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Editors: E. Slater
P. MacGregor.

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EDITORIAL

The Editors wish to apologise for the long delay in bringing out this issue of the Journal. Pressure of work has been largely responsible.

We hope that Number 3 will make its appearance in October.

The eleven cave reports in this issue should prove useful as a basis for planning trips. Unfortunately Friend, in reporting his most interesting find in the sandstone area south of Sydney, has not given its location. The committee will however take steps to obtain further information on this point.

The President's article on cave photography is intended to be an introduction to the subject and deals mainly with the use of flash powder and black and white film. Containing as it does, much practical information, it will be of value to photographers with little or no experience in this branch of their craft.

MacGregor's data on the air conditions at Jenolan were obtained for the N.S.W. Government Tourist Bureau and are reproduced here with their permission.

Two articles have been lined up for the next issue, but several more will be needed. Clyde of Med. II has submitted an interesting one on bats while MacGregor has prepared one on some advanced aspects of cave photography using colour film and single and multiple photoflash illumination. Several trips are scheduled to take place before October and reports of thesewill be included.

So long is it since the previous issue of this Journal appeared that its aims are restated here. They are:

(1) To serve as a vehicle for the interchange of ideas and opinions on items of speleological interest.

(2) To provide a medium for the publication of data from reports and original observations on Australian Caves.

Please continue to submit information falling within the scope of these aims (which means just about anything even remotely conected with caves.)

CAVE REPORTS

1. The National Park - Sydney.

A broken stalactite was brought to Sydney from the limestone caves and analysed by me.

The composition is as follows:

Calcium carbonate	93.76%
Iron Oxide	a trace
Cobalt	a trace
Copper	a trace

Also present was a variable quantity of sand grains and Chlorophyll.

The limestone caves, with well developed stalactites and stalagmites are situated in a deep and narrow gully just above a young brook in very rough country. The lime is seeping out through an extensive joint at the top of a large sandstone cave.

There is no doubt that there is a large deposit of calcium carbonate underground as seepage water tested by me over a large area gave positive reactions. There is also cosiderable evidence of the cementing and coating of nearby rocks and potholes by lime and iron. The brook from the bottom of the falls just above the cave, flows completely underground for about half a mile. This being an important sign of the presence of an underground cavern.

From above, the valley is seen to be narrow and rugged, with a small canyon at the bottom.

Norman B. Friend

2. Moore Creek Caves

Location: 8 miles N.N.W. Tamworth

Transport: There is a gravel road to within 100 yards of the caves. No special transport is available.

Size: Extend 20 to 30 yards. Fairly large cavities are structurally formed and not bu solution. Only three or four tunnels are available.

Formations: Practically absent. One or two columns and stalagmites. Dull and quick formations in poor state of preservation.

Vandalism: Evidence is marked.

Prospects of exploration : Practically nil.

Historical Reference: See Limestone Deposits of N.S.W.

Remarks: Some Guano has been taken out of the caves but deposits are very small. Only a few bats were seen during the inspection. The caves have no tourist prospects or commercial future.

F. Jeffries.

3. Liena Caves - Tasmania.

December 1949.

Croesus Cave.

Following Croesus up to the first block-up of large boulders, which we negotiated, and thence through a second but smaller block-up, we estimated that this was the vicinity of the farthest point surveyed by the Tasmanian Caverneering Club from various marks in the sand and footprints. From this point a number of measurements were made.

The passage was followed up for about 180 yards and a point was reached where two passages about 8 ft x 4 ft, each containing a flow of water, met each other. The passages lead off S.E. and E. respectively to the right and to the left. A crawling through sand and water in a passage 4 ft x 12 ft, a dead and very smelly possum was discovered. Animal footprints, spider webs and a brown frog all led us to expect that we were near an exit.

Eventually a section was reached with near vertical walls about 150 ft high. At the top a faint glimmer of light could be seen and on climbing to within 50 ft of the top, it was observed that the light came through a hole about 10 ft in diameter with a fallen log across the entrance. We climbed to within 10 ft of the surface but found further progress impossible.

A return was made to the junction of the two passages

a distance of 260 yd. The other passage was followed for about 60 yd where the roof came down to within 3 in. of the water. This was the farthest point explored.

Leon Cohen.

4. Bendithra Caves

Location: The caves are located in the county of Dampier, 21 miles W.S.W. of Moruya, 34 miles south of Braidwood. The reference on Canberra 4 miles to ome inch military sheet is 264573.

There is no regular means of transport to the c caves. We were able to reach Khan Yunis by truck. In dry weather, it is possible to drive 2 miles further south. From Khan Yunis to the limestone belt is 10 miles. The ridge and main range are covered with scrub and progress is fairly slow.

Caves Explored: Of the caves indicated on O. Tricketts maps, only the main Bendithra Cave and numerous potholes on the Krawaree track ridge were found. A brief search was made for the other caves indicated but none of the deeper holes, the Fig Tree Cave nor the Gin Cave were located.

Trickett's maps are usually reliable, and so a more intensive search of the area should disclose the interesting potholes mentioned. The deepest pothole investigated was 40 ft. The main Bendithra cave is a very large chamber. No side passages of any size were located in it. It contains several, at one time beautiful, columns. The largest is about 30 ft high. They, like the other formations, are dry and appear to have been so for many years.

Little evidence of vandalism was found, but several names have been carved or marked with candles on the walls.

Bendithra Homestead is now deserted for most of the year. Alan Rankin runs cattle on the reserve for part of the year. There are no other houses in the Reserve.

Khan Yunis Homestead, mentioned above, is owned by Ted Grigg whose hospitality is greatfully acknowledged. His address is: Ted Grigg, Bendithra via Krawarree P.O., N.S.W. He can supply information on the area.

Jak Kelly.

5. Tuglow Caves

Location: The caves are situated two miles down the upper Kowmung from its junction with the Tuglow River in the County of Westmorland. The reference on the Bathurst 4 mile to 1 inch sheet is 297805 (i.e. about 1 mile east of the spot marked Caves on this map).

Transport: No regular means of transport to the caves is available. A road to Tuglow allows access by car to within four miles of the caves. A further two miles - down to Tuglow Creek - is negotiable by Jeep.

Caves: The largest and most interesting cave is entered through a vertical hole. This hole is located at the foot of the ridge running east from the limestone bluffs which overlook the Blue Pool on the hairpin bend of the river. The vertical descent is 200 ft, of which 150 ft is negotiable without rope. At the bottom is an underground river. This has been explored both up and down as far as is possible without forcing syphons. The upper end flows from a small syphon, probably too small to permit entry. The lower end terminates in a waterfall some 12 - 15 ft high and a large lake. On all visits to this pool, the water level has been high, with large volumes of water flowing over the falls. A map of the river level is in preparation.

The source of this river is believed to be a stream which flows into a soak 1000 yd up the valley from the cave entrance. No exit has been found. It is presumed that it flows into the blue pool below the surface. No dye tests have yet been made. Many large and dirty chambers exist in the upper levels of this cave. The river level is richly ornamented with shawls , columns, calcite flows, stalactites and stalagmites, most of which are still aive.

Some exploration of the surrounding area failed to reveal any noteworthy caves.

Many rooms exist in the upper levels of the mais caves Few of the formations are within easy access.

The area is aninteresting one and should repay detailed survey. An immediate problem is the tracing of the course of the underground river.

Fauna: Some animal specimens have been taken from the main cave. From the lake at the foot of the underground waterfall a frog (Lymnodynastos peronii) was captured. From an upper level of the cave , a bat (Miniopterus blenotis) was taken. A long horned grasshopper, believed to be unnamed,

was also taken. The specimens were identified by Mr. Musgrave of the Australian Museum, Sydney.

Jak Kelly.

6. Borenore Caves.

Location: The caves are found in the County of Ashburnham ten miles west of Orange. They are only one mile from the Orange-Forbes road and a track, passable to cars, turns off this road eleven miles from Orange. No regular transport to the caves exists, but as indicated, a car may go to the Big Caves.

Caves: The Big Caves have no extensive systems, but do have several large arches, the largest of which is forty feet high. Several minor caves, including the camping cave, are near the main arch.

Two miles down the Cave Creek, the Little Caves are found. These contain several formations, which have been mutilated and are now dead. Unfortunately, erosion from farms on the slopes of Mt. Conobolas and several floods have deposited mud far into the caves. This has happened in the last five years. The Little Cave is 300 yards in length, with a sinkhole from its centre to the top of the hill. It has been fully explored.

Four hundred yards further down Cave Creek is the Verandah Cave. Five years ago this cave was an attractive one. It is formed by a bend in the creek undercutting the limestone. Multicoloured marble has thus been revealed. It is now largely silted up.

A mile up Cave Creek from the Little Caves, Waterhole Creek and Cave Creek join. Approximately one mile up Waterhole Creek, the Boloring Rock is found on the north side of the creek. Proceeding up the west side of this rocky outcrop, perpendicular to the creek, a limestone outcrop will be discovered. In this outcrop is found Alec McDonald's Hole. This sinkhole was bottomed for the first time by members of this Society and is 80 feet deep. The level at 80 feet below the surface was explored and several attractive formations found. Exploration of the west branch was stopped by a pocket of foul air.

Two other minor caves were found nearby. The formations in all these were alive.

The Big and Little Caves are in reserve. Alec McDonald's Hole and associated caves are on the property of Mr. McDonald, c/- Borenore P.O., N.S.W.

Fauna: A long eared bat was taken from the caves but has not yet been identified.

Jak Kelly.

7.

Jenolan Caves,

August 6-9, 1950.

The party consisted of H. Fairlie-Cunninghame (leader), A. Robertson, E. Robertson, B. Player.

The Bottomless Pit was found to be 570 ft. above the Blue Lake and 90 ft. above the creek junction immediately below.

A small cave was found straight up the hillside from the Playing Fields, approximately midway between a small tributary creek and the large bluff of limestone at the southern end of the fields. The entrance is about 2 ft. wide and one foot high and goes in horizontally for several feet when it opens out into a tunnel about 10 ft. high and 4 or 5 ft. wide. This continues for about 20 ft. to a mass of broken rock. It is rather difficult to get through this but progress was made for about 50 ft. when the spaces became too small.

The Frenchman's Cave was found to be 320 ft. above the Blue Lake and 170 ft. above McKeown's Creek. It is near the cave with a rope ladder hanging out of it on the cliff face about 50 yds south of the Playing Fields. The entrance is about 2 ft. wide and 4 ft. high under a small tree further up the slope from the cave with the ladder. It is 55 ft. perpendicularly out from the base of the cliff and 30 ft. above a dead stump about 10 ft. high. There is a second entrance about 10 ft. across and 8 ft. below the main entrance.

There is a 50 ft. drop from the main entrance to the first landing and a further drop of about 20 ft. down a slippery mud slope to the bottom of the cave. A tunnel turns to the right from here which reenters the cave and another which goes down the right but is blocked.

A large passage goes to the left but is blocked. This may be followed up over formations to a dead end. There is an 8 ft. drop to the right of this passage which leads to horizontal crack. This leads through small passages to a small cavern. Three passages lead off from this cavern, one straight ahead and one to each side. Neither of the latter two lead any great distance but the one straight ahead leads to a large tunnel blocked by a rock fall. There are several small passages leading off to the side, but none are extensive. Some have good white formation in them.

The country upstream from the Bottomless Pit was searched for caves. A few holes were found, some of which were entered, but none extended any distance. The country looks very promising and traces of old caves were found. The search was reasonably thorough, although it is quite possible that an entrance was missed.

The main creek was flowing about 200 yds. up from the Bottomless Pit and good water was obtainable. Further up, the creek emerges through gravel and the creekbed beyond this point is dry until the end of the limestone is reached. The tributary which joins the creek near the pit was also running at some distance upstream, but its point of disappearance was not investigated.

The Mammoth Cave was found to be 260 ft. above the Blue Lake.

H. FAIRLIE-CUNNINGHAME.

8. The Bottomless Pit - Jenolan.

The bottomless Pit was descended to a depth of approximately 200 ft. using wire rope ladders. The first stage is 200 ft. below the entrance (a small hole, about 3 ft. x 3 ft). The last 60 ft. or so are not vertical and it is possible to climb without the ladders over this portion. The bottommis littered with many boulders. A search was made for entry to a lower level, but none was found.

Jak Kelly.

9. Yarrangobilly

March, 1950.

K. Burke
P. MacGregor.

The limestone outcrop is situated west of the Monaro Highway, 70 miles by road N.W. of Cooma in the midst of rough and mountainous but attractive country. Some of the caves have been opened by the N.S.W. Government to tourists and accommodation is available at Yarrangobilly Hotel.

A base camp was established on the Eastern bank of Yarrangobilly River immediately opposite the downstream side of the Natural Bridge (about 1 hour walk from Caves House). Many holes on the Western bank were investigated but exploration on this side of the river was soon abandoned for the much more promising eastern bank and plateau.

Particular reference will be made to four caves.

A. Eagles' Nest Caves:

As far as can be ascertained, these caves have not previously been named and since the caves lie near the part of the plateau known locally as the Eagles' Nest, the adoption of the above name is suggested.

Location: The caves are situated east of the natural bridge and slightly west of south of the "Tombs". They are most easily located by following up the ridge onto the plateau from the natural bridge. The two caves are very similar, lying about 50 yards apart on a line bearing 240° from the Eastern Cave, each being at the bottom of a large sink about 70 ft. deep and 200 ft. wide. A stream flows into the Eastern Cave.

Lacking equipment, we were unable to enter the caves on this occasion, but from the surface they are two of the most impressive caves I have seen and the obvious first point of attack at Yarrangobilly.

B. Underground River Thought to be deep Creek.

Location: A short distance upstream from the natural bridge on the Eastern Bank. This is a river cave and its entrance is on river level.

Description: After negotiating a low arch, a turn left was made, the river widening here, and a second arch encountered about 2 ft. 6 ins. wide and providing at this time about 8 in. clearence between the top and the water surface. This led into a wide low chamber at which point the explor-

ation was abandoned because of the cold water (8° C). This stream is thought locally to be the eflux of Deep Creek which flows underground about a mile to the north-west.

C. Copper Mine Cave.

Location: Northern end of Reserve. The southern entrance would be difficult to find coming down from the plateau and it is recommended that it be approached from Yarrangobilly River.

The cave is extensive with networks of passages at different levels. Formations of most types are represented including a few helictites. In some parts of the cave the formations have many names written on them while in other less accessible parts, there are few signs of previous visitors. Prospects of further exploration are good since few people - if any - have traversed the cave the cave from end to end.

December - February, 1951. P. MacGregor
A. Tansell
H. Duncan

December 31, 1950 P. Fielding

A descent was made into the crack in the hillside opposite Caves House. This was found to connect with the ampitheatre in the South Glory Cave and provides a possible means of access for tourists.

In the South Glory Cave, the crack under the wall near the "fossil bone" was followed. The crack rises steeply to the left and finally opens into a vertical crack leading into Dante's Inferno in the North Glory.

January, 1951.

Eagles' Nest Cave.

a. Western Cave P. MacGregor
W. Woof

This cave was explored to a depth of about 100 ft and gave no sign of ending. It is extremely rough and requires a stout boiler suit.

There is an initial drop of about 30 ft requiring ladder or rope.

b. Eastern Cave

B. Hond
P. MacGregor
C. Slack
M. Woof
W. Woof

The cave was explored for about 1/3 mile. For the first half of this distance it bears approximately 260°. The tunnels are for the most part large and rough with excellent formation in many parts. No signs of earlier explorers were seen in either cave and it was the opinion of local residents that they had never previously been entered.

Much exploration remains to be done in both the eastern and Western Caves.

Deep Creek Caves.

P. MacGregor
C. Slack

These two sink holes are situated about ½ mile N.N.W. of the north end of the Tombs. Both were explored for some distance and are very promising, although exploration of the Eastern sink would be rather dangerous because of the large loose boulders through which it is necessary to climb.

The Tombs.

A number of deep cracks probably lead to caves.

Sink above Natural Bridge.

The sink, about 20 ft dia. and 30 ft deep is on top of the ridge leading up onto the plateau immediately north of the natural bridge. There are two dead trees just west of the sink. A cave leads off possibly connecting with the Eagles' Nest Caves.

Fauna.

A specimen of cave locust collected in the Jillebenan Cave was identified by A. Musgrave as belonging to the Subfamily Raphidophorinae (Family Gryllacrididae) of which two species have so far been recorded in Australia viz. Pachyrhamma chopardi Karny, 1935 and Raphidophora crassicornis Brunner Van Wattenwyl, 1888. Sinces the types of these species are in Continental Museums and the literature is not available, Mr. Musgrave was not in position to identify

the material further.

Enquiries regarding the Yarrangobilly Caves should be addressed either to myself, Box 35, The Union, University of Sydney or to Mr. Bruce Hoad, Yarrangobilly Caves via Tumut, N.S.W.

Peter MacGregor.

10. Jenolan Caves.

October 7, 1950.

The tourist caves were examined to asses the possibility of producing a documentary colour film depicting limestone caves.... their geological history, exploration and contents.

Although unexplored caves in their primitive state would provide the most suitable background, the lack of electric power makes the use of them impossible. It is felt that much of the material required could be obtained in or near the lighted caves of Jenolan.

Such an undertaking will, of necessity, occupy a considerable time and some photography may have to be done elsewhere.

The Elder Cave.

The doorway to this cave is not locked, being fastened only with wire. As this entrance gives complete and easy access to all tourist caves north of the Grand Arch, and there is evidence of not infrequent visits by unknown persons, it is suggested that this doorway be padlocked.

The Elder Cave would provide a suitable site for continuity shots of exploration. An electric lead could be attached to the lamp above Ridley's Short Cut to provide power. The wooden ladder leading to the Lyceum Cave discovered and described by Foster in 1888, is still existent though much decomposed. This section of the cave was not inspected ~~ix~~ though several members have previously examined it. Neither was the Crystal Cave entered.

The Coral Cave was entered from near the top of Ridley's Short Cut and the formations therein warrant photographic record. On returning, the Jersey Cave was entered. This cave would not be worth photographing and

and access with equipment would be difficult due to the close proximity of the wire netting.

Right Imperial Cave.

From Ridley's Short Cut wedescended into the Right Imperial Cave. Numerous formations were noted for photographic purposes, particularly in the Gem of the West branch. At the extremity of the Right Imperial are many areas worthy of exploration. As yet the Lilly of the Valley described in early literature has not been found. This may be a cave worth investigating from the tourist angle.

Jubilee Cave.

All branches of this cave were investigated. Some very beautiful passages exist where obviously only J. Wilson had previously been. At the end of the Water Cavern already reported as being 500 ft from the Frenchman's Cave entrance, a ladder has been placed in position where we had previously attempted to reach a passage showing promise of by-passing the syphon. I do not know who has been attempting further penetration of the cave but can only surmise that the effort was abortive, the ladder being too short. I would like to hear of the persons investigating this section and the results, if any.

Returning, the possible entrance to the Red Cave (v. Trickett, p. 71) was noted near Cook's Cavern. No ladder being available, this cave wasnot visited although it appears to offer possibilities for colour photography and a visit in the near future is anticipated.

Left Imperial Cave.

This cave was also examined and promises much suitable material for inclusion in a film. Photographs of the river (McKeown's Creek) showing use of a rubber dinghy could be made though possibly the southern caves offer greater scope (River Styx).

As stated previously the Imperial Caves offer much in the way of exploration especially the Red Cave and Lilly of the Valley.

No photographs were taken.

Caves South of the Grand Arch.

Caves South of the Grand Arch

The Skeleton Cave will provide much interesting material in addition to the aboriginal skeleton, particularly the "Arabesque" and river section. All sections of the River Cave were inspected. A disused passage was noted leading from near the Grand Stalagmite to the White Temple. Time did not permit a visit though this passage may be worth relighting. After noting all formations and sections of the river for exploration sequences, the Temple of Baal was entered. This was left at 1.30 a.m..

Several interesting subjects such as shawl formation on wire netting and a calcite encrusted kerosene tin are located in the Ribbon Cave.

Return was made via the River Cave.

Nettle and Arch Caves

The Nettle and Arch Caves, adjacent to the Devil's Coach House or Easter Cave were viewed during daylight hours and should form an ideal sight for much continuity work and sound recording. The view of the Devil's Coach House from the Nettle Cave could not be surpassed. These Caves possess much of interest already described (v. Foster and Trickett).

Electric wires and fittings seem to be all intact but there are no globes. However if power is required it will be necessary to repair the broken power lines near the entrance to the Nettle Cave.

The wooden stairway from the Nettle Cave to the Arch is in need of repair, the steps inseveral places having rotted. Also the hand rail is insecure.

Photographs of the Devil's Coach House were taken before leaving. Further shots will be made with the use of flash powder for illumination.

E. Slater

MOLE CREEK AND LIENA, TASMANIA

January, 1952

H. Fairlie-Cuninghame
P. MacGregor
A. Tapsell
E. Slater

The purpose of this trip was mainly the taking of photographs. About fifty subjects were photographedin Kodachrome and a few in black-a nd-white.

Marakoopa Cave.

An interesting find was made by members of the Tasmanian Caverneering Club of a chamber containing many helictite clusters some of which were photographed. The chamber is a short distance in from the end of the tourist portion of the cave.

Croesus Cave

This cave is on Lynd's property. A large stalagmite was discovered about 50 ft above the level of the underground river. This and many other formations were photographed.

Lynd's Cave

A few photographs were taken.

Four of the photographs were subsequently used to illustrate an article on cave exploring in the A.M. Magazine.

P. MacGregor.

SPELUNCA (From the Journal of the Royal Geographical Society of Australasia, Vol.VI, No.1, November 1895, page 20).

"....A proposition by Mr. Paschal Grousset, to sink a well in connection with the forthcoming exhibition to be held in Paris in 1900. The proposed well is to reach a depth of from 5000 to 6000 feet. It would be the means of communication to a series of lateral galleries placed a t various stages and forming an underground city replete with attractions and curiosities of all kinds. But Mr. de Lapparent, the well known geologist, and others, consider Mr. Paschal Grousset's scheme impracticable."

The main purpose of this article is to induce more members to take cave photographs. Many members have cameras, but have not bothere to use them in caves, possibly because they do not know how. It is hoped that this article will overcome that difficulty.

Exhibitions of cave photographs are probably the best form of publicity for the Society, but up til now there have been few contributors and hence there has been only enough material of sufficiently high standard for one exhibition in the history of the Society. It is hoped that there will be more contributors in the future and more and better exhibitions.

This article will deal only with the use of flash powder and magnesium ribbon and a note given on the use of acetylene lamps for cave photographs. Special attention will be given to box cameras as these are what many members will probably start with.

Panchromatic film is preferable for use in a cave as it is sensitive to all colours, but orthochromatic film like Verichrome or Selochrome is not very sensitive to the oranges and yellows predominent in caves and hence does not give as good results. Fast film like Super XX or H.P.3. is best unless big enlargements have to be made, as less light is required with them and hence there will be less smoke produced. Super XX and H.P.3. are equivalent for most purposes and subsequent data will be given for them. Plus X and F.P.3. are medium speed panchromatic films, most suitable for 35 m.m. cameras and require 1½ to 2 times the exposure of Super XX. Verichrome and Selochrome require about 3 or 4 times the exposure.

Exposures are made by placing the camera on a firm support, putting the shutter on "time", opening the shutter and then igniting a small pile of flash powder or strip of magnesium ribbon. When the flash powder has gone off or the ribbon completely burnt the shutter is closed again. Many cameras have no "time" position, only "bulb" in which the shutter remains open only as long as the release button is held down. If a cable release can be fitted, one with a locking screw should be used so that the shutter may be held open. If the flash powder is very dry and burns with a small explosion, the camera may be hand held, but this is risky if good sharp pictures are desired. People in a photograph should keep perfectly still, especially with magnesium ribbon.

As small a quantity of powder or ribbon as possible should always be used in a cave so that not too much smoke is produced. Even so only a few photographs can usually be taken in the average cavern before there is too much smoke. Apart from this, the smoke settling on the formations tends to dull them if photographs are repeatedly taken with these lights. Less smoke is produced by ribbon than by powder, and ribbon may be preferred for this reason, but due to the long time it takes to burn it is not suitable where people have to hold a difficult pose. It is also more expensive than powder, but is safer and easier to handle and it is a good idea to have some so that a bright light may be produced to get a good look at a

large cavern.

Magnesium ribbon may be obtained from many chemical and photographic stores. The required length is broken off and the strip straightened so that it hangs nearly straight. It may be held vertically by one end and the other end lit or it may be held horizontally near the burning end and the grip moved as the ribbon burns. It may be lit with a match or candle, but it must melt before it burns and hence the burning end is easily flicked off. Thus it should be held still while it is alight. If it should go out in the middle of an exposure just light it again and there will be no harm done if the subject does not move. It is often convenient to hook one end over a rock, but if the flame touches the rock it will leave a white mark and this should be avoided.

Flash powder may be made from many formulae, but the one to which the figures given refer consists of three parts potassium chlorate and two parts magnesium powder. The chlorate should be finely ground in a pestle and mortar before mixing with the magnesium which should be bought finely powdered. Never grind the two together. Several members have bee severely burned in this way. The friction of grinding can cause the mixture to ignite. It is best to weigh the constituents after grinding and then mix them on a sheet of paper with a piece of wood or spatula. Do not mix too much at a time, an ounce or two should be plenty to take on one trip. The mixture should be kept in an airtight container. It is usual to carry a small scoop, say a .303 cartridge case cut in half, and to place the required number of scoop fulls on a piece of paper which partially hangs over the edge of a piece of flat rock or jam tin lid carried for the purpose. Some powder is spread so that it is on the unsupported paper and the the paper is lit. If this proceedure is not carried out the paper usually goes out before the flame reaches the powder. Grease proof paper is best for this purpose as it is less succeptible to moisture and celuloid film is also good. Another method is to measure out the powder at home and wrap it in paper which has been soaked in potassium chlorate solution and let dry. The powder is placed in the centre of a square of paper and the four corners brought together and screwed up to form a wick. It is advisable to make packets of say ½, 1, 2 and 4 grammes. The powder should not be left exposed in a cave for too long or it may become damp and not go off properly. It should not be let off on a wall or it will leave a mark.

To determine the amount of powder or ribbon required and the apperture setting of the lens is quite a simple matter. For any particular quantity of powder or length of ribbon and a certain type of film a guide number is determined experimentally and once this is known it is only necessary to divide the distance between subject and light into this number to give the f. number required. The distance between camera and subject has no effect on exposure. A slight correction should be applied to the above results to allow for the colour of the surroundings. Half a stop more or less should be given if either the surroundings or subject are dark or light and a full stop if they are both

dark or light. If one is dark and the other light no allowance need be made.

For greatest ease in calculation the guide number for one scoop full of powder or definite length of ribbon should be known. This will be called the "unit" of powder or ribbon. For close subjects the above rule may be applied directly to the corresponding guide number, but for more distant subjects more than one unit will be required. It is probably easiest to calculate the f. number that would be required for the unit and then double the unit for every stop between the calculated one and the one that is actually used. Now the stops on most cameras run 1, 1.4, 2, 2.8, 4, 5.6, 8, 11, 16, 22, etc. It should be noted that stops such as 3.5, 4.5, 6.3, are half stops, i.e. 4.5 is half way between 4 and 5.6. It is seen that the ratio between successive stops is approx. 1.4 or the square root of 2, and hence the f. nos. of alternate stops are double one another.

Alternatively the guide number of the particular number of units that is expected to be necessary may be calculated and then the f. no. required calculated in the usual way from this new guide number. This method is best when powder is packaged as the guide no. of each packet may be written on it. If N is the guide no. of the unit and n the number of them used, then the new guide no. N' say is N' = N times the square root of n. Thus 2 units have a guide no. of 1.4 N, 4 units 2N, 8 units 2.8N, 16 units 4N, etc.

The calculation of exposure does not have to be extremely accurate; there will probably be no appreciable difference in two negatives given half a stop different exposures, but if a guess has to be made it is better to over expose than under expose. To give an example, suppose the unit to be used has a guide no. of 160 and the subject is dark in dark surroundings at a distance of 40 feet, and suppose the picture is to be taken with a box camera with an apperture of f. 11 or the camera in use has to be stopped down to f. 11 to give the required depth of field. Now 40 goes into 160 4 times and thus an apperture of f. 4 would be required for one unit, but f. 4 is 3 stops larger than f. 11, i.e. the unit must be doubled three times. This is not 6 times the unit, but 2 times 2 times 2 = 2^3 = 8 times the unit and when an allowance is made for the subject and surroundings this has to be doubled again making 16 times the unit. If the distance had been 30 feet instead of 40 an f. no. of 160/30 = 5.3 would have been required for one unit. Now 5.3 is not marked on the camera and it is not an integral number of stops larger than f. 11. It is usual in a case like this to approximate approximate the calculated stop to the nearest full stop which is 5.6 in this case and f. 5.6 is 2 stops larger than f. 11.

With fixed apperture cameras like box cameras there is a completely different method which may be followed. From the foregoing it follows that f = N root n over d where f = f. no., N = guide no. of unit, n = number of units, d = distance. Therefore it follows that n = $f^2 d^2/N^2$ and since f and N are constants N^2/f^2 = N' say which is also constant and is a new guide no. of

a different type for $n = d^2/N'$. I.e. to find the number of units required , divide the square of the distance between light and subject by the new guide number. Taking the previous example in which the guide no. of the unit = 160 and the f. no. = f. 11, the new guide no. will be $160^2/11^2 = 200$ approx. Therefore the number of units required for a subject at 40 feet is $40^2/200 = 8$ and this will have to be doubled to allow for the dark subject and surroundings giving 16 units as before.

Very often two lights are required for one picture. If a cave is extensive and there is a close foreground and distant background one light near the camera would illuminate the foreground only, but by placing a second light either well out of the field of view of the camera or shielded from it by an opaque object, the background may be lit. The relative amounts of light on fore and background must be adjusted to give the effect desired. A lens hood should be used on the camera at all times if possible and it should be remembered that the flame from even a small pile of flash powder is quite large requiring any screen between flash and camera to be sufficiently large to screen the whole flame.

Two lights often give better results than one even on close subjects. A light at the camera throws practically no shadows and the picture may look flat. If the light is moved to one side the shadows become larger, but are usually very black and hard, lacking all detail. This may give a dramatic effect, but is often undesirable and rhe solution lies in having one light at the side to give shadows and one at the camera to give some detail in them. The relative intensities of each may be varied over wide ranges to give different effects and although the two light technique is more difficult than one, the results are well worth it. Care should be takenwith two lights that the smoke from one is not photographed by the other and that smoke does not drift in front of the camera. If flash powder is used a flash in or near the picture area should be fired last, but as soon as possible after the first flash. Smoke from the powder rises very little during the actual burning, but continues to rise in a column to the roof where it spreads and gradually settles. If a flash near the camera is fired first and then one in the picture area is fired before the smoke from the first begins to settle, no evidence of the smoke will be recorded; if the order is reversed the smoke from the first flash may easily be photographed by the second unless it can rise right out of the picture.

The actual guide numbers to use with the flash powder mentioned earlier are 160 for one gramme or 280 for one level teaspoon full which is about 3 grammes. The latter is much too large a measure for most subjects and the former is a bit large too. One half to three quarters of a gramme will be found most useful. When a scoop has been made multiply 160 by the square root of the weight of its contents in grammes to get the guide no. of that quantity, or determine how many scoop fulls go to a level teaspoon and divide 280 by the square root of this number. The guide no. of one foot of magnesium ribbon is 140. If using only a foot or less allow for the two or three inches that are

[illegible] in the hand and don't bother. This is insignificant for long lengths, but important for short lengths.

If after using these guide numbers the photographs are consistently incorrectly exposed, then the guide no. may be altered. If all the pictures are over or under exposed by say n stops then multiply or divide the old guide no. by 2 to the power n/2 to give the new, correct number.

If a film requiring n times the exposure of Super XX for which the above guide nos. apply is used, then divide the guide no. by the square root of n. If two lights are used to illuminate the same part of the subject the f. no. to use is the square root of the sum of the squares of the f. nos. that would be required for each light alone. This accuracy is seldom necessary for black and white photography. If f_1 and f_2 are the two f. nos., then if these are nearly equal give one stop less than with either of these alone. If one is larger than the other then use this larger value, e.g. if $f_1 = 2f_2$ then $f = 1.12f_1$ where f is correct f. no. and this is only 1/3 stop smaller than f_1, the difference being negligable for black and white photography.

With the foregoing knowledge it should be possible to take correctly exposed photographs in caves, but whether they will be good cave photographs is a different thing altogether. Firstly the camera should be accurately aimed which is often not easy in the dark. It may be necessary to have a companion move a lamp around the extremities of the subject while the immage is watched in the viewfinder to see that it does not go out of the field of view. Box cameras and some cheap folding cameras have small reflex viewfinders which are almost useless in caves, especially if they have ground glass in them. A pocket magnifying glass greatly improves their usefullness, but even so it is often necessary to stand to one side of the camera and see if it is pointing in the direction of the subject without using the viewfinder at all. The sports type viewfinder is by far the best for use in a cave.

If there are too few shadows in a picture it may convey the impression that it was taken outdoors. They may be technically good and good records of the cave, but still be bad cave pictures. This may be remedied by having the light far removed from the camera so that there are deep black shadows making up a large proportion of the picture. Of course, not all subjects could be treated in this way, and each subject requires its own special treatment to make the most of it. Very effective photographs may be taken with acetylene lamps, either alone or in conjunction with other lights. These probably convey more cave "atmosphere" than most other photographs as they appear as one actually sees the cave. The exposure varies conciderably with the size and condition of the flames, number of lamps, distances, etc. 20 seconds at f. 8 with two lamps at 3 or4 feet has given good results, but has over exposed pictures when the lamps were burning brightly with 28 litre jets. The latitude of the film

will cover up many mistakes in exposure so long as they are not too great.

A few precautions.

One of the cave photographers' greatest enemies is dampness and humidity. Handling a camera with wet or muddy hands will not do it any good, so if gloves are worn while crawling about the hands may be kept clean to handle the camera. Alternatively, clean gloves may be put on for this purpose, but this makes one rather clumbsy. The high humidity in caves causes moisture to condense on the lens and so fog the picture. This may be wiped off with a soft cloth, but it is better to warm the lens in front of a lamp until the moisture evaporates. Care should be taken while focussing etc. not to breathe on the lens. The lens should be checked before every exposure to see that it is clean. The high humidity also causes one's breath to appear like steam and thus care should be taken not to breathe in front of the lens while the exposure is being made. When using the camera at eye level the breath should be held during the exposure.

It is a good idea to keep the camera in a rubber bag between photographs to protect it from dust, drips and accidental wetting by falling into a pool etc.

Flash powder is an explosive and should be handled with care. It should be kept in an airtight container to keep it dry, and should be handled at a safe distance from a naked light. There is a chance that dust from the powder may catch fire and send the whole lot off. There is quite a large flame from a small pile of powder and hence one should never stand over it while it goes off. Nor should it be let off in a shed with inflammable material overhead. It is quite safe to put the powder on a flat stone or tin lid and hold it in the hand while it goes off, providing it is held at arms length and no part of the hand or arm is in a direct line with the powder. Intense dazzle lasting up to ten minutes or so will be caused by looking at the flash, so keep the eyes closed or head turned to one side.

A lens hood is a definite advantage in a cave to prevent light reflected from the walls not on the picture from passing into the lens and causing fog. Also if a light is placed just out of the picture area, the hood prevents stray light from causing a flare on the film. If no hood is available stand between flash and camera or hold a hand there to prevent this .

Now that the theory of cave photography is known, give it a try on the next trip and with reasonable care excellent results should be obtained.

T. Fairlie-Cuninghame.

Physical Characteristics of the Air in and Around Jenolan Caves.

15 August, 1951

Peter MacGregor

SUMMARY.

An attempt has been made to provide a basis for the study of the laws affecting and relating the following variables in the cave environment: Pressure, temperature, humidity and velocity of the air.

The significance of temperature, humidity and air velocity both as regards their effect on human comfort and on the formation of secondary deposits is briefly indicated.

Values are given for the three variables at different parts of the caves and it is deduced that:-

(1) The temperatures are higher in the higher portions of the caves and in the innermost portions. Excluding readings taken at or near the entrances, the difference between the warmest (Orient) and coolest (Bone Cave, Left Imperial) is about 9° F. Temperatures at any one place are fairly constant throughout the year, differing by not more than a few degrees.(1)

(2) The humidities are lowest near the entrances where comparatively dry air is entering from the outside.

The high humidity slightly affects human comfort in some caves, especially where some exertion is called for as in climbing the Orient stairs or those in the Jubilee. Beyond this no evidence was found of undesirable characteristics in the air of the Orient Cave.

GENERAL AND INTRODUCTORY.

The equations:

CO_2 plus H_2O ⟶ H_2CO_3

H_2CO_3 plus $CaCO_3$ ⟶ $Ca(HCO_3)_2$

$Ca(HCO_3)_2$ ⟶ $CaCO_3$ plus H_2O plus CO_2

describe qualitatively the relationship between calcium carbonate water and carbon dioxide in cavemaking.

Rainwater dissolves carbon dioxide from the air to form the weak acid, carbonic acid. This dissolves limestone with the formation of calcium bicarbonate. As water evaporates from the saturated solution of calcium bicarbonate, calcium carbonate is deposited and carbon dioxide is liberated.

Now, increase in the concentration of water vapour in the air tends to slow down the evaporation and when the air is saturated evaporation can no longer take place and secondary deposition stops. Still air in an enclosed space in contact with a free surface of water will become saturated and thereafter no evaporation and hence no calcite deposition can occur. Thus it is possible to say that, other conditions being equal, the higher the humidity, the slower will be the deposition of calcite.

The comfort afforded by an atmosphere is measured by its cooling power (i.e. its ability to remove heat generated dn bodily movement) and this in turn depends on its temperature, humidity and velocity. Low temperature, low humidity and high air velocity all make for a greater rate of cooling while high temperature and humidity and low air velocity a re conducive to a low cooling rate.

RESULTS.

Instruments used:

1. Velocity	Short & Mason Anemometer
2. Temperature	Corrected Thermometer (32°-110° F)
3. Humidity	Sling Psychrometer

For the thermometer and psychrometer, readings were taken at 30 second intervals until constant values were obtained. Care was taken that the heat of the body did not affect the results.

Temperatures were read on the standard thermometer to $\pm$ 0.1°F a nd the psychrometer to $\pm$ 0.2°F.

CAVES.	POSITION.	Date August 1951	Time (24 hour clock)	Temperature (°F)	Relative humidity (%)
Right Imperial	Entrance gateway	11	0956	40.0	-
	Entrance gateway	13	0945	39.0	-
	Left Imperial Junction	13	0958	44.5	93
	Nellie's Grotto	10	2030	56.8	95
	Jubilee Junction (foot of steps to Cook's Cavern)	10	2100	57.0	97
	Gem of the West	10	1955	55.0	95
Left Imperial	Bone Cave - (end chamber)	13	1030	49.8	96
	Bone Cave - (junction of left branch)	13	1013	43.8	67
	Bone Cave - (junction of left branch)	13	1037	-	67
	Wilkinson's Cave (summit)	13	1045	-	94
	Lucinda Cave	13	1138	53.9	97
Jubilee	Pin Cushion	11	1115	56.2	98
	Gem of Jenolan (Victorian Bower)	11	1028	56.0	98
	Alabaster Hall	11	1140	57.0	100
SOUTHERN CAVES	Lower entrance gateway	12	1920	35.9	-
	25' towards entrance from top of steps down to Bone Cave	12	1930	46.7	82
Bone Cave	Switch board	12	1937	50.0	90
	" "	12	1000	-	90
Lucas	Southern caves junction	12	1953	53.0	94
	Mafeking Cave junction	12	2000	57.0	96

CAVES.	POSITION.	Date August 1951	Time (24 hour clock)	Temperature (°F)	Relative humidity (%)
Lucas Contd.	Exhibition Cavern (foot of steps from Cathedral	12	2021	55.0	97
	Cathedral switch-board	12	2036	56.0	98
	Cathedral Ante-room (top of steps)	12	2045	45.5	76
	Cathedral Ante Room (30' back towards Cathedral from top of steps)	12	2050	55.0	95
Skeketon	Downstream bridge	11	1650	53.5	94
	Bath of Venus	11	1635	53.0	94
	30' in from end stair-way (chosen because of helectites and crystals	11 11 11	1445 1450 1500	- 55.7 56.0	93 93 -
	End	11 11	1411 1416	- 56.0	96 -
River	Summit of Mons Meg Loop	12	1400	58.7	99
	Grand Column (platform below) " " "	11 12	2040 1415	58.0 58.0	97 97
	Temple of Baal junction	12	1445	57.5	98
	Furze Bushes " " " " End of Cave track	12 12 12 12	1515 1700 1705 1430	58.8 58.8 - 59.0	95 92 94 96
Temple of Baal	First switch-board	12	1037	-	97
	Second (marble) switch-board	12	1015	58.7	98
	Gem of the South	12	1050	-	95

CAVES.	POSITION.	Date August 1951	Time (24 hour clock)	Temperature (^{o}F)	Relative humidity (%)
Orient	Pillar of Herculese (west branch)	12	1557	59.0	97
	Grotto below Pillar of Herculese	12 12	1540 1547	59.0 59.0	97 97
	Arabesque (South Branch	12	1614	59.0	97
	End of South Branch track	12	1530	59.0	96

The following observations were made under the lamp suspended over the roadway at the narrowest part of the Grand Arch. Readings were taken at the centre of the roadway and at a height of four feet

Date August 1951	Time (24 hr. clock)	Temp. (^{o}F.)	Relative humidity (%)	Corrected air velocity ft./min.	Direction
10	1850	38.0	-	487	Towards Caves House
11	0930	40.0	-	418	"
11	1200	41.0	-	933	Away from Caves House
12	1900	33.0	90	571	"
12	2340	-	-	0	-
13	0935	33.0	90	264	"

Air Velocities at Caves Entrances.

The readings were taken at ground level in the centre of the open doorway.

1. Right Imperial.

Date August 1951	Time (24 hour clock)	Corrected Air Velocity ft/min	Direction
10	2230	251	in
11	0945	135	in
11	0950	161	in
111	0952	247	in
11	0955	196	in
13	0945	152	in

2. Lower Entrance to Southern Caves.

Date August 1951	Time (24 hour clock)	Corrected Air Velocity ft/min	Direction
11	1331	414	in
12	1915	406	in
12	1916	417	in
12	1918	391	in

Incidental Observations.

Date August 1951	Time (24 hour clock)	Place	Temperature (°F)
11	0915	Centre of Roadway at Caves House	37.5
11	1219	"	40.5

Analysis and Discussion.

The conclusions stated by Dunlop (1) are for the most part substantiated. In general the highest temperatures are in the highest caves and in the innermost caves although several exceptions exist. For example, though the Victorian Bower is both higher and futher in than the Pin Cushion the temperature in the former is lower than in the latter. Similarly, a momentary decrese is observed in moving into the Skeleton Cave. Possibly the fall in temperature at the Bath of Venus is due to

the presence of a large body of cold water nearby (the Underground river)

It is difficult to form any generalisation from the humidity readings because of the inherent inaccuracy of the psychrometer in the high region. The sudden fall in relative humidity in the Bone Cave (Left Imperial) is explained by the presence of a perceptable draught probably entering through cracks from the Grand Arch and it is probably the strong inrush of relatively dry air that has caused the efflorescence in the cave and given rise to the 'dried out' appearance of the formations

The highest readings were in the Jubilee Cave and indicate that the air in the places recorded is saturated or nearly so.

Humidities measured in the Orient are not as high as might be expected although when I returned later on the 12th. August, (2100) hours without instruments, it was observed that a fog had formed, indicating that the air was saturated.

I t is undesirable to theorize on the comparatively small amount of data so far obtained. Doubtless, circulation in winter when the outside temperature is lower than the inside is caused by the warm air rising through the higher entrances and drawing cold air in at the lower ones, and in summer, when the outside temperatures are higher, vice versa. However this is merely a result of the temperature difference, which difference is itself unexplained. It hardly seems possible, for instance, that despite the fact that cold air is blowing in for months on end, a temperature gradient of 10°F in 30 feet should exist in the Cathedral Ante Room; yet it is so.

Since the air is usually still and the humidity high, the the cooling power of the air is low and exertion may cause discomfort. There is clearly no remedy for this and visitors must be prepared to accept the very slight discomfort it entails.

No evidence of unbreathable air was found in the Orient Cave. To test this a stay of two hours was made in the South Branch and of half an hour in the West Branch, with constant movement and without the slightest ill effects; (the rapid climbing of the stairs produced slight palpitation and increased breathing and pulse rates all of which effects soon subsided.

Futher Work Desirable.

The Author supports the suggestions made by B.T.Dunlop and and in addition, the following.

1. More detailed study of the geomorphology of the Caves involving, largely, a more intensive exploration. (Without an adequate picture of the actual physical structure of the cave system, no valid generalisation relating to the three variables dealt with is possible).

2. Measurement of pressure along with the other variables at different heights in the caves and at different distances from the entrances.

3. Use of a Barograph in conjunction with a Thermograph.

4. Similar investigations in other cave systems showing different structural characteristics to those of Jenolan, in order to obtain, if possible, a relationship between the physical structure of and the prevailing conditions in the caves.

References:

1. Dunlop, B.T. "Temperature and Humidity Readings within Jenolan Caves."

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