

# SPELEO SPIEL

Newsletter of the Tasmanian Caverneering Club

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*PRESIDENT:*

Garth Cornelius 310 Back River Road, Magra, Tasmania, 7140 **Ph:** 61 2126

*SECRETARY:*

Trevor Wailes 214 Summerleas Road, Kingston, Tasmania, 7050 **Ph:** 29 1382

*TREASURER:*

Nigel Williams 1/98 Arthur Street, West Hobart, Tasmania, 7050 **Ph:** 34 9403

*QUATERMASTER:*

Trevor Wailes 214 Summerleas Road, Kingston, Tasmania, 7050 **Ph:** 29 1382

*EDITOR/TYPIST:*

Garth Cornelius 310 Back River Road, Magra, Tasmania, 7140 **Ph:** 61 2126

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**\* \* \* FROM THE EDITORS DESK... \* \* \***

Bet you didn't count on the next Spiel coming out so soon, did you !!

This issue follows on in the same vein as the last, that is, we have a special article that has taken up most of the room...

Arthur Clarke has written about his research so far on a little known, but extremely important area of Speleology : the study of Palaeokarst. Arthur's article details his investigations into palaeokarst deposits at Ida Bay, and makes for some *very* interesting reading.

Some may argue that this article is a tad too technical for a rag such as this, but stiff - we are privileged to be able to publish what is probably the first specific article on palaeokarst in Tasmania, and certainly the first on palaeokarst at Ida Bay. Many thanks to Arthur for his contribution (hopefully NOT the last).

I have also managed to squeeze in Dean's report on the recent SAREX exercise, and I promise that all of the articles and snippets that people have contributed so far will see the light of day very, very soon. Thank you to all of you (you know who you are), and please keep them coming !!

Garth Cornelius, Editor.

**\* \* \* TRIP REPORTS \* \* \*****SAREX SYNOPSIS :**

On the weekend of the 11th and 12th of March 1995, a party of 2 pretend cavers (mainlanders of course; Tasmanian cavers would never do such a thing) pretended to go caving in the Growling Swallet system with the pretend plan of pretending to dive the sump in Black River through into the bottom of Pendant Pot.

The pretend cavers only had 1 pretend air tank and the pretend plan was for 1 pretend person to dive through and the second pretend person would then pretend to drag the air tank back through the sump on a line so he (or she) could pretend to dive through as well. Unfortunately they had pretend problems pretending to drag the air tank back so one pretend person was stuck at the bottom of Pendant Pot with no way of diving back through to Black River. With all this pretend information on hand, SAREX 95 sprung into action. The pretend cavers had only said they were going into Growling Swallet so we had to pretend that we had no way of knowing where they were in the system so this is how it all unfolded :-

4 separate parties were sent into the cave with different strategies to try and find and rescue the 2 pretend cavers. 3 parties went in the main entrance with No 1. party

**!! ANNUAL SUBS ARE NOW DUE !!**

going down the main streamway and turning off into New Feeling to cover all areas around there. (although rumour has it that they couldn't even find New Feeling, let alone any hypothermic dying pretend cavers lost anywhere waiting for help!!!)

No 2. party went down the main streamway and up into Refuge Aven. Once there they phoned up to the surface at Slaughterhouse Pot via the phone line left in place after SAREX 94. After confirming that the phone line did indeed work, and ordering 2 large pepperoni's with mushrooms and capsicum, they continued through down into Trapdoor Streamway, running out a phone line behind them in case they wanted to order a garlic bread as well.

No 3. party went in through Slaughterhouse Pot leaving 1 person on the surface to man the phone line with the others doing the through trip and pulling the ropes down behind them. They arrived at Refuge Aven 5 minutes behind No 2. party and also phoned up to the surface to be told that the pretend cavers had not yet been found. They then proceeded on up into Destiny all the while on the lookout for pretend cavers.

No 4. party also went in the main entrance and down the streamway running a phone line through and checking some side passages for pretend cavers. Once into Refuge Aven they also phoned their position through and then sat around shivering and clattering teeth together while waiting for instructions from the surface. One of them was seen trying to use the phone to ring out to one of those 0055 Fantasy Sex calls but thankfully he couldn't get through (much to the relief of the others in the party who were getting a bit nervous at the way he was looking at them). By this stage No 2. party had run out of phone line in Trapdoor streamway so they left the phone there and continued on up into Necrosis.

No 3. party had continued on down the Destiny pitch and traveled to Black River. Once there it was cries of 'gosh' and 'crikey' as they then pretended to be surprised to find a pretend caver. They then pretended to be told what had happened to the other pretend caver who they then pretended was still waiting in the bottom of Pendant Pot presumably also shivering and clattering his (or her) pretend teeth together. No 3. party then pretended to start their way out of the cave pretending to take the pretend caver out with them. They stopped at Refuge Aven to phone the news to the surface about the other pretend caver. Unfortunately the phone had stopped working at this stage for some unknown reason so the message could not be relayed. (Hopefully this was only caused by bad connections where the wires connect onto the phone. We don't know the exact reason for the communication failure yet.)

The plan would then have been to send a party into Pendant Pot to rescue the other pretend caver but because of a lack of cavers turning up to SAREX 95 there was not enough people to perform the rescue so he (or she) will have to sit there and wait until next year. The other option is that we could just pretend that we did rescue him/her.

By about 1930 hours (7.30PM to normal people) everyone was out of the cave so we all pretended that there were a couple of pretend people thanking us for saving their lives and we all pretended to be modest and said "Oh it was nothing, we do it all the time. We pretend to save lives at least once a year." whereupon we all started fading

back into reality after such a hard days pretending and everyone compared notes on how things had really gone throughout the day.

Overall SAREX 95 was a success with everything going according to plan. (except for the Pendant Pot rescue.) The biggest complaint was the simple lack of cavers that had turned up to the exercise. This made it hard to get party leaders and people who knew Growling Swallet well enough. The police even questioned whether it was worth their while putting on this type of exercise with the poor turn-out of cavers, although they were pleased to see all the newer TCC members getting involved.

Something has to be done about the phone line that runs from Slaughterhouse Pot down into Refuge Aven to try and find out what is wrong with it. It would be good to try and get that done before the winter floods as it could save lives when it is needed in a real rescue...

A special thank you from all cavers to the Police S&R team for putting on SAREX 95, and thanks to all that turned up and made it a success. With a bit of luck we will only ever need these "pretend" exercises and never need to do the real thing.

Dean Morgan.

*Ed's Note: What do you think about mounting a mid-year (winter ??) exercise - just to keep in touch with the Police dudes and keep our/their skills up to date ? The exercise would not necessarily have to be in Growling.*

**\* \* \* SPECIAL FEATURE (AGAIN) \* \* \***

**SEARCHING FOR PALAEOKARST AT IDA BAY -  
IN SOUTHERN TASMANIA**

Arthur Clarke

EASTER WEEKEND - 1994:

This article should perhaps be better titled as "Searching for palaeokarst at Ida Bay ...and finding Garth Cornelius"! After being literally blown off the side of Hill One on Moonlight Ridge by horrific winds during a bushwalking trip to Mt. La Perouse, Emerson Clarke and I were leisurely strolling down from Moonlight Flats towards familiar limestone country ...with radio headphones on ...listening to Triple JJJ-FM.

We distinctly heard the sound of shouting voice(s) as we walked along the ridgeline saddle above Western Creek Swallet, past the track to Valley Entrance/ Exit Cave and the junction to cavers' access tracks on the southern side of Marble Hill. With earphones off, we waited for a moment, expecting to be overtaken by another group of bushwalkers, or perhaps some cavers.

**!! ANNUAL SUBS ARE NOW DUE !!**

No one appeared so we descended to the old (Blayneys) quarry on the western side of Marble Hill, to examine some lime-cemented gravel fills in a probable palaeokarst site.

Barely five minutes had elapsed, when Garth Cornelius arrived amidst a group of bushwalkers returning from the windswept Southern Ranges. More to the point perhaps, a bedraggled and weather-beaten looking Garth was tagging behind this other group as they crossed the quarry floor. Recognising Emerson and myself, Garth immediately asked if we had any water? I offered him a choice: a cold "tinny" of VB (beer) or water from a wine (riesling) flavoured bladder; he chose the latter !!

He told us he had just spent the night under the stars without a tent or camping gear, lost in unfamiliar territory in the Ida Bay karst on the south western side of Marble Hill. On the previous day, Garth had walked into the "potholes" area from the saddle behind Benders Quarry on the eastern side of Marble Hill to do a solitary "de-rig" trip in "*Pseudocheirus*" (IB-97) - a popularly visited cave with a spectacular entrance shaft, numerous skeletal remains, ancient cave deposits and an array of speleothems.

Following his circum-navigation of the karst on Marble Hill, Garth was given an introduction to the topic of palaeokarst during a brief period of recovery, rest and much-needed sustenance. With our mutual concern regarding the possibility of those who may be distressed or anxious by his overdue return, we left our study for another day. In exchange for a promise to write something for "*Speleo Spiel*", Garth helped us carry some fragments of palaeokarst fill as we walked out along the old Ida Bay tramway to the carpark at Benders Quarry road, prior to seeking out those that might be searching for him !!

#### PALAEOKARST - AN INTRODUCTION:

"Palaeokarst" literally means "old" or "fossil" karst ....cave forms or karst features that are remnant from a previous erosion, solution and/ or deposition cycle in past geological time, often dating back to several hundred million years ago. Palaeokarst is usually identified by the presence of ancient deposits, as lithified (hardened) cave fills or breccias, exposed by the present solution cycle in active caves on passage floors, in fissures, walls or "ceilings" - e.g., Eastern Passage in *Exit Cave* or exposed at excavated karst sites, such as road cuttings or quarries - e.g., Blayneys or Benders Quarry at Ida Bay. Present day solution activity often parallels the earlier palaeokarst trends following similar structural weaknesses in limestone and, **Jennings (1985)** states that "...filled caves are likely places for later resumption of solution and for fresh inputs of sediments." Ancient cave forms and their sediment fills are being increasingly studied by exploration geologists due to their importance in containing or trapping economic deposits of oil and gas and base metal sulphides, (**Ford and Williams, 1989**).

The presence of sulphur in sulphides and its breakdown to sulphate in an aqueous (watery) environment will markedly increase the acidity of percolating waters in limestone leading to an accelerated solution of carbonate and this may account for the large dimensions of some major cave systems in the Ordovician limestone of Tasmania, e.g., *Exit Cave* (**Clarke, 1993**, **Osborne, 1994**).



Palaeokarst deposits can be important from a geomorphic or speleological perspective because apart from providing a means for predicting erosion trends or likely patterns of karst solution, the deposits are useful in determining relative ages of karst development. It has always been difficult to determine the speleochronology (age) of past (or present) karst landforms, such as caves. Without being able to relate a particular cave development to the known time for a surface feature that has evolved under similar or related conditions (e.g., a known glacial event or a dated lava flow). The usual method of dating caves is based on deriving an age determination of its contents or deposits, such as skeletal remains, fossils, speleothems or cave sediments. (An assumption for the minimum age for cave development is then based on the premise that the cave or deposit site predates its contents.)

Palaeokarst is more commonly used to describe those landforms, usually seen as cave forms, which are or were buried as distinct from merely those old cave forms (relict karst) that were produced by earlier geomorphic processes. In many present day stream caves, there are examples of relict karst such as the abandoned upper level stream passages or similar surface features - while not actively forming, they are open to modification by present day processes including deposition of speleothems, sediments or skeletal deposits. Examples of relict karst at Ida Bay includes many of the upper level passages and chambers in *Exit Cave*, perhaps the ancient deposits in *Pseudocheirus* and the underground stream passage remnants of a former course of the D'Entrecasteaux River, perched 20 metres uphill from the present underground route on the southern side of Marble Hill.

#### PALAEOKARST IN TASMANIA:

Palaeokarst deposits have been reported or recorded in several limestone areas in Tasmania. In one of the earliest studies, Emyr Williams investigated some ancient deposits in the Eugenana area of northwest Tasmania and discovered pollen spores in bedded cave fill sediment. The palaeokarst cave fill was "undisturbed", but was surrounded by limestone which had been distorted or folded, suggesting that the fill had been deposited subsequent to a major tectonic disturbance. The pollen spores from the cave fill were dated at around 350 million years in age, enabling geologists to place a definitive (earlier) age on this major tectonic event in Tasmania, known in eastern Australia as the Tabberraberan Orogeny (pers. comm., *Max Banks, 1994*).

Examples of palaeokarst are likely to occur in many of the older carbonate rocks (limestone and dolomite) in Tasmania, as well as other parts of Australia. It is highly probable that many of the larger caves in Tasmania have been formed by the exhumation (re-working, re-excavation, removal or disintegration) of cave fills from a previous cycle of karstification, e.g., caves such as *Exit Cave* at Ida Bay and *Kubla Khan* and *Genghis Khan* at Mole Creek. Palaeokarst cave fill deposits have been reported in *Growling Swallet*, a major streamsink cave of the Florentine Valley in southern Tasmania. Rolan Eberhard (pers. comm., 1995) describes some sites of lithified cave fill and possible breccias in *Growling Swallet*, including examples of passage development that either directly follow old deposits imbedded in the cave roof or present passage sections that appear to have been diverted, skirting around the side of former cave fills, especially where the deposits are highly lithified.

## PALAEOKARST INVESTIGATIONS AT IDA BAY:

A number of non-specific references to palaeokarst at Ida Bay have appeared in various unpublished geological papers; these mainly relate to palaeokarst deposits in Benders (or Newlands) Quarry, e.g., *Dickenson, 1945*, but generally omit specific detail of actual sites. In a BSc.(Hons.) study of the Ordovician system at Ida Bay, *Sharples, (1979)* made reference to "fissure filling deposits" in Benders Quarry suggesting evidence for previous periods of karstification. The first significant study of the palaeokarst deposits in limestone at Ida Bay was undertaken in 1981 by Emyr Williams from the Tasmanian Dept. of Mines.

Based on his detailed mapping in Benders Quarry he was able to classify the palaeokarst into four distinctly separate deposits. Williams believes that each of these deposits represent different time intervals, which could possibly have an age range from Devonian (350-400 million years ago) through to Permian (260 m.y.a.) to Tertiary (2-70 m.y.a.), *pers. comm., Emyr Williams, 1995*. In his unpublished findings, Williams relates to the repeated nature of karst development at Ida Bay suggesting that the four probable separate phases indicate a long history of cyclic karstification, burial and exhumation, the latter possibly due to tectonic uplift.

In the description of limestone reserves at Benders Quarry by *Baynes, (1991)* there is a brief geological description of some palaeokarst deposit types. A geomorphic overview of palaeokarst at Ida Bay was provided by *Kiernan, (1991)* in his discussion of the origins of karstification and the limestone hydrogeology in relation to the Exit Cave Quarry. Kiernan described a number of features including a known cave, "Exits Nostrils" (IB-X12), which lies within one of the "terra rosa" palaeokarst deposits in an upper section of the quarry. Due to quarrying activities, many of the now exposed palaeokarst sediment fills are weathering severely, releasing large amounts of clay - much of which is draining back into Exit Cave and creating special problems for quarry site rehabilitation to minimise future impacts on Exit Cave (*Anon., 1993, Clarke, 1993,*).

During the March 1990 study of sub-fossil fauna (skeletal remains) in selected caves at Ida Bay, the writer located a number of old cave fills within Benders Quarry some of which appeared to contain deformed fossiliferous sediments (*Clarke, 1991*). At one of these sites where a deposit of ochre-yellow coloured, fine grained, laminated mudstone occurs, palaeontologists from the University of N.S.W. collected a number of samples containing possible marine shell fossils. There has been no recorded identification of these purported fossils.

In late 1991, during the course of planning activity to extend and re-develop Benders Quarry, the writer discovered palaeokarst sediments at the base of the entrance chamber of a recently discovered cave within the quarry itself. This sediment fill was comprised of a mauve coloured, bedded and laminated mudstone/siltstone which was generally indurated (very hard), but also included more friable (softer, crumbly) micaceous sections. The deposit was found as loose fragments on the chamber floor, "chunks" imbedded in the chamber roof and as a solid *in situ* (original) deposit wedged between the walls of a draughting fissure, with bedding dipping at a low angle (approx. 20 degrees) in relation to the near vertical fissure walls.



Subsequently explored in January 1992, during the course of an environmental management plan (EMP), part of the fissure deposit was removed to gain further access to lower reaches of the cave. With a recorded depth of around 90 metres, this cave (now known as *EMP Pot*: IB-143) appears to contain remnants of ancient sediments, adjacent or subjacent to most of the cave's vertical extent (Clarke, 1993<sub>2</sub>).

Following the discovery of palaeokarst fill in *EMP Pot*, Ian Houshold located some similar ancient fills in upper level sections of Eastern Passage, (Houshold, 1992). In February 1993, a more detailed study of ancient cave fill sites at Ida Bay was commenced by the writer, in conjunction with Ian Houshold (Karst Officer for Parks & Wildlife in Tasmania) and Armstrong Osborne (a leading authority on palaeokarst in mainland Australia).

The search for examples of palaeokarst was limited to two main areas: Benders Quarry and *Exit Cave* (especially in the Eastern Passage). In the quarry we examined a number of features that had been previously mapped by Ian during preparation of the quarry rehabilitation plan (Anon., 1993). On the bench faces there were numerous sites with lithified fills which were layered, folded, distorted or disjointed in ancient fissures, cave chambers, cave passage and a basin-like structure, possibly a buried doline. The geology of the fills was varied: ranging from silt and sand-sized sediment including some with fossils and dropstones; coarse breccias containing dolomite and replacement pyrite (Osborne, 1994) and possibly other sulphides; plus zones of sheared or broken limestone with gypsum growths.

A number of the cavity fills were either associated with or ensheathed by fine crystalline gypsum or coarsely crystalline to massive calcite. (Some of these sites were given a "re-appraisal" in late November, 1994, when members of the Tas. Cave & Karst Research Group inspected the sites, accompanied by Max Banks - a retired sedimentary geologist and palaeontologist, formerly with the University of Tasmania). The 1993 studies in *Exit Cave* with Armstrong Osborne were concentrated in the Eastern Passage area and in the Rockfall - areas recognised by geomorphologists to be some of the oldest and largest sections of the cave (Houshold and Spate, 1990; Houshold, 1992). Examples of old cave fill associated with gypsum, plus lithified breccias and massive calcite with blocky slabs of juxtaposed limestone were found in either or both the roof, floor and walls of Eastern Passage and similar sites were seen in different sections of the Rockfall.

#### PRE-PERMIAN (?) AGE PALAEOKARST IN BLAYNEYS QUARRY AT IDA BAY:

The palaeokarst fills in Blayneys Quarry, appear to be quite different to the deposits in Benders Quarry and in *Exit Cave*. On the western most buttress in Blayneys Quarry, directly below the walking route to Southern Highlands, there are two more or less horizontal cave fill sites, one above the other. From a distance, these features appear as a clayey mass of overburden that has spilled over the edge of the quarry face, but closer inspection reveals a conglomeration of relatively unsorted cobbles and rock fragments, plus some large, sub-rounded and polished boulders all lying within a weathered sandy and clayey matrix with surface travertine (tufa-like) deposits.

Numerous fragments of less weathered material are found on the quarry floor including some massive sandstone-like boulders. (Gravelly cave fills such as these, and their clayey parts, would have been very frustrating to the early limestone quarrymen and may have contributed towards the abandonment of Blayneys Quarry as a limestone source.)

In the exposure on the excavated quarry wall at Blayneys, the studied palaeokarst feature has the appearance of being an ancient stream passage. Adjacent to this feature are a number of smaller sediment filled pockets or cavities which could represent earlier stages of downcutting or scouring of limestone or solution when the rock was submerged in water, below the water table or perhaps under ice. "Fresh" rock from this fossil karst feature show the tightly packed, cemented cave fill "joining" the limestone, giving the appearance of being a facies (rock type) change during original deposition of the limestone.

The sediment fill is equally as hard as the surrounding limestone, even though there are voids within the fill deposit, perhaps due to subsequent solution of carbonate from the calcareous matrix.

Macroscopic (naked eye) analysis of cave fill samples from Blayneys Quarry shows a mixture of sections with sorted and graded fragments - often sub-rounded and down to sand size and finer, suggesting a fluvial (stream laid) influence, plus unsorted and irregular sized, often angular fragments in a sandy, clayey matrix, suggesting short transport or dumping effect due to a landslip, mass overland flow or the (till) debris of a glacial moraine. The possibility of a glacial origin or glaciofluvial influence is also indicated since most smaller fragments appear to be very angular or broken, whereas the larger fragments show some rounding, smoothing or polishing. Preliminary analysis indicates the presence of Ordovician fossils (coral), pink and white quartz, chert, siltstone, feldspar, sparry calcite and possible agate, schist and granite-like pieces.

A more precise analysis was determined by microscopic examination of thin sections of the cave fills, prepared by Simon Stephens (a former T.C.C. member, now in the Geology Dept. at the University of Tasmania). These were examined by Max Banks and the writer. The clasts or fragments contained in the infills include pieces of flowstone, various limestones - mainly dark and/ or fenestral micrite, numerous Ordovician age fossils - bryozoa, algae, coral, gastropod and shell fragments, siltstone, chloritic wackes, chloritic quartzite, quartz grains, mica schists, chloritic schist, a coarse grained quartz-mica (possibly granite) - all cemented by coarsely crystalline sparry calcite, some of which is partially dissolved and replaced with opaline silica and quartz crystals.

Since there are no known outcrops of schist east of the Arthur Ranges or the Cracroft River (*pers. comm.*, *Max Banks, 1995*), it would suggest that glacial ice was responsible for transport of some fragments. The fragments appear to be mainly Pre-Cambrian and Ordovician rock types and are likely to be all pre-Permian, suggesting that this fill was probably deposited before the Permian period, and this palaeokarst cave passage was formed at least 260 million years ago. (It is probably fair comment to conclude that parts of Exit Cave were also originally formed at this time, placing it as one of the oldest cave systems in Australia.)

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