Web References (Current at 1 September 2001)

Australia's National Mapping Agency
http://www.auslig.gov.au/
GPS tutorial - http://www.trimble.com/gps/
How it works?
http://www.howstuffworks.com/gps.htm
Garmin brand GPS unit site - http://www.garmin.com/
Magellan GPS site -http://www.magellan.com.au/
Lowrance GPS site - http://www.lowrance.com/
DGPS location map for Australia
http://www.ctsystems.org/s-asia.gif
DGPS: list of beacon locations
http://www.trimble.com/findbeacon.html

Caution:** Get to know your GPS before you go bush.Of course, reading your manual is also a good option. **A GPS unit is an aid to good navigation skills, not a substitute for learning how to effectively use a map and compass.

GPS Pocket Guide

1. Check map for: Print date and Geo Datum info – Australian Geod 66\84 or WGS84
   GPS Unit Configuration
2. Set Geod Datum as above!
3. Set GPS country code to Australia, state or local area.
4. Which North – True Magnetic or Grid?
5. Datum format – set to UTM.
6. Set known altitude – often!
7. Set Time\Daylight Saving Time!
8. Recalibrate after every 300km if required.

CAVE PHOTOGRAPHY

Djuna Bewley

This article first appeared in NSS News and can also be found at http://www.goodearthgraphics.com/showcave.html. Djuna and NSS News editor, Dave Bunnell, have kindly given permission for HCG to reprint this article in Calcite. (Ed)

Caves are challenging photographic subjects. Fortunately, the payoff is big: cave pictures can be very dramatic and, using a few specialized techniques, allow the photographer a great deal of creativity. Whether you're a beginning or advanced photographer, a little preparation will allow you to create some truly exceptional pictures during your cave visit.I guarantee that when you see the pictures at home, you'll see the cave in an entirely new light.

The Task Ahead

A few day-in, day-out troubles plague the cave photographer, whether he's using a point-and-shoot or a medium-format camera. May as well get them out in the open.

1) Fog happens

The very first thing most photographers learn in caves is that cameras are cave moisture magnets. Out of the padded case for only seconds, many lenses could pass as bathroom mirrors after a shower. A lens tissue or cloth momentarily alleviates the problem. Better yet, warm the lens by wrapping a hand around the lens barrel or by holding a lighter flame near the glass (not *too* close!) for several seconds. Time also does the trick. The camera inevitably equalises with the cave environment as your cap lamp begins to grow dim.

2) Caves are cramped.

If you are photographing show caves they can be high traffic areas. Even in grand trunk passages, foot traffic is almost always confined to designated trails. Never assume that photography grants you the license to venture off-trail and destroy the delicate environment you hope to document. Your challenge will be to create an impressive image given your limits on view and lighting angles. Maximize your options by arming yourself with a zoom lens. (Note that a zoom is better suited than a set of lenses to the pace of guided tours.) If you must choose a single, fixed focal length lens, think **wide**. Many times anything narrower than a 28mm lens fails to completely capture the enveloping three-dimensional nature of the cave landscape. Variable-power flashes also help make the most of difficult lighting arrangements.

3) When you look through the viewfinder, you don't see anything.

Yes, this is disconcerting. But go with it. There's a cave out there somewhere. A bright flashlight is a welcome aid for composition and for manual focus, if you still use such a thing. (Eds note: If using auto focus you definitely need something that will light your subject well. Dim light renders auto focus useless on most cameras!)

4) Did I mention it's dark?

O.K., you've found something in the viewfinder. Now you face the task of exposing it properly on film. No, your light meter won't help. Even the brightest trail lights will do little for this scene, unless you have a lot of time, a tripod and film appropriate for the lighting system. But judging by that last punch line in your tour guide's monologue, you should be wrapping up this shot right about now. Deftly you strike (THWAP!) with the guerilla cave photographer's secret weapon. It's quick. Blindingly efficient. Comes standard with most instamatics. It's the synchronised flash! First we'll cover its point-and-shoot applications, then we'll run the photo nerds through the more gruelling details of cave flash wrangling. (Nerds: No skipping the next section. Even *you* might learn something.)

Great Cave Photos in Seconds

For the humble instamatic-toters clinging to the fragile hope that their cave pictures might look something different from the cave in its natural (inky black) state, I have this to say: Aim higher!

These days, it's possible to get some really fine shots out of the microchip generation of "instant" cameras. For cave pictures, probably the most important way you can help your camera is by feeding it the right film. Since you can't control exposure when you snap the photo, you must control it with your choice of film speed.

Decide what film to use by looking at pictures of the cave you'll be visiting. Check here in the Show Caves Directory, in brochures, or in the cave's visitor centre or gift shop.

Are most of the attractions large, open passageways? Or are they delicate close to the trail? Are the walls black, as in a lava tube, or covered with white, sparkling calcite?

ASA 200 film is a safe middle-ground for instamatic cave photography ranging between macro shots to pictures of small rooms and walls about 15 feet away (unless you use a telephoto). If most of the features you'll photograph are large or darkly coloured, choose a faster film. ASA 400 film will extend your range to about 20 feet, ASA 1000 to about 30 feet. If you plan to focus on closer, smaller details,

however, consider shooting with ASA 100 or 64 film. Slower films have smaller grain and produce sharper images. (Eds note: It's hard to beat Velvia 25 ASA film but for all round cave shots I find the 800 ASA Fuji Press very good and it is no less grainy than 100 ASA film. You can buy 800 ASA Fuji Press (36 prints) from retail outlets such as Fletchers Photographics for around $9.00).

A good way to hedge your bets with cave photography is to use slide film. Cave pictures tend to err toward underexposure, and slide film is much more forgiving than print film on this end of the spectrum. The inverse is true for overexposure, by the way, so when you hit the beach or ski slopes, prints are the more fool proof choice.

If you do go with prints, expect to be disappointed when you get them back from the processing lab. But don't blame yourself. Yet. The machine prints cranked out of photo labs just don't do justice to that delicate interplay of light and dark so artfully arranged in your viewfinder. In fact, the print machine's job is essentially to obliterate that interplay. If it has its way (and the machine operators usually let it), the net average of all light and dark areas will approach a safe, neutral-density tone.

Sometimes it's better to just not look at your prints. Look at your negatives. These are more likely to show your true potential as a snapshot artiste. Look for good range and details that don't show up in your print. If you see room for improvement in your negatives, ask the processor to reprint them to bring out details in either light or dark areas. You deserve it.

Random macro tip: remember that with your rangefinder instamatic, the close-up seen through the view finder isn't the same as the one your film sees through the lens.

You're viewing the scene from a higher vantage point than your lens is, so you'll have to aim the camera higher than you'd like. There should be tick marks in your viewfinder that show the upper border of your macro shot.

Random flash tip: remember to give your flash ample time to recharge after it fires. It's working hard to light up this cave and may need several seconds to recover its full potential after each shot. Fresh batteries are a big plus.

So far we've covered the basics of instamatic artistry. But don't stop here. Read on and you'll find that a lot of the cave photo tricks used by hardcore gear junkies can be used with your point-and-shoot, too. Lighting control in caves actually gives you more power over your point-and-shoot pictures underground than you normally have on the surface.

A good start for mastering intermediate instamatography is to search your camera and its manual for a lens aperture range (its f-numbers, e.g., f3.5-f8) and flash distance range. (These details can be ridiculously hard to come by. If all else fails, contact your factory representative, ask why, and tell me.) Multiply the camera's lowest f-number (e.g., 3.5) by the maximum flash distance for 100 ASA film. You now have in your command the all-powerful "guide number" for your camera. (A typical value is 50, using distance units of feet). With minor mathematical manipulation, your guide will tell you the maximum distance you can shoot in a typical cave, and with various films.

Advanced point-and-click wizards make some great pictures by expanding their cave photo arsenal with an external strobe. Choose a strobe with a built-in infrared trigger (known as a "slave"), and it will automagically synch with your on-camera flash. (Turn the strobe off when it's not in use, as other people's flashes will trigger the slave, too!)

A remote flash greatly increases your creative lighting options, as well as your distance range. It completes the ultimate guerilla photo set-up for both the rushed cave tour and the late-night party scene.

Cave Pictures for Photo Nerds

Aside from some aforementioned inconveniences, photography in caves is like it is anywhere else, except that you have absolute control (and responsibility) over lighting. Here in Nature's greatest darkroom, you practice landscape photography using studio lighting techniques. Your mission: to paint a picture with light. Your personal lighting choices can make your picture so different from that of another cave photographer. It could, at first glance, be difficult to recognize when two shots have the same composition. But before revelling in lighting's artistic nuances, let's discuss its more technical aspects, such as sources and exposure calculations.

Today the most accessible and portable light source for cave photography is the electronic strobe. This is sad, because strobes are pitifully weak opponents against a cave's deep blackness. Yet gone is the heyday of the far more brilliant magnesium-based flash. The featherweight M3 bulb could blow away any heavyweight strobe (and the flash operator's fingerprints) any day. A handful of bulbs could light up all but the biggest cave rooms. Even the unprepossessing Magic Cube packed a powerful punch. Today the few flash bulbs that remain are jealously hoarded and judiciously fired by only the most devoted cave photographers. (If you spy any at a garage sale, by the way, drop me a line.) I presume the cave photo diehards know what to do with their

bulbs, so I'll direct my attentions to the two strobe-users who managed to read this far.

What kind of strobe and accessories are best for cave photography? A powerful strobe with variable power settings is most useful. A long, heavy-duty PC cord that lets you get the flash fairly far off camera adds much to a shot's depth and drama. For additional strobes, you'll want to synch them to the on-camera flash with either built-in slave triggers, or better yet, dedicated external slaves.

Even seasoned nature photographers may face serious self-doubt when figuring flash exposures. Fortunately, many modern camera systems are equipped with TTL flash metering, so that good exposures with synched flash seem nearly unavoidable. Fear not, you can still botch the shot if you push the envelope on the strobe's distance rating. TTL flash metering is quick, convenient and generally gives good results. It's best, however, to use the flash in manual mode when using additional flashes.

If you'll be reckoning your flash exposures by brute mathematical force, you'll need to know the power of your strobe. Look on your flash or in its instructions for a guide number, sometimes abbreviated GN. The guide number describes the strength of your strobe at full power, generally rated for ASA 100 film. For a proper exposure, the flash guide number should be related to the flash-to-subject distance (usually in feet) and lens aperture as follows:

guide number / distance = f-number

Thus, if your flash has a rated guide number of 90 and your flash is 20 feet from your subject, you could figure on an f-stop of 90/20 = 4.5 using 100-speed film. (Note that it is the flash-to-subject distance that counts, not camera-to-subject!)

Don't see a guide number on your flash? First work backwards and derive the guide number from the strobe's distance and f-stop recommendations at ASA 100.

The Cave Caveat:

In caves, guide numbers must be corrected by an appropriate Cave Light Sucking Factor (CLSF). Some caves are voracious light suckers, like wet highways are to headlights on a moonless night. For general purposes, use a CLSF of 0.7, like so:

guide number x 0.7 / distance = f-number

Don't be afraid to modify your final f-stop as the subject matter requires. If your subject is lightly coloured, close down your aperture a stop or two. If it's darkly coloured, open it up one or two stops. When in doubt, a good rule of thumb is to "bracket" a stop above and a stop below the recommended exposure. In other words, try three separate takes on the cave photos you really don't want to screw up. If you plan to bracket, make sure your flash has fresh batteries since you'll need short recharge times on a quick-moving cave tour.

Under various circumstances, you'll need to derive a working guide number from your strobe's standard guide number rating. To correct for faster film speeds, for instance, multiply your guide number by 1.4 for every doubling of the film's ASA. Using 400 speed film (100 x 2 x 2) and a strobe with a GN=90, we would thus calculate the working, in-cave guide number at 90 x 0.7 x 1.4 x 1.4 = 124. Shooting toward a cave wall at a distance of 20 feet would then require an aperture of 124/20 = 6.2 (between 5.6 and 8).

Conversely, if you use film with an ASA lower than 100, or flash settings below maximum power, divide your guide number by 1.4 for each halving of the film speed or flash power.

Most truly stunning cave pictures are created using multiple flashes. A classic multi-flash lighting layout which emphasizes wet highlights and wall sculpturing uses strong back light—a flash aimed directly toward the camera but eclipsed by a person, stalagmite, or whatever—and a softer front fill flash. (Calculate your exposure for the front light, then use twice the flash power for the back light.) This is sure to yield a dramatic shot. Other multi-flash shots make use of strong side lighting and the like. The best way to find the effect you're after is to experiment with strong flashlights.

When calculating exposures for multi-flash photography, you generally won't need to consider the combined power of the flashes if they're aimed at different parts of the subject matter, or even at the same subject matter but from different angles. Since different faces of the subject will be illuminated most strongly by each flash, you can simply treat each flash independently, as if it were the only light source for its subject.

Even if you don't have multiple strobes and slaves, you can still produce multi-flash cave images under certain circumstances. The practice is what is most traditionally known as "painting with light", and involves exposing one frame of film with multiple firings of the same flash unit. Unless you have a sophisticated multiple-exposure feature on your camera, this technique will work only in caves without artificial light.

To paint with light, you'll need a tripod, a single strobe, a locking cable release, a dim light, a bright assistant and an opaque cloth (double-check that cloth—even dark materials can be very translucent!). Compose your frame using the tripod. Attach the cable release to the camera, set the shutter to 'bulb', and mumble a word of reverence for that great cave flash of yesteryear. Give your assistant the strobe and

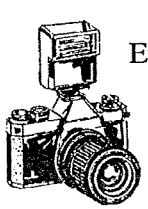
dim light and point him in the direction you'd like to light up first. Drape the cloth over the camera so that it covers the lens. Then, take the cable release in hand and kill the lights. All the lights! Open the shutter (glad the release is in hand, aren't you?) and lock it open. Lift the opaque cloth away from the lens, have your assistant fire the flash once, and drop the cloth back down. Send your friend stumbling down passage with the dim light and when he reaches a good position for the next flash, repeat the procedure. Kill lights, lift cloth, fire strobe, drop cloth. Continue as necessary, then close the shutter. (Still got that release in your hand? It's hard to find in the dark!)

One problem you might wish to avoid when moving a flash assistant around is"ghosting". This occurs when you double-expose one area of film with both your assistant and a lit-up section of cave. Your friend will then appear semi-transparent, as if stuck in some transporter beam failure. This is where the brightness of your assistant comes into play. Your assistant may need to leapfrog ahead the full distance of the flash range, or stand in areas that were (and will be) in shadows from all other flashes.

Perhaps the easiest solution, however, is for the assistant to appear silhouetted (or lit from behind by you) on the first flash, then hide for all subsequent flashes. For instance, your assistant could dodge around a corner then fire light back toward the camera, adding great highlights to distant walls.

If you have the luxury of more bright friends and flashes, you can use the bulb setting technique without the hassle of repositioning people and strobes. Simply pass out strobes, and position and aim people as you like. Kill the lights, and count to three. On the count of two, open the shutter. On three, fire the flashes. When all have fired, close the shutter. This is the classic cave photography technique used with flash bulbs, and still the most common strategy for lighting up big rooms.

Somewhere in this discussion we've graduated beyond what can easily be accomplished on the hour-long guided cave tour. Some cave areas offer self-guided trips on which you can make cave pictures at your own pace. Wild caves are not developed with lights, and give you the full opportunity to experiment with bulb settings and multiple flash photography. Or ask a show cave manager about special arrangements for photography. Some managers may accept copies of your work for the privilege of photographing their cave during off-hours.



Enjoy Nature's Darkroom!

HCG at Mudgee

An overview of the Mudgee Area.

Evalt Crabb

Introduction

The NSW documentation system has NSW divided into various regions, one of which is the Lithgow-Mudgee Region. HCG can lay claim to being the first, and still the dominant, modern speleological investigator within this region. As much as can be gathered is being brought together for a forthcoming HCG publication, *Caves and Karst of the Lithgow/ Mudgee Region.*

The Mudgee area is one of eight areas within the Region, and this report gives an outline of the Area. Complete detail is on hand for the above publication.

History

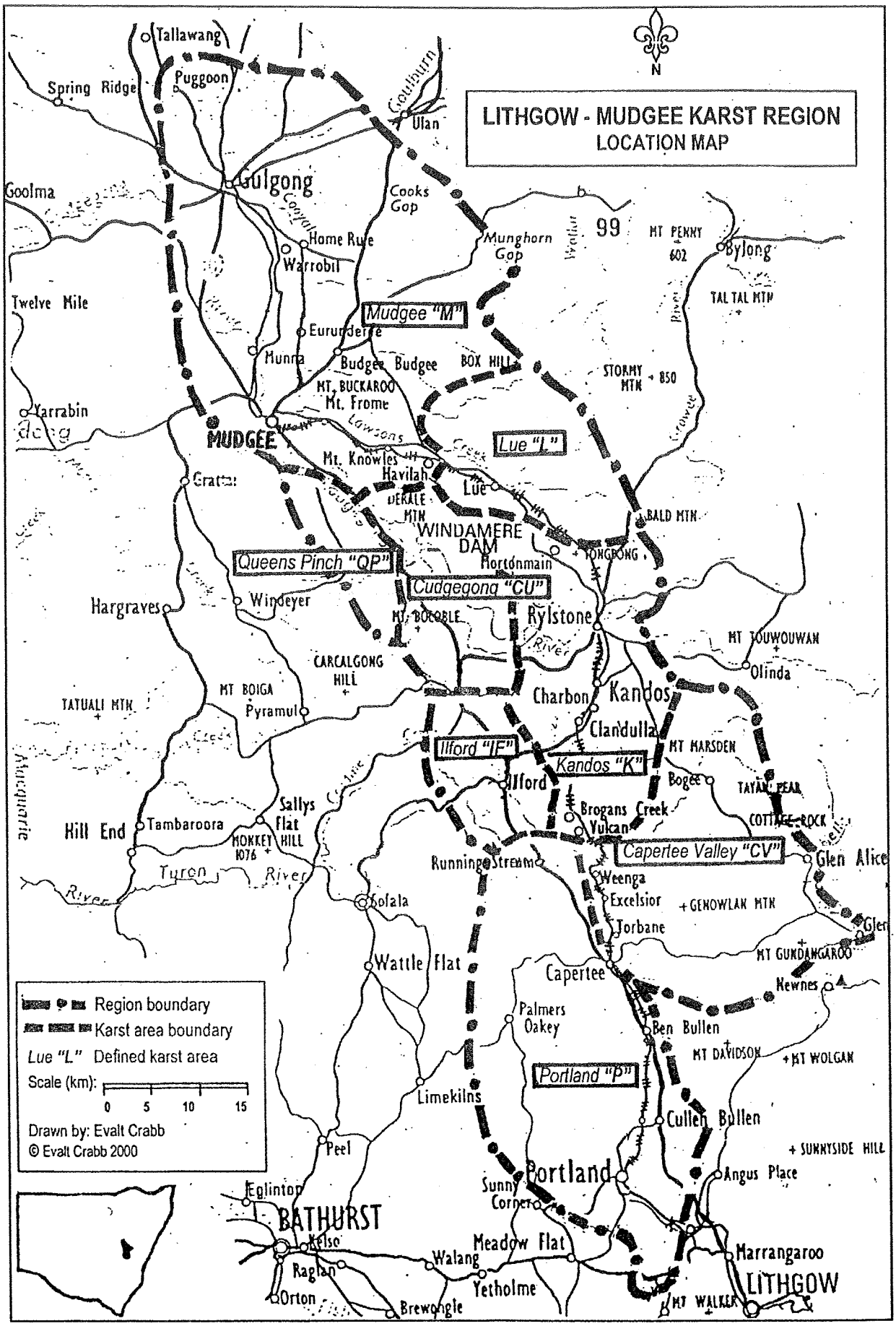
Interest in the Mudgee area started in May 1963 as a result of a radio interview with a Mrs Archer. She claimed there were many caves on her property at Buckaroo, 11km NE of Mudgee. It was claimed that many farm implements were lost by falling into the caves, children had been lost in them, the longest was at least 1½ miles long. Contact with the radio station revealed Mrs Archer's address and a trip was organised for the long weekend in June 1963.

There was much local interest, particularly from the local Tourist Development Association. The Mudgee Guardian, then a broadsheet, carried a two-page report on our presence there supporting local endeavours. There were vivid descriptions of our campsite - anyone remember the old orange Japara tents?

Many valuable local contacts were made, the most significant being Mr Lance Tubnor. His company conducted almost all of the limestone quarrying in the region, whether for lime, cement, flux or road base. He was most friendly and introduced us to many local landowners who had deposits of limestone, dolomite or marble on their properties.

His son John offered practical help with his blasting skills, 'dissolving' many a passage restriction without leaving a trace of his action.

There was much concentration on "Buckaroo" during 1963 and into 1964, but trips became sporadic. Bigger, more interesting caves were being found elsewhere. It was mainly Blayne Pearcey, Evalt and Joan Crabb who continued to visit the area. By 1965 they had visited every known or rumoured cave and almost every limestone deposit currently known in the Mudgee, Queens Pinch and Cudgegong areas.

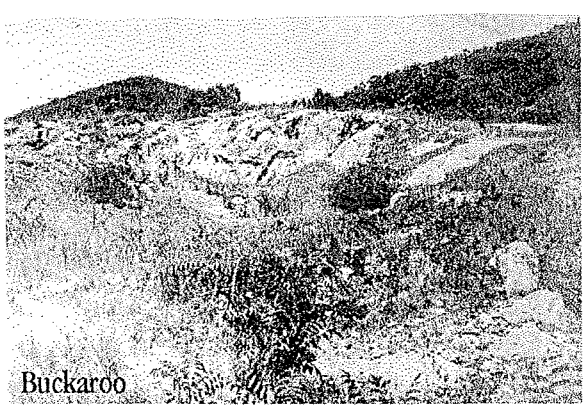

LITHGOW - MUDGEE KARST REGION
LOCATION MAP
N
Tallawang
Puggoon
Spring Ridge
Coolaburn
Ulan
Goolma
Gulgong
Cooks Gap
Munghorn Gap
Home Rule
Warrobil
99
MT PENNY 602
Bylong
TAL TAL MTN
Twelve Mile
Mudgee "M"
Eurunderee
Munna
Budgee Budgee
BOX HILL
STORMY MTN + 850
MT. BUCKAROO
Mt. Frome
Yarrabin
MUDGEE
Lawsons
Lue "L"
Mt. Knowles
Havilah
Lue
Gulgong
DERALE MTN
BALD MTN
WINDAMERE DAM
Hortonmain
TONGBONG
Queens Pinch "QP"
Cudgegong "CU"
Hargraves
Windeyer
MT BOOBLE
Rylstone
River
MT TOUWOUWAN
Olinda
CARCALGONG HILL
MT BOIGA
TATUALI MTN
Pyramul
Charbon
Kandos
Clandulla
Ilford "IE"
Kandos "K"
MT MARSDEN
Ilford
Bogee
TAYAN PEAK
Sallys Flat
Brogans Creek
Vulcan
COTTAGE ROCK
Hill End
Tambaroora
HONKEY HILL 1076
Capertee Valley "CV"
Glen Alice
Running Stream
Tyren River
Weenga
Excelsior
+GENOWLAN MTN
Sofala
Torbane
Glen
MT GUNDANGAROO
Wattle Flat
Capertee
Newnes
Palmers Oakey
Ben Bullen
MT DAVIDSON
+MT WOLGAN
Portland "P"
Limekilns
Cullen Bullen
+SUNNYSIDE HILL
Peel
Portland
Angus Place
Sunny Corner
Eglinton
BATHURST
Kelso
Meadow Flat
Marrangaroo
Walang
Raglan
Yetholme
LITHGOW
Orton
Brewongle
MT WALKER
Region boundary
Karst area boundary
Lue "L" Defined karst area
Scale (km): 0 5 10 15
Drawn by: Evalt Crabb
© Evalt Crabb 2000

Interest in the Mudgee area developed further in the period between 1977 and 1990, largely based on hospitality at Mudgee Wines (sold Dec. 2000). During this period, apart from many personal and group observations, it was possible to draw on the knowledge and observations of many long-standing local people. There were valuable contributions towards filling in missing jigsaw pieces. Sadly few of these friends remain. Their knowledge of groundwater characteristics and peculiarities over countless seasons served to arouse curiosity, leading to quite intense observations of groundwater behaviour.

Later, during NHT field trips during 1999-2000, much of the earlier conjecture firmed into opinions. Even now there are still some gaps and perhaps there are still opportunities to find significant features.

Caves of the Mudgee area.

There are only two locations in the defined Mudgee Area where caves existed. The main one is at Buckaroo (por. 102,103,109 and 110, Parish Bumberra, County Phillip). Here, all caves were in one rounded hill. Quarrying had taken place about a century ago, and then a little later, into one side of the hill but not down cut below plain level. After abandonment of the quarry a horseshoe shaped hill remained.



Buckaroo

It is likely that the quarrying exposed two caves, one with two entrances. Both led to water. Other negotiable shafts were excavated near the hilltop, all of which descended to slowly running water. Of two dolines down the slope from the quarry, one descended about 13m, again to running water. Tight cave entrances were found in minor dolines a few hundred metres to the south of the quarry and 15-20m higher, with fluted walls.

The longest cave at Buckaroo was not at least 1½ miles, but about 18 metres.

The other cave(s) in the Mudgee area was at the south-western corner of Mt Frome, acting as a stream capture on that side of the mountain and possibly had a resurgence to the Cudgegong River at Rocky Waterholes. A sunken quarry, later to be a rubbish tip, cut across its downstream route and enabled pollution of the river from the tip's putrescible waste. It was regarded as two caves because there was and impenetrable section directly under the Rocky Waterholes Road through which there was free visual and aural communication.

On a trip in August 1999 (E. Crabb, P. Dykes, C. Dunne) it was noted that due to extensive landform modification and road enhancement the cave(s) no longer existed.

Later, in September 2000, it was noted (E. & J. Crabb) that the hill containing the quarry and caves at Buckaroo no longer existed.

There are no other known caves in the defined Mudgee Area.

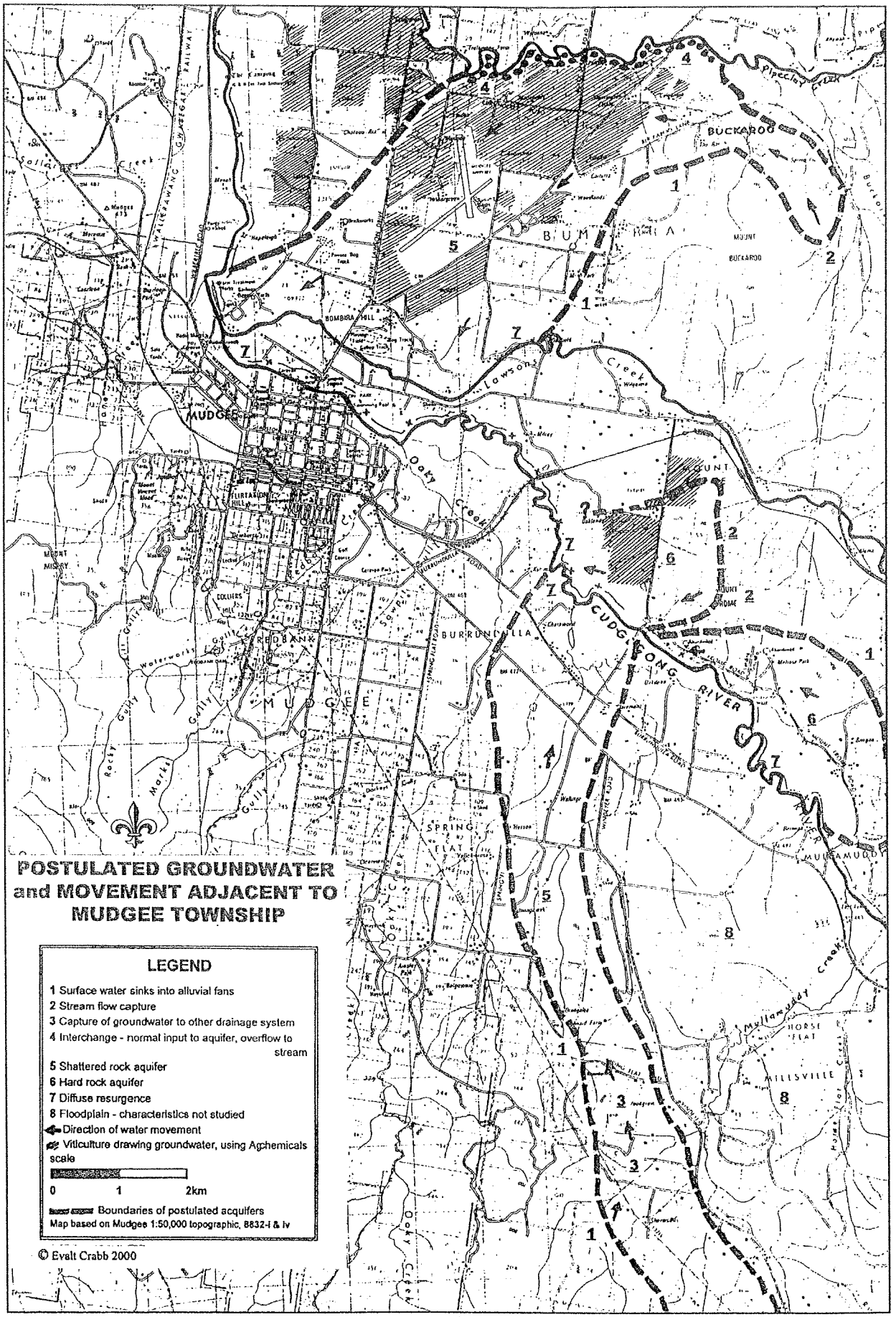
Groundwater

From the earliest days of HCGs visits to the area, there has been a fascination with groundwater behaviour and use. The earliest observation was that in the encompassed area shown on Map 2 there was never any surface run-off except on road verges yet both Lawson's Creek and the Cudgegong River were prone to flooding.

After a week of heavy rain, Blayne Pearcey noted quite a resurgence of water along Pipeclay Creek despite the absence of run-off. This suggested all water was absorbed into an aquifer, with Pipeclay Creek serving as an overflow for discharge. The existence of an aquifer was increasingly confirmed by local knowledge gained from sinking wells and bores. Groundwater was available - in one notable example aerial irrigation could be observed on a property even in the driest spells amounting to a stated 3-5 megalitres per 24 hours. Bore drilling on the obvious floodplain between Pipeclay Creek and Lawson's Creek indicated underlying fragmented rock, mainly limestone/dolomite, with some gravel and some red clay fill.

Interest extended to south of the town; gradually evidence of a similar aquifer was identified in three succinct areas. Of concern was the knowledge that the Mudgee township water supply was drawn from the ground and filtered. One report indicated high levels of aluminium hydroxide being used as a flocculent.

Where viticulture had previously been non-irrigated, the past decade has seen major changes. Instead of the traditional 3m vine spacing, this is now (usually) 1.2m. To enable this, full drip irrigation is used drawing on groundwater (ie the aquifers). A wide range of fungicides, pesticides and fertilizer are metered into the irrigation system with all residuals


POSTULATED GROUNDWATER and MOVEMENT ADJACENT TO MUDGEE TOWNSHIP
LEGEND
1 Surface water sinks into alluvial fans
2 Stream flow capture
3 Capture of groundwater to other drainage system
4 Interchange - normal input to aquifer, overflow to stream
5 Shattered rock aquifer
6 Hard rock aquifer
7 Diffuse resurgence
8 Floodplain - characteristics not studied
Direction of water movement
Viticulture drawing groundwater, using Agchemicals
scale
0 1 2km
Boundaries of postulated acquifers
Map based on Mudgee 1:50,000 topographic, 8832-I & IV
© Evalt Crabb 2000
MUDGEE
BUCKAROO
BUMBIRA
BURRUNDULLA
SPRING FLAT
HORSE FLAT
MILLSVILLE
CUDGEGONG RIVER
Lawsons Creek
Oaky Creek
Pipeclay Creek
Mullamuddy Creek

re-entering the groundwater and eventually moving downstream. It should be noted that native flora is not tolerant of such a chemical regime (only roadside vegetation remains) and little is known about the effects of this regime via human or other fauna usage.

Of the Future

There are still some possible speleological investigations in the Mudgee area.

- There had been reports from the 1870s of gold shafts breaking through into limestone caverns in the Gulgong area. Geologically possible though historically perhaps exaggerated. Very little evidence remains of the location of such excavations and current land use (urban) might preclude investigation.
- Although much limestone is reported on both sides of the road from Havilah to Buckaroo (south-eastern side of Mt Buckaroo) access has not been easy nor easily defined. There has been one known speleo trip along that route; P. Dykes mid 1980s.
- On both the northern and western faces of Mt Frome there appear to be drainage gullies from the peak, until seemingly they are captured well before the bottom. Both Julie Bauer and John Eastwood (pers. comm.) have indicated that there are no caves there as the rock type is unsuitable for karst development. More detail would be appreciated for a permanent record.
- A curiosity is a large water-filled quarry at Mt Knowles. This apparently flooded overnight many years ago (P.J. Saunders, Dubbo, pers. comm.) and the quarrying equipment remains at a depth of about 25m, irrecoverable. This suggests a sudden hydrological breach.
- In the late 1980s I was asked, through an intermediary, if I would explore a deep cave stated to be south of Mudgee. The originator was a Mudgee Shire councillor. The verticality was beyond the councillor's competence although he had descended 10m. Access was very difficult. Through private property to a locked unfriendly property; through that or maybe a route around it; onto private property where permission had been given. High above river level but not at the top of the range. Four-wheel drive needed.

The councillor suffered a massive heart attack three weeks before an arranged trip and no more info is available.

From what little info was conveyed, the most likely location is east of Apple Tree Flat/Broombee, near the northern end of the range commencing about 15km south of Mudgee. I had the impression that access was from the northern side, perhaps from near Mt Knowles.
Geologically, this is feasible.

Documentation.

There is conflict between various 'authoritive' publications. The *Speleo Handbook 1968* was incomplete at that time; *The Australian Karst Index 1985* partly ignores the numbering used by Pearcey in 1963-4, being over-ridden by Dykes entries. Because the original numbering should have prior rights, this system will be maintained in *Caves and Karst of the Lithgow Mudgee Region.* There is still much to be done and much research to be accomplished before this valuable publication can see the light of day. Hopefully HCG members will be inspired to concentrate on the Lithgow/Mudgee Region in the coming year.

The Voucher Winning Story!!

Grace Matts & Evalt Crabb

A story writing competition was held as part of the entertainment at the 2001 Caver's Dinner. With the wealth of writing talent in our club, HCG managed to take out first prize and win a $50 voucher from Mountain Equipment. The story ws read out by Julie Bauer at the dinner. Well done everyone!

In the beginning there was Genesis and Genesis was the cave. And the cave called Genesis begat Evalt who proceeded on the path of truth. But Evalt lost his way finishing up in Australia. Herein lies the first lesson.

Then Evalt sought the path of truth again and fell over a Hairy Bunyip. The Hairy Bunyip sought shelter in his cave, the Hairy Bunyip Cave, and was pursued by Evalt who believed that at last he had found the path of truth again.

The Hairy Bunyip led Evalt across the path of truth to a den of politicians. They were seeking the political truth. Herein lies the second lesson.

Over time, Evalt metamorphosed in to Gollum, the slimy politician expelling shit from the insurance morass. Ever greedy, Gollum used his mobile phone as a detector to seek the power and truth of the ring. Too late! Too late! He fell into the Sewer Cave.Genesis was crap anyway and wasn't a lesson a all.

Nangwarry

23-24 June 2001

Kevin Coller

Present: Julie Bauer, (trip organiser) Peter Bauer, Joe Sydney, Bruce & Lynda Waddington, and Kevin Coller

Joe arrived at the Bauer's place at 6.30pm on Friday night and indulged in some KFC for dinner over some earnest conversation about caves.

The early morning was icy with a keen southerly shaking the trees, but the sunrise was something special. Pink, gold and orange clouds were spread across a turquoise sky in wisps and ribbons. I arrived Peter and Julie's at 6.55am after Peter gave one final check of the gear we departed at 7.30. Bruce and Lynda joined our convoy somewhere near Foxground. Joe couldn't resist the golden arches and stopped for a McBreakfast at North Nowra but by 8.30 we had assembled for inspection at the park (now without a plane) in Klandor Street. With all present and accounted for Joe led the way to Nangwarry.

With roads not clearly marked and with memories made vague by time, there was confusion and cartographic consultation, but the right path was eventually discovered. The track was rough and dusty and had large mounds to prevent speeding. Joe and I had Subaru's but the two Fords were forced to be cautious. The saplings got closer together as we progressed and the rocks on the track larger.

On a hill overlooking our intended campsite we waited as Joe and Julie scouted ahead. When satisfied Joe signaled for us to follow. It was difficult for Peter's big Falcon to negotiate the narrow, uneven track, but what really stumped him was a well hidden hole with a tree chainsawed to ground level alongside it. The body of the car came to rest on the stump leaving the left rear wheel spinning freely. We all pitched in. Myself, Joe and Peter filled the hole with rocks while Bruce jacked up the car. Eventually we packed under the wheel, ever under the all seeing eye of Joe's video recorder, which was being operated by Julie, the car was finally free and mobile by 9.35.

On arrival at the campsite, maps were produced and car bonnets became conference tables. The GPS reading was 7598 3870 and the grid reference 759 385 on the 1:25,000 Berry topo map. As we stood overlooking Humbug Reach the GPS told us we were standing in the middle of the Shoalhaven. As we hadn't even gotten wet feet we figured that the GPS was out by about 200m.

After a bit of this adult stuff, I wandered off and breathed the cool clean air and watched the meandering Shoalhaven sparkling platinum as cycads swayed in the southerly. The site was on the northern shoulder of the rise and with the tree cover we had relative shelter from the wind. The best thing was that our camp was no further than 20 metres from the caves.

At about 10.15 we were rockhopping on clifftops and soon found *Kangaroo Cave*. Peter, Bruce, and I spent some time exploring the upper light and airy regions. Being fully trogged up, Peter and I went deeper into the dark zone where we found the bones of the cave's namesake. Unable to find a way on we rejoined the others. I entered another hole tagged N7 and followed more passage similar to that in *Kangaroo Cave*. These caves consist of high, narrow canyons decorated by clay which had washed over the walls and built up over time to form a scale pattern, but this is the full extent of decoration. The sandstone walls are sharp to the touch and wore holes in cotton overalls without a great deal of trouble. All the caves were dry and with a vigorous dusting overalls came relatively clean. There were several paths leading on through N7 but being alone I decided to take a steep climb up to a window in the cliff and exit to find the rest of the party.

Peter had gone into a hole tagged N2 and followed it to the exit point about 5 metres from *Spider Cave*. He had a quick look in *Spider Cave* commenting on the humidity, the spiders and the tree roots.

Peter Bauer in Spider Cave. Photo Julie Bauer

There was a bit of surface exploration in various directions before we adjourned for lunch. By then the sun shone pale yellow behind a screen of thin cloud. At first cold we had dressed in thermals and rugged up warm, but with the mornings exertions had been forced to accommodate the rise in body temperatures and strip down again.

After lunch Julie, Joe and Bruce trogged up and we went direct to *Spider Cave*. Climbing carefully past rock lilies and over dry mossy walls we entered the warm, acrid cave of spiders and tree roots. Just inside we found a number of wetas. There was a strange brown fungus which clung to the walls in thin shreds. The upper ceiling was home to huntsmen spiders and large brown moths with eyes reflecting red in the glow of our subterranean lanterns. Someone had commented they were 'Vampyr moths.' These moths had been seen in other caves as well and on more than one occasion had given us a bit of a shock when fluttering past our lights. More a rut than a cave, *Spider Cave* is about 20 metres long, 3 metres deep and about 1 metre wide for the most part. There didn't seem to be any passages leading anywhere.

Fooncey Weta was next. Just inside the opening was a tight squeeze and then narrow passage similar to elsewhere. We followed it to a junction with a wide passage opening onto the cliff-side. Before going that way though, we followed the narrow path and descended still lower. We slid down the narrow abrasive walls and in to the passage. This led into a tight section which got still tighter and came to a bigger chamber that terminated. Climbing the walls out of there was difficult and we emerged tired to sit outside in an opening that over-looked the river, where we relaxed for a while.

We entered N7 and I discovered it much harder to climb down than it had been to climb up. By the time I reached the bottom and started to follow the path that I had neglected to follow previously, Peter could be heard returning. This passage led to the narrow section we had just climbed out of and we were not keen to go down there again. Going south we encountered Bruce and Joe who had opted for the southern entrance.

As there are no tags marked on the cave maps and many caves have more than one entrance it became very confusing so throughout the day we had collected cave entrance data with the GPS.

TAG	GPS READING	ALTITUDE	COMMENTS
XN7	7596 3872	52m	
N5	7593 3872	52m	rock lillies
XN3	7593 3872	-	top ent. to N5
XN2	7598 3873	51m	
no tag	7606 3872	38m	joins N2
N10	7608 3872	?	

Back on the surface we gathered around maps in the fading sun and began to speculate on how we missed the "Root Chamber.' We all scouted the surface for caves that we may have missed but it appears that cave development is controlled by geological faulting and we have covered the extent of the "karst field". That only left one possible lead. It could be reasonably assumed that the Root Chamber had been a continuation of the large passage at the bottom of that horrible little canyon which was such a mongrel to climb out of. Joe was keen to return but others were less keen, still we pushed ourselves in the name of exploration.

At 4pm it was time for Bruce and Lynda to go home leaving us to search for the elusive Root Chamber on our own.

With heavy hearts and tired muscles we returned the way we came. At the bottom we discovered nothing more than last time. The climb out was no easier than last time either. Convinced the chamber had to be there somewhere, Joe dragged Peter and myself back into *Fooncey Weta* right to the end where we examined it minute detail. Nothing. Determined to find it Joe returned to the entrance of 112. Peter had had enough and refused to renegotiate the rift. He was quite satisfied to follow us from above ground. Peter wasn't going to be budged so Joe then dragged me back into *Spider Cave*, increasingly convinced that the 'Root Chamber' was just beyond a tight squeeze in a lower part of the cave which we had neglected to follow earlier. Joe was too large to enter which meant I was too. This was pleasing. This meant it was a job for Peter Bauer on the morrow. This point marked the end of the day's caving and we joined Peter and Julie for a cuppa.

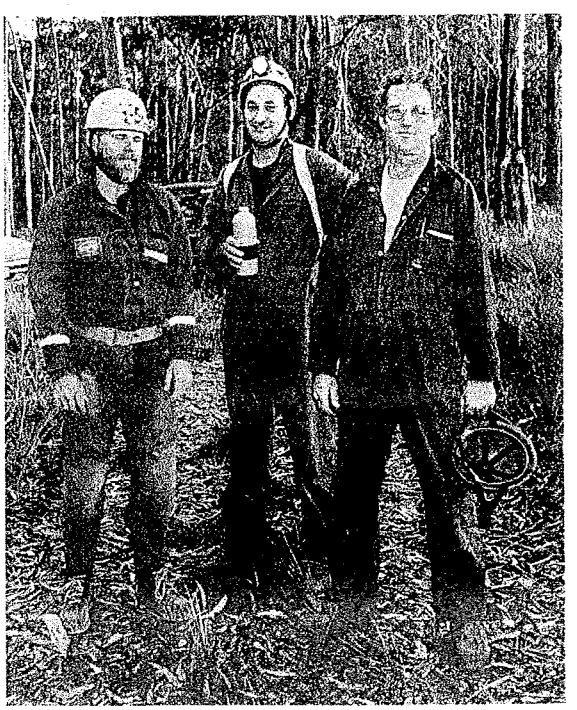
While Joe was cleaning up and putting on clean clothes for his trip home, I wandered down to the cliffs where the Shoalhaven was reflecting the most incredible sunset from it's now stilled waters. The wind had died and stars began to appear. Before Joe left (at 5.30) he extracted solemn vows from Peter regarding Sunday's activities.

So, at 9am in the morning Peter and I explored the lead in *Spider Cave*. This proved disappointing as Peter couldn't even get his head through the hole. Joe seemed to think that beyond was a widening chamber about 20 metres deep; Peter however, thought that it probably didn't widen much at all, but seeing how he couldn't fit anyway the question remains unanswered. We did see a large weta - 2" long from head to toe not including the antenae. Julie had ventured into the main passage to take photos of us and spent some time photographing the weta on the way out. See photo.

While dressed for caving Peter and I went over to *Kangaroo Cave* to check out the chambers we ad previously missed. Julie made a start on packing up camp. Scaling the cliff face was a bit more difficult than I would have liked but the entrance was a wide tunnel leading to a wide canyon which was not safe to free climb. Having no climbing gear we didn't attempt it. I had really been hoping we would come out the nice safe exit at the top of the cliffs but that was not to be. Instead it was the hairy climb over loose boulders yet we managed it without incident and survived to tell the tale.

By late in the morning we were heading out of Nangwarry. Peter being very careful not to end up in the hole he had discovered on the way in. To ensure that we don't get lost on our next visit, Julie and Peter clocked distances and wrote a description of the route. We stopped at McDonnalds for coffee and to finish off a pleasant weekend we spent the afternoon walking along a very beautiful stretch of rainforest that follows Bombaderry Creek.

(Moreon this in Calcite 42 - Ed).



Above: Kevin exits Fooncey Weta Cave.

Above Right: Joe grunts through the Fooncey Weta entrance.

Right: Peter, Joe and Kevin after surface exploration.

Below: L-R: Lynda, Peter, Bruce, Kevin and Joe. Lunch... or is it dinner?

Photos by Julie Bauer.

Seeking the Sun

July 2001

Evalt & Joan Crabb

July is becoming a traditional getting away from Sydney winter month.

First stop relevant to caves on the way to warmth was with Noel Sands and family, some kilometres north of Rockhampton, Qld. Peter Berrill dropped by for a chat - much appreciated - and filled us with envy with his descriptions of the Mitchell Palmer area. 4WD, heat, The Wet, biting things, razor-sharp limestone. Maybe one day... but it's far, far north on the western side of Cape York.

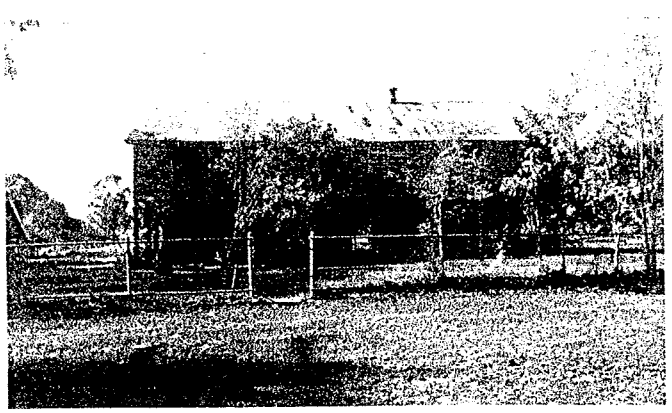
On to Chartres Towers and Undara Lava Tubes. The tubes are immense - in places 25m high. Where once it may have been continuous, now many sections have collapsed allowing the remainder to be described as separate caves for tourist purposes.

Noticing many bats (Horseshoes, I think) I queried of the ranger whether they had a torpid period in this semi-tropical zone.

"Oh yes, they hibernate every winter! Watch!" Whereupon he beat the wall with a stick, agitating a few dozen bats. If this was a daily spectacle the bats would surely run out of stored energy by mid-winter.

On to Chillagoe, arriving safely despite the thunderous road-trains transporting large cows. Well before reaching Chillagoe the spectacular karst towers came into view, and continued for many, many kilometres.

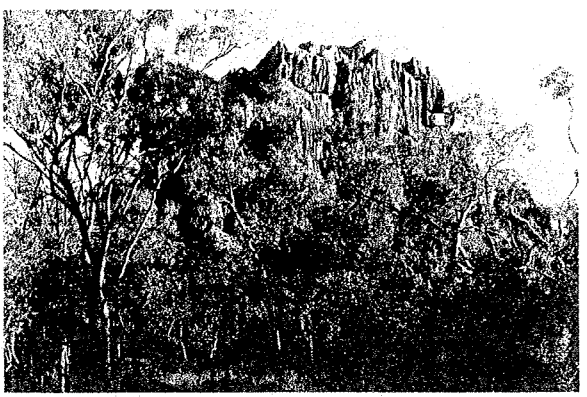
Here, caves have formed within the base of the towers but there has not been any solution effect below plain level. There appears to be almost unlimited opportunities for caving. The Chillagoe Caving Club has its own cottage at the end of the main street. A most fascinating place. Easy to get around - the population is... well, not very many.



Since the many islands in Torres Strait are basalt, there aren't any caves there.

Back to Rockhampton and Olsen's Caves or Limestone Ridge or whatever it's called now. It was probably very interesting once but we could find no inspiration in a cave chamber equipped with an organ - or was it piped music? - and now used for wedding receptions and the like. Each to their own taste, I guess. That hasn't happened to the nearby Mt Etna - still a magnificent place.

Yes, we'd go to Queensland again - particularly the north bit.



Top &Above: Tower karst in the Chillagoe area.

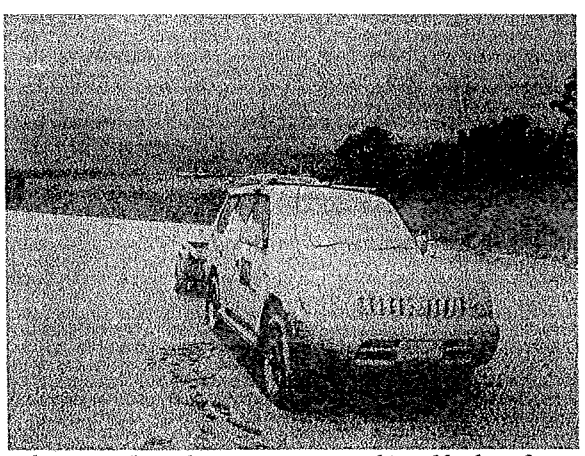
Left: Cavers cottage (old school house)

NavShield 2001

Julie & Peter Bauer

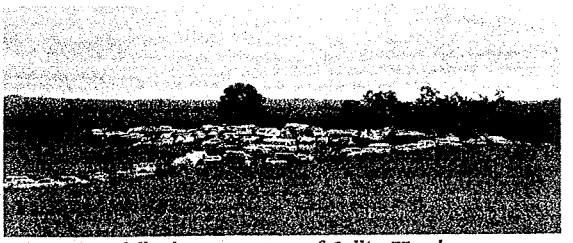
The VRA Wilderness Navigation Exercise for 2001 was held at Arkstone near Oberon. Every year hundreds of rogainers, firefighters, SES, police, VRA and ocasionally cavers gather to test their navigation skills - no you can't use a GPS, it's good old fashioned map and compass stuff. There is a one day and a two day event. For the last three years at least Joe Sydney has entered a team as Cave Rescue. Besides Joe there is a fair representation by HCG club members over the years: Joe Sydney, Peter Bauer, Jason Moule and Julie Bauer and Kevin Coller have gone along as "support crew". Last year the NavShield was held at Dunn's Creek, in pagoda country out Rhylstone way and the year before that in Wingello State Forest. The two previous years Joe's team brought home a trophy but this year Mark Bonwick's team blitzed the course to win the VRA category.

Organisers were there days before putting in the last of the check points and setting up base camp. To say that it was cold is a mild understatement. It was literally freezing as shown by the scene below, a 50cm blanket of snow had gently fallen over Arkstone during the night.



Arkstone early Friday morning cavered in a blanket of snow. Photo courtesy of Collin Wood.

Travelling together, Kevin and Peter left on Friday afternoon. The opted for the route via Goulburn and Taralga, stopping in Taralga for hamburgers. It was dark when they arrived at base camp but could still make out remnants of snow in paddocks through the gloom. Of their team, Kevin and Peter arrived first. Of course the best way to kill time on a frosty night in the open is to gather around a fire and listen to the incredible tales of adventure and occasionally mishap. Joe arrived late at around 11pm and as everyone was tired and cold they went to bed.



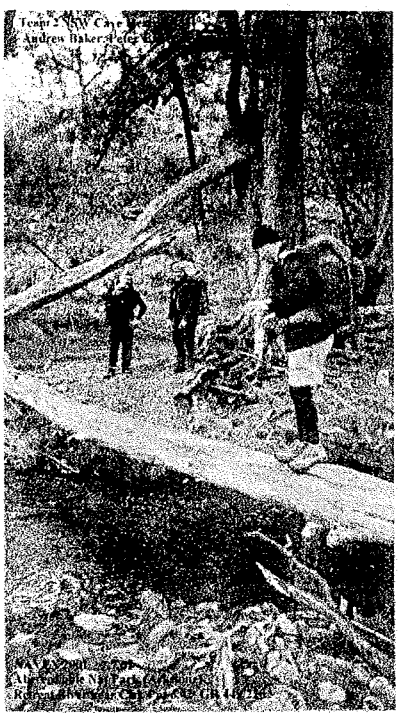
Base camp full. Photo courtesy of Collin Wood

The following morning the team awoke to a sea of cars and tents. Days before the paddocks had been occupied by sheep happily grazing in the peaceful country quite, now these locals had been somewhat displaced. Joe Sydney, Peter Bauer, Andrew Baker and Peter Brady quickly plotted their course and decided on the best strategy for collecting the most points without killing themselves. Peter had the flu and Joe was suffering from poor health as well. Just as they were about to start on their two day quest they discovered Megan and Alan Pryke. In the sea of writhing humanity they had completely missed each other and as a result hadn't received all of the information vital to the event. Their team had no time to plot their course and quickly copied the info from Joe's map. Unfortunately one point had been copied incorrectly and this cost them not only vital points but first prize. Finally the whistle sounded and participants fled towards their first check point. Base camp became deserted. This was Kevin's first Navex so he was happy just to go along and suss it out and hung around base camp watching and learning.

In comparison to last years course through the pagodas, the Arkstone terrain was far more kind. There were a few steep hilly bits but overall the elevation wasn't too high and there were quite a few roads to make the walking easier. As the vegetation is open woodland there was very little scrub bashing to be done and some areas had been recently burnt out leaving a soft new undergrowth.

Joe's team in action. Photo courtesy of Joe Sydney.

Peter's amazing eye for locating check points proved useful as always. After a long day the team wandered down a dry creek bed in the dark to check point Bravo - one of the two check points with a radio. All teams on the two day event must check in at a radio check point as a safety measure. Check point Bravo was a bustling camp away from camp but as there was no communal fire tired participants cooked their dinner and kept pretty



Mark Bonwicks team warded 1st in the VRA class. Photo J. Sdney

Meagan & Alan Pryke's team 2nd in the 1 day VRA class. Photo courtesy of Collin Wood.

much to themselves. It was late when Joe's team arrived at Bravo so they bedded down straight after dinner. If you've ever been away with Joe on a camp out you must. You'll be amazed at the elaborate snacks that emerge from his pack.

The next morning Joe's team headed out of Bravo via the roads collecting check points. Peter was beginning to feel that he'd conquered the flu and picked up somewhat from the day before when everything seemed like a slog. The team didn't have that killer instinct this year though and were fairly laid back, just happy to complete the course within the time limit. They did arrive back at base camp with plenty of time to spare. Kevin was happy to see them after spending a relatively solitary weekend around the base camp fire. Although base camp usually comes to life again on Saturday night with the return of the 1 day event participants.

Sunday afternoon is presentation time. The 1 day event was won by the Mudgee Bushwalkers with 700 points, NSW Cave Rescue (Pryke team) with 650 points and 3rd, Blue Moutains SES with 600 points. The winners of the 2 day event and the NavSheild were the Newcastle Bushwalkers with 1920 points, they were also first in the Bushwalkers class. 2nd in the NavShield and first in the RFS class was kangaroo Valley RFS with 1850 points. 3rd in the NavShield was the National Parks Blue Mountains team with 1730 points. Mark Bonwick's team came first in the VRA class with 1280 points. And finally Joe's team unfortunately didn't gain a place with their 600 points but a great time was had by all.

Into the sunset. Most left a few stayed and enjoyed the marvellous display of light and cloud. Eventually the paddocks had to be returned ot the sheep and particpants returned to the city with the memories and the anticipation of Navex 2002. Photo courtesy of Collin Wood.

St Patricks Lake, B4-5 Extension Bungonia - 11-12/08/01

Julie & Peter Bauer

Present: Peter & Julie Bauer, David & Michael Rothery, Joe Sydney, Geoff McDonnell, Matt Fisher, Angus Macoun, Andrew Baker

In an attempt to follow a lead at St Patricks Lake in the B4-5 Extension, Peter Bauer has led a few trips to explore the mysterious aven. The first trip, which was held in May, was reported in Calcite 40. This report concludes the second trip. The final trip for 2001 was held in September (see trip report in Calcite 42).

Joe arrived at Bungonia at 9.30pm and promptly nailed up the sign at the entrance to the campsite (red dancing girls and all!). The Bauers arrived 10 minutes later. After tents were erected, Joe broke out the McWilliams Royal Reserve and some cheese and crackers to wash it down. Geoff and Matt arrived before we'd finished our first glass of royal red. We soon had Geoff oohing and arrhing over Calcite 40 and he couldn't resist buying a copy for himself. Half of him is now a member of HCG. We finally retired at 11.30pm.

Bodies began emerging from tents around 7am. While Geoff munched on pancakes and others partook in Joe's crumpets and maple syrup, Dave performed the pre caving ritual of preparing his CO_2 scrubber. Soon other members of the expedition began preparing gear, littering the ground with so much equipment it looked like market day and a rescue expo. Joe with his trusty video camera began taping footage. With Calcite in mind Julie gave Geoff a roll of 800 ASA film to use on the trip. This proved to be very successful.

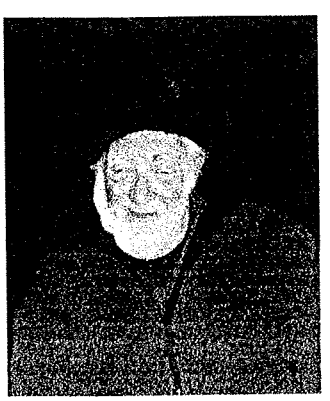
It was 10am before the team reached the cave. Although a lot of gear had been dispensed with compared to the first trip the cave packs were still heavy. The CO_2 was constant at about 4% and gratefully lower than it was in May. The entire team made it down to the Baby Snake this time but this again proved to be an obstacle to Joe and David. Joe tried every which way to negotiate the rift to no avail. Fearing he'd crack ribs if he continued to push it he handed the video recorder to Angus who leisurely walked through the Baby Snake taking footage. By this stage those in front had continued on and Angus was alone on the sump side of Baby Snake. He didn't seem to mind until he reached The Swim, completely unprepared for this both mentally and physically he returned and met back up with Joe and David who where slowly making their way out filming on the way.

Peter, Geoff, Matt, Michael and Andrew finally reached the sump. As the CO_2 was manageable they remained in the terminal chamber for 3 hours. After numerous unsuccessful attempts to climb and negotiate the chossy rock to the top of the aven they decided to head out. The cave had defeated them again.

On the surface Julie had spent a leisurely day photographing the wildlife around the campsite and engaging in light conversation with Evalt and Joan. Late in the afternoon Julie and Joan drove out of the park and collected a wagon full of wood for a fire. The cavers would need it. When 8.30pm came and went concern began to grow for the team that had reached the sump. It was some hours later that the last of the cavers returned to camp tired and wet. The usual banter around a nice warm fire was enjoyed by all and Geoff spiced up the conversation with his enthusiastic report of the trip. Knowing that everyone was safe and accounted for, Evalt and Joan decided to return home.

As it usually is after a St Pats trip, Sunday morning was slow. People emerged from tents as late as 9.30am. Andrew seemed keen to tackle another cave but motivating anyone else was proving to be difficult. After a hearty breakfast and copious amounts of caffeine some people began to pick up on Andrew's enthusiasm. Eventually a video trip through B4-5 was decided on. Peter, Joe and Andrew were the only takers. Dave retired to his tent for a mid morning siesta after the cavers left the camp. Others left early and headed back to Sydney to other commitments leaving Julie and Michael to guard the camp and keep David from a completely restful sleep. What fun would it be if they didn't shake his tent now and then?

Early afternoon the B4-5 video crew returned happy with their results. Julie had packed away most of their gear for a quick get away. After a quick bite to eat everyone finally departed but not before the next trip was planned.



Evalt waits for all the cavers to return safely before heading home.

The August 2001 St Pats crew. L-R back row: David Rothery, Andrew Baker, Joe Sydney, Matt Fisher, Evalt Crabb and Joan Crabb L-R front row: Michael Rothery, Peter Bauer, Geoff McDonnell and Angus Macoun. Photo by Julie Bauer.

Below: Mat Fisher emerges from the baby Snake. Photo by Geoff McDonnell.

Peter Bauer attempts to negotiate the crumbly climb into the unknown. Photo Geoff mcDonnell.