S P E L E O G R A F F I T I

The Newsletter of the National University Caving Club

VOLUME 6, NUMBER 4. AUGUST, 1969.

EDITORIAL

What prompts a person to take up caving? The answers to question would make very interesting reading. Many first year students of psychology will immediately draw attention to a subconscious desire to crawl into caverns, holes and dark openings. This is then stated to be due to underlying insecurity and a desire to return to the womb. What caver could resist checking out a black hole sited in the side of a limestone cliff? (this pseudo Freudian reasoning shows why an occupational hazard of psych. I is a loss of friends.)

Some trogs "get their kicks" from rather difficult climbs (climbing in daylight without mud to contend with is too easy). Others are interested in the problems of cave photography. Most, I think, are glorified tourists, with no particular "pets". These form the backbone of most clubs, and their importance is often underestimated. Most cavers will agree that the mere presence of others in a cave is very reassuring (apart from obvious safety implications who likes caving alone - I feel this is rather hair-raising). This might sound like praising mediocrity, but I don't think everyone is capable or inclined to make great new discoveries or contribute their favourite speleological theories to "Helictite". Obviously other members will have different ideas on this subject, so how about putting them on paper. As said before the different reasons trogs go caving could be quite interesting.

THE EDITOR.

SOME NOTES ON THE CALCITE - ARAGONITE PROBLEM

Calcite and aragonite are polymorphs of calcium carbonate, the problem associated with them is their relative stabilities under surface or near surface conditions.

Using the calcite - aragonite equilibrium curve as a function of temperature and pressure at high temperatures and extrapolating back to room temperatures, workers have found that aragonite would only form as a stable phase under pressures of about 3000 atmospheres - equivalent to a depth of about 14 kilometers below the surface. Comparing free energies and entropy values for calcite changing to aragonite, we find the change of free energy is +250 cals/mole and the entropy change is -1 cal/mole deg. Heat change for this reaction is -40 cals/mole. These values indicate that under normal surface conditions calcite is more stable than aragonite. Also, comparing solubilities at room temperature, we find solubility products of 4.7×10^{-9} for calcite and 6.9×10^{-9} for aragonite. It is known that the least soluble polymorph will be the more stable. Thus the evidence clearly indicates that aragonite is less stable than calcite, in their macrocrystalline states and near surface conditions. Now, why do we find partial aragonite speleothems in some cold, wet caves. Obviously there must be additional factors to consider. Possibly the most important factor is the effect of impurities on the system. Divalent metal carbonates with the cation larger than calcium occur with the aragonite structure, while those with smaller cations occur with the calcite structure. Now, it is known that if two chemically pure phases are in equilibrium and one dissolves a larger amount of impurity than the other, the most impure polymorph will be stabilised. It might be anticipated, therefore, that a cation impurity such as strontium would favour the formation of aragonite. Estimates show that approximately 15 mol percent impurity is required to stabilize the aragonite modification. This would lead to a free energy change of mixing sufficient to offset the +250 cals/mole required for the calcite - aragonite transition. The maximum amount of strontium ever found in aragonite was only 3.87 percent, therefore this is not enough for a favourable energy situation. Well that kills that argument, (or does it). Just how come aragonite forms in caves and stays as aragonite for such long periods of time. More on this fascinating subject at a later date. I would be interested in hearing your opinions on this problem till then.

KEN PALMER.

BACKGROUND

The below is a summary of a cave report on the Drum Cave at Bungonia, written by W.S. Leigh in the Annual Report of the Department of Mines and Agriculture for 1891. At the time, the N.S.W. Government was very cave-conscious, and employed a person to explore caves and report back to the Department of Mines and Agriculture, who were the controlling body at the time. Then, they were more interested in caves, than in limestone, more interested in aesthetics than in money. In those days for example, Colong was better protected than Yarrangobilly is now - a sobering thought.

THE DRUM CAVE, BUNGONIA, N.S.W.

The first chamber is at 50 feet from the entrance, which is at the bottom of one of the largest of numerous depressions, and is a considerable orifice. This chamber, which runs to about 80' high, is conical in form, and averages about 30' in width on the floor, and 10' at its highest point. From this chamber, the rest of the cave is reached by descending a shaft 20' in diameter and 150 deep. At the bottom of the shaft, two passages, resembling drives, branch off, one to the south-west, one to the north-west.

South-west Branch.

After traversing a fissure 12' in width for 40', a chamber 60' long, 30' wide, and 50' high is reached.

North-west Branch

The first 50' of this cave is very low and tortuous, being about 2' high. Beyond this point, the cave opens out to about 15' wide, and 30' high for a distance of 150'. There is then a perpendicular drop of 40', which is the wall of a chamber. After passing this chamber, traversing a passage 200' long, and two other chambers, one reaches a natural tunnel, which is up to 100' high, and 50' in width, and at least 300' long. After following a passage leading from this chamber for about 90', our progress was stopped by large pools of water.

.....

Leigh was the man who, more than any other, could be called Australia's first speleologist. His numerous explorations include: at Bungonia, Drum, Grill and Fossil; at Yarrangobilly, Jersey, Harrie-Wood and River Cave; at Bendethera, the Bendethera Cave, Fig-tree and Ginn Caves; all the known caves at Kybean; Bunyan; Wyanbene. He there-

fore explored many of the caves that are well known to us. He also spent much time at areas less familiar to us - Jenolen, Ashford, Wellington and many others.

He was succeeded in 1895 by Oliver Trickett, who made many of the maps in the club library, including that of the Drum, the subject of this article. More of Trickett next issue.

HOT AIR AND ALL THAT

There are many types of hot air. All of us are familiar, even though we may not realise it, with several :-

(i) those beautiful breezes which make this city habitable in spring and autumn, and the scorching winds which make it untenable in summer,

(ii) those pearls of wisdom that Noble Trip Leader spouts while, and after, indoctrinating freshers,

(iii) those blustery gales which come, e.g. through the Blowhole in Wyanbene.

Yes, this last is hot air. Provided, of course, that you are near the temperature of liquid nitrogen.....

How often do we hear "Then there must be another entrance!" as an comment after mention of noticeable cave winds? Must it be so? Not at all. In the air enveloping the Earth, the sun heats air in one place, changing the local atmospheric pressure. Since, then, the atmospheric pressure is higher at one place than at another, air moves from the place of higher pressure to that of lower in an attempt to equalise at the two places. A humidity (i.e. the amount of water in the air) gradient across the pressure difference complicates matters - but not significantly - as there is then two differences to resolve (pressure and water concentration). What often happens is that the water vapour condenses in the lower pressure region and falls as rain, dew, frost, or snow, depending on quantity and temperature.

This mention of temperatures adds a further complication. Pressure, humidity, and temperature are inextricably intermeshed. Even in the simplest (mathematically, not physiologically) case, with the sun constantly shining on the one spot, it would be impossible to equalise temperatures over the Earth, because while heat was being conducted away from the heated area, more heat is being poured into it from the sun. Furthermore, on the dark side, heat would be radiated

away into space. As it happens, the sun has a fortunate, for us, habit of moving relative to the Earth. Nice though it may be, it complicates matters, making atmospheric pressure, temperature, and humidity go up and down like yo-yos, each with its own characteristics, all complex.

Moral: don't blame the weather man too much, it's a lot easier to be wrong than right.

What has all the above to do with speleos?

The basic characteristics of most caves are a considerable body of air in chambers, tunnels and narrow fissures, held at a more or less constant temperature by the great body of rock surrounding it. (The infra-red rays from the sun which heat the surroundings can only penetrate a few centimetres of limestone in any significant quantity, and consequently, the temperature remains fairly steady.) At constant temperature, only the pressure and humidity can vary. In wet caves such as Wyanbene, Dog Leg, and many others, humidity will be held fairly constant by the constant influx of cold water through the cave, some of which will inevitably evaporate into the air. Thus as fast as water precipitates out of the air, more rises to take its place. The relationship between the three variables thus contrive to hold pressure fairly steady also provided that the air volume is sufficiently large. Only minor fluctuations are allowable. The same applies for very dry caves, where humidity is kept very low by heat and lack of water. The amount of control drops between these extremes, but it is still present, and still primarily pressure and humidity controlled.

Now consider the special case of Wyanbene, with which most of us are familiar. Air temperature is fairly constant at any one point, with a slight gradient throughout the cave length, once satisfactorily out of the twilight zones. Say allow 100' for the cave air system to reach equilibrium. Over a 24 hour period at Blowhole on 17/2/68, air temperature was 57 + 1 degrees F, humidity 95 + 5, -2% (scale ran out at 100%). Figures courtesy MSS - reference 1. The barometric pressure was 29.85 + 0.05 inches Hg. Comprehensive figures are not available for Caesar's Hall, but every time I've measured the temperature it has been 53 + 2 degrees F, humidity presumably very high. Yet at Blowhole on 17/2/68 the air speed varied from 169 feet per minute to 1350 fpm. (Thanks to Ken Keck and his merry men again.) Why?

Over the period, the only quantities which varied significantly were the outside pressure, temperature, and humidity. What happens when there is a difference in one of the three main variables? Air moves to bring the system back to equilibrium. So, if the outside pressure is lower than that on the inside,

there is a nett air movement from the inside of the cave to the outside in an attempt to equalize the pressures. That is, a cave wind. The converse is also true.

It must be remembered that the cave volume is a great deal larger than that apparent to cavers, and that the volume of air which must be considered part of the system is greater still (see reference 2). The considerations of the above special case also of course apply in many general cases, although the wind is not generally noticeable except in constricted places.

Agreed, cave wind can be caused by two entrances some distance apart with a level, and hence pressure, temperature, or humidity difference between, but is such a case general? I leave it to you.

Also in a cave with two or more entrances with a level difference, there may be a temperature difference between the outside and the cave walls, setting up convection currents in the air between the lower and upper entrances. Again, is this a general case? Would you expect such winds to be strong enough to feel, or would you expect them to be part of cave microclimate?

Please remember that this article is not intended to present a complete scientific picture of cave meteorology. At best I have been able to make a few points refuting the oft-heard but inaccurate comment concerning cave winds in this part of the state. Anybody who wishes to learn more or better must first go to the references listed below and then carry out his own experiments.

MICHAEL G. WEBB.

References quoted:

1. MSS Meteorological Report on Wyanbene - unpublished. Figures cited taken whilst assisting the observers 17/2/1968.

2. Wigley, Wood and Smith - Mullamallang 1966 pp40-46. CEGSA.

General:

NUCC Trip Reports.
Encyclopaedia Brittannica.

THE WORD ACCORDING TO HADES

At the last committee meeting, two amendments to the club regulations were made. Rule B7 was amended to read "three days". This means that as from now all equipment must be cleaned and returned to the equipment officer within three (3) days of its use. As before, carbides, and other gear, must be cleaned by the people who use them.

The other change is a new procedure for collecting equipment. This is necessary as with the increasing activity of the club, an accurate knowledge of who has what gear is needed. (this could be vital in an emergency). In future, when equipment is issued a requisition form detailing what gear is taken must be given to the equipment officer. This form can be obtained beforehand from a committee member, or, more simply, just fill one in when collecting the gear.

It was also decided that at future monthly meetings a charge of 20 cents will be made for supper. Again, all are reminded that to save the purchase of 401 mugs (coffee type) could those wanting coffee bring a mug.

TRIP REPORTS

BUNGONIA - THE DRUM, B13. 26 JULY, 1969

Members present : Noel Call (T.L.), Mike Webb, Paulette Call.

Left camp at 12 noon with numerous ladders, ropes and beeners, and by 1.30 pm we found ourselves at the closed sump of the longer (North-west) passage. After recording the event on film we wandered back to the main chamber for another photographic session using a non-synchronized flash. (NC was bawled out twice for turning a light on before the shutter was closed.)

The party surfaced at 4 pm to rejoin Paulette, who had spent the afternoon abseiling with a group of scouts.

N. CALL.

BUNGONIA - B22 27 JULY, 1969.

People: Michael Webb (L), Bill Wallace, plus 6 Senior Scouts and Scoutmasters.

We went into B22 at about 10 am, and were all down the first pitch by noon. One bod was stupid enough to peel off about 20 feet up, but was neatly fielded in nine inches by a complete fresher whose knowledge of belaying was solely that which he had been shown the previous week. Down to the squeeze and 20' pitch found on the trip last November and down that on a ladder. Very tight in places. It narrowed down to 9 by 16 inches so we stopped despite nice clean air coming up. (Too many freshers with us to continue in such cramped places). We were all up by 4 pm - no, nobody peeled - and left for home at 6.15 after a meal.

M.G.W.

WYANBENE 2 August, 1969

People : Noel Call, John Furlonger, Michael Webb (L).

This trip was the second anniversary of the (in) famous "August Special" of 1967. Consequently, anything could happen. We left Canberra in Noel's car at 9.15 pm Friday night, and arrived at Wyanbene at 11.30. We set up camp, then sat around the fire until half past one or thereabouts, then to bed.

Up at 9 a.m. breakfast (very leisurely), and into Wyanbene at 11.03 (this later became of interest to us). We went straight up to the Blowhole, pypassed the Wet-Stretch, then five minutes rest at Rockfall Chamber, then Caesar's Hall, dump food pack at the bottom (12.58 pm) and on to Lake Chamber. For those who haven't been there, the trip is mainly mud and hard climbing. We had the place tied up in miles of string and krabs before we reached Frustration Lake at 3 pm exactly. Exploration, then back to Caesar's Hall (6 pm) for eats. Exploration in Caesar's, but nothing significant. Back into Rockfall where Noel showed me the route up to the Gunbarrell and the north end of Rockfall. Looks hairy. Since Noel needed to be home Saturday night, we didn't do any more, but headed for home, exiting at 9.28 pm. Elapsed time 10 hours 25 minutes. There was a very strong, icy cold wind blowing, and dense cloud. Change, eat, yarn in Noel's tent for a bit, then strike camp, and head for home at 11 pm.

Owing to the small size and the high standard of fitness of the party this trip was easy - the complete antithesis of the original August Special. A hot meal in Caesar's makes a big difference to an extended trip to Wyanbene. So also does not attempting to do too much on the one trip. This was the 19th trip I have made to Wyanbene, and I think it was the best of all.

M.G.W.

COMING EVENTS

23/8/69 Yarrangobilly Leader M.G. Webb.
More work in Y59 and maybe also in Y58.

30/8/69 Bungonia Leader M.G.W.
Hogans Extension if gas is low.

10/9/69 General Meeting
Physics Room 8, A.N.U. 8 p.m.

13/9/69 Bunyan or Kybean Leader M.G.W.
Small but very pretty cave near Cooma.

20/9/69 Big Hole

27/9/69 Colong Leader Noel Call.

.....

If you would like to go on any of the above trips, contact the Trip Leader by 9.30 pm of the Wednesday previous.

The address list of the NUCC Executive for 1969 is given below.

.....

NUCC COMMITTEE FOR 1969

President	Michael WEBB	42970 (AH) or 489066 Ext.219 (Work) 1/74 Ainslie Ave - Reid, ACT.
Vice President	Noel CALL	49.3009 (Work) 11 Renwick Street, Chifley, A.C.T.
Secretary	Ken PALMER	48.0412 (AH) 30 Earle Street, Lyneham, A.C.T.
Treasurer	Jim ATKINSON	49.7352 (AH) 58 Jacka Crescent, Campbell, A.C.T.
Equipment Officer	David CHRISTIE	70.3253 (AH) Federal Highway, Sutton, N.S.W.
Committee	Paulette CALL	11 Renwick St. Chifley
	Norm STOKES	51.1053 12 Roberts St. Macquarie, A.C.T.
	John BRUSH	9.4610 149 Mugga Way, Red Hill, A.C.T.