SPELEO - SPIEL.

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Pres: Albert Goede, 8 Bath Street, Battery Point, Tas. 7000.

Sec: Noel White, Geology Department, University of Tasmania, Sandy Bay, Tasmania, 7005.

FORWARD PROGRAMME.

Sept. 11	-	Saturday. TWENTY-FIFTH BIRTHDAY, ANNUAL DINNER. Prince of Wales Hotel, Hampden Road, Battery Point. Meet for pre-dinner drinks at 7p.m. Dinner at 7.30. More details in last months Spiel. Payment before dinner appreciated.
Sept. 18,19	-	Weekend. Mole Creek. Including combined trip through Herberts Pot with S.C.S. Acting Leader: Kevin Kiernan.
Sept. 22	-	Wednesday. 8p.m. Genuine UNDERGROUND FRENCH FILMS to be shown at the Lenah Valley RSL Hall, 188 Augusta Road.(Left hand side, just past Pottery/Creek Road Junction.) Supper afterwards at 8 Bath Street.
Sept.25,26	-	Weekend. Exit Cave. Leader: Bill Lehmann. Leave Fridaynight.
October 3	-	Sunday. Ladder practice at Rocky Tom. Leader:B.Collin.
October 6	-	Wednesday. 8p.m. General Meeting at the Farley's 49 Wells Parade, Blackmans Bay. Gate identified by helmet and willow tree.
October 10	-	Sunday. Day trip to wolf Hole, Hastings. Photography and exploration. Leader: Noel White.
October 24	-	Sunday. Day trip to Mystery Creek Cave. Exploration of upper entrance and Canyon. Leader. Albert Goede.

Twenty-five Years of Caving; 1946 - 1971.

This month we celebrate the twenty-fifth anniversary of our club - the oldest in Australia. The inaugural meeting of the Tasmanian Caverneering Club was held on 13 September, 1946 as a result of the guiding influence and enthusiasm of professor S.W.Carey. One of the first trips to be held after the club came into existence was to the Junee area where members explored the Junee resurgence and several small caves nearby. This trip was not without excitement. Our founder nearly foundered in the swollen Junee River after a party had reached the end of the cave and established the presence of a siphon. During the following night the party camped on the river floodplain had to move to higher ground as the river overflowed its banks.

It is interesting to consider that after twenty-five years the Junee River still keeps its secrets but the prospects of finally unlocking these looks brighter than at any time during the club's history. In a quarter of a century the wheel has come full circle and in the last two years the club has once again concentrated its efforts in this area with considerable success. Last summer saw the descent of Khazad-dum to a depth of 950 ft. - a new Australian record. The cave still continues and may give us access to the Junee Cave system. Water tracing a few weeks ago proved that the water from Khazad-dum does resurge at Junee. The fluorescein dye used covered the distance of 2½ miles in just eleven hours. Other swallets such as Niagara Pot and JF 10 which appear to be part of the same drainage system are still being explored. Surface traversing in recent months is giving us a clearer picture of the relationships of the swallets and potholes to each other. The survey has already shown that Khazad-dum is heading straight for Cauldron Pot and JF 3 and that these caves are nearly 100 feet higher. It makes the area of potholes surrounding JF 3 a most promising area for further exploration.

The club is already preparing for the coming Khazad-dum season and has just completed the manufacture of 240 feet of new ladder.

The team spirit and close friendships which characterized the club in the early days is with us today and membership stands at an all time high. We can look back with pride and satisfaction on our past record and look forward with confidence to the future in our state where still so much of its underground world remains to be discovered.

Albert Goede,
President.

Club News.

+ The club has received two long and newsy letters from Norm Poulter now in Adelaide on his round Australia trip. His vehicle is obviously much happier on the flat and straight South Australian roads and Norm Has already been on several trips with CEGSA. Nevertheless one can detect a touch of nostalgia in his letters for the wet and awesome depths of Khazad-dum. He is wishing us all the best for the coming season.

+ The production of eight new ladders has been completed except for the splicing of the ends which is being done by Rex and Sons. Special thanks are due to Denis Seymour who not only cut all the rungs and ferrules but also freely made available his home and workshop. Thanks also to Bill Lehmann who supplied the crimping device and quartermaster Brian Collin who supervised the actual production. One must also mention the keen members who in less than a month attended some or all of the four working bees to get the job done. The operation has seriously depleted club funds but leaves us well prepared for the coming summer season.

+ Cave numbering. The following caves were numbered by Albert Goede and Kevin Kiernan on Sunday, 22 August, 1971.

JF 30 - Cave with small abandoned stream passage approx. 200 feet long. Located uphill from left bank of Junee River approx. halfway between Junee Cave and road bridge.

JF 31 - Small stream intake on bank of Junee River below JF 30. Takes some river flow at times of high water and can be entered in dry weather only.

JF 32 - Small cave 40 ft. deep with talus and mud in hill behind Junee homestead and a short distance from JF 33.

JF 33 - Dead Horse Cave. Small chamber with skeleton of horse on floor. Small side passage continues another 15 ft. Located a short distance west of JF 32.

+ Prospective member.

Geoff Hall, 64 Bay Road, New Town, 7008.

+ Additions to list of financial members published in last Spiel.

CUMMINGS, Nick	c/o Hytten Hall, Uni. of Tas., Sandy Bay, 7005.	F.
NORBURY, Laurel		F.
TARBURTON, Shirley	4 Barossa Road, Glenorchy, 7010.	A.
Van TWILLERT, Henk	8B Braeside Crescent, Sandy Bay, 7005.	F.

Our apologies to Shirley who was incorrectly listed in the last Spiel as being unfinancial and in the June Spiel as having been accepted as a full member. Shirley applied for associate membership and was in fact financial.

TRIP REPORTS.

Exit Cave - 6-8/8/71.

Party: Bill Lehmann(Acting Leader), Sally Morris and Kevin Kiernan.

We left Hobart at approx. 7.30 p.m. on Frudaynight after collecting the key to Exit Cave gate from Albert. The trip in was fairly uneventful with the river level down the lowest that I have seen it since Christmas. We arrived in Camp 2 at approx. 3 a.m. on Saturday-morning. A small snack and then into our sleeping bags till approx. 10 a.m. After breakfast we headed via the Grand Fissure and Mud Passage to the Conference Concourse. The main object was to check on a possible extension past an aven found at Christmas time but not explored due to difficulties in climbing around the side as the passage entered the aven approx. 10 - 12 feet above the floor.

A short stop was made in the main passage to retake the photos of the cracked mud and the frog skeleton that did not come out too well on the last trip. The aven exploration did not take long as, after cutting a step in the mud with my geology pick I managed to scramble across onto the mud bank. The passage extends for about 50 feet and off to the right 15 - 20 feet past the crossover point there is another aven with a small(6" diameter) passage leading back to the passage from which the first aven was approached. There is a possible high level but it would need a braver man than I to climb up the mud wall to reach it.

After returning to the main passage we went on to the Last Straw to photograph the ringtail possum skeleton and then up to the Waddlen-splosh where Kevin took some more photos. Two other items of interest visited were the Straw Chamber and the short cut passage at the end of the main tunnel.

Biologically two interesting things were found; one being a cricket at the Cracked Mud suggesting easy access to the surface via the aven, and the other an Anaspides in the stream where the main passage rejoins it before the extension to the Last Straw.

We arrived back at camp at approx. 7.00p.m. and after tea had a natter before going to sleep again. Arising at about 9.30a.m. on Sunday we packed up and leisurely made our way back to the talus paying a short visit to Edies Treasure on the way. At the entrance side of the talus a stop was made for coffee, a few photos and a quick visit to part of the Hammer Passage. We then continued to the entrance of the cave. While Sally did a little ditch digging to help drain the large puddle just inside the gate, I rerigged the rope on the high level. We then went to the surface camp at the bridge for another cup of coffee. At this point we remembered that the gate had not been locked so while I went back to lock it Kevin did a quick trip up to where the D'Entrecasteaux River goes underground before re-entering the cave. We arrived back at the car just on dark and then headed back to Hobart stopping at Dover for food and Huonville for more food and fuel for the car.

As usual there were a couple of comical incidents on the trip both involved with people falling into the water. Sally succeeded in doing this in the main passage on the way out just before the talus, and myself off the high level entrance traverse while rerigging it.

Bill Lehmann.

Junee Area - 15/8/71.

Party: Peter Shaw and Philip Robinson.

No trip report received but a useful piece of work was done by running a surface traverse from Cauldron Pot to Khazad-dum and part of the way back along the track towards the track.

Plotting of the survey indicates that the entrance to Khazad-dum is nearly 100 ft. lower than Cauldron Pot and JF 3 and that Khazad-dum heads straight for this area.

Editor.

Junee Area - 21,22/8/71.

Party: Albert Goede(leader), Kevin Kiernan and (Sunday only) Michael Shield.

We left the car at 10.50 a.m. headed for Khazad-dum and arrived there 30 minutes later. Between 11.30 and 11.45 a.m. Albert injected 4.5 kilogrammes(approx.10 lbs.) of fluorescein into the stream after dissolving it in plastic buckets while Kevin endeavoured to capture the historic moment on film. We then moved up above the waterfall to collect water samples for chemical analysis and measure temperature, conductivity and pH. The temperature was a chilly 3.2°C. We left the cave at 12.20 p.m. by which time the fluorescein had virtually disappeared and arrived back at the car at 12.50 p.m. Therese then ferried us to Junee where we arrived at 1.20 p.m. The river was fairly high but no trace of fluorescein as yet. After setting up camp near the footbridge we went to the cave where more water samples and measurements were taken. It was discovered that the recorder had been vandalized. The cover had been smashed in and the copper capillary tubing cut and some removed. The instrument was taken out for repairs.

That night at 10.40 p.m. shortly after Kevin had taken the first two hour watch the first of the fluorescein started to come through. Water samples were then taken at regular intervals for later fluorometer analysis of fluorescein content. A little later Mike Shield arrived and we organized a roster system to collect water at half hour intervals throughout the night! Although the night was frosty a fire kept us comfortable. Visual observation by Kevin suggested fluorescein concentration reached a peak between 1.30 and 2.00 a.m.(Later fluorometer analysis indicated a peak conc. at 11.40 p.m.) At daybreak the river still appeared quite green and the colour remained visible till noon. The tracing indicates a direct and fast flowing connection between Khazad-dum and the Junee rising. The straight line distance of approx. 2.5 miles was covered in only 11 hours by some of the water. The peak concentration of dye was reached only 12 hours after injection. A surprising feature was the length of time the Junee River remained green - more than 13 hours. Later comparison of the samples with standard solutions showed a concentration of less than 1p.p.m. but greater than 0.1 p.p.m. when the dye concentration was greatest.

On Sunday morning we visited and numbered the two small caves near the bank of the Junee River as JF 30 and 31. JF 30 was explored a little further by Kevin who believes there are prospects for further progress. JF 31 was full of water but Kevin sat down to his middle in the water to fix a number to the only available rockface. We then visited the hill behind the Junee homestead and discovered a small cave(JF 32) as well as locating and numbering Dead Horse Cave(JF 33).

After lunch we returned to Hobart with Mike's car severely loaded down with equipment. A most successful weekend.

Albert Goede.

Weld River - 29/8/71.

Party: Philip Robinson(leader), Kevin Kiernan, Bill Lehmann, Graeme Watt, Jeanette Collin, Sally Morris, Henk and Gerrie van Twillert.

For 1½ hours the Old Port Davey track was followed to Mt. Bowes. From here the T.C.C. track heads down toward the Weld River 2 - 3 miles away. From previous trips the Weld was reckoned to be only a short distance from the end of our track. On this assumption no gear other than two slashers and Kevin's butter knife was brought along. Soon we reached the end. It rained heavily, we slashed and the scrub thickened. The tributary valley grew steep sided and several hundred feet high while the creek was too deep to follow. We were forced to criss-cross the stream and climb on several occasions. Two chain saws and several more choppers would have been most useful. As time ran out the decision to return was greeted with great joy. Much to our amazement an outcrop of rock actually 3 feet square was visible through the dank vegetation. This was eagerly bashed in the hope of finding dolomite. No such luck. We added less than ½ a mile to the track and the Weld River is still a long way off.

Philip Robinson.

P.T.O.

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cont. from page 6.

return valve which pushed a known volume of the atmosphere through sets of AVER gas detecting capsules. The capsules allowed direct measurement of the concentration of each gas by reading off the colour development against the scale. A multiplication factor of 5/4 was used as a volume correction for the pump.

The equipment, although appearing rather crude, gave reasonable results as relative concentrations were measured over a number of explosions using the A.N. mixture, gelignite, T.N.T. and P.E. The latter providing a known basis from which to start measurement. Separately, the actual concentrations were meaningless as there was not a definite volume in which the explosions took place. For general testing the bicycle pump was worthwhile considering the high cost of commercial testing equipment.

SAFETY:-

In his article Phillips states the explosive is very safe to handle. Government chemists and explosive experts in Western Australia, Tasmania, and Victoria suggest that extreme caution be taken in handling aluminium powder, particularly so in the case of new powder which has only a thin oxide film. Extremes of heat could cause spontaneous combustion. As the mercantile laws prohibit the carrying of aluminium powder except under certain controlled conditions, I think we should assume the worst and treat with caution.

In my opinion it is better to mix on site rather than rely on storage in air-tight tins. These pre-mixed batches seem to deteriorate if kept for long.

The use of aluminium foil cartridges is to be recommended as cardboard, waxed paper, plastic etc. will all produce varying amounts of carbon monoxide and carbon dioxide.

The use of Cordtex boosters results in production of toxic fumes and could assist in rendering a misfire more dangerous. Number 6 detonators have proven effective and are regarded by European explosive experts as sufficient.

As Phillips mentions in his article the explosive can be placed in a stoppered glass bottle and exploded underwater. This is particularly effective for waterfalls, efluxes etc. or even in very wet caves such as most Tasmanian caves where damp is a problem to the shot firer.

THE LAW:-

The law varies from state to state regarding the buying, use and manufacture of explosives. The experiments described herein require the acquisition of special permits issued after examination, and manufacturing has been undertaken under standard Ordinance Procedures.

Any person undertaking such a program should first consult with the Explosives Branch of their State Government.

My thanks to Ron Van Senten and Ian Martin, both of W.A.S.G., who provided much assistance in conducting these experiments.

P.W. Henley(signed).

A FUMELESS EXPLOSIVE.

P.W. Henley.

The September, 1970 issue of the A.S.F. Newsletter refers to a paper published by J.A. Phillips in the "Bulletin of the British Speleological Federation" and subsequently reviewed by Mr. E. Hamilton-Smith.

The experiments described herein are the result of field tests carried out in Western Australia and Tasmania during 1970 and 1971. Some historical, technical and explanatory notes are included in order to give a background to people unfamiliar with nitro-explosives.

INTRODUCTION:-

Nitro-explosives can be defined as any chemical compound able to explode, or able to combine with metals to form an explosive compound. The explosion is produced by the chemical reaction of nitric acid, either alone or mixed with sulphuric acid, upon any carbonaceous substance which may or may not be mixed with other substances.

The compounds and mixtures used, can be greatly varying in chemical composition, e.g. Cotton, glycerine, sugar, bezene - to mention a few. The most important compositions are the nitrated glycerines which give dynamites and nitrated celluloses which give gun cottons.

Nitro-glycerine is one of the most powerful of the modern explosives and is contained in dynamite. Gelignite, commonly used by farmers, road-workers etc; consists of a lesser amount of nitro-glycerine, gun cottons and varying proportions of woodpulps and saltpetre.

HISTORY:-

Nitro-glycerol was discovered by Sobrero in 1847 and first commercially manufactured by Nobel in 1863. However, it wasn't until 1866, after many accidents that Nobel thought of absorbing the dangerous liquid in absorbant earth forming dynamite. The absorbant earth used was Kieselguhr, a silicious earth consisting of diatom skeletons, many of which are tubular and so absorb the nitro-glycerine.

Ammonium nitrate (A.N.) was developed in 1867 by two Swedish chemists Ohlsson and Norribin. This compound was a mixture of A.N. and solid or liquid carbonaceous material. The competition between A.N. and dynamite resulted in the eclipse of A.N. until early this century.

The first practical commercial blasting agent using the A.N. system was introduced to mining in 1935. However, it was not until 1955 when Akremite was introduced that this low-cost system was fully appreciated. The solid explosive was found to work best in large diameter drillholes of 6" - 10".

It was soon realized that a liquid would have an advantage over solid Akremite and by 1958 A.N. became established in much open-pit mining. Instead of using a carbonaceous earth, common fuel oil is used as an additive in proportions - 1 gallon of oil per 100 gallons of A.N. (6% by weight).

The use of aluminium in explosives in order to increase "strength is well known. This "strengthening" condition exists because of the high heat of formation of aluminium compounds formed from rapid oxidation in an explosive reaction. It is the consideration of the use of this element that has resulted in the production of a non-toxic explosive described herein.

TOXIC PRODUCTS OF AN A.N. EXPLOSION:-

The great problem facing users of A.N. underground is the severe concentration of toxic fumes.

Figures quoted by Phillips in his article regarding exposure to toxic fumes are a useful guide to follow.

The following table of toxic by-products of A.N. explosions is based on Phillips' figures.

CARBON MONOXIDE:-

This gas has no means of detection by taste or smell. For a one hour exposure it is safe below concentrations of 800p.p.m., dangerous at 1,000p.p.m. and lethal for less than one hour exposure at 4,000p.p.m

CARBON DIOXIDE:-

As with carbon monoxide the gas cannot be tasted and has no smell but it can be suggested by an increase in breathing rate, sweating, headache and irrational behaviour. It is dangerous to expose to concentrations of 10,000 - 30,000 p.p.m. and prolonged exposure over 30,000 p.p.m. will result in death.

NITROGEN DIOXIDE:-

This is the most dangerous of all the gases, however the gas can be detected by irritation to the nose at concentration over 60 p.p.m. For concentrations of 75 p.p.m. it is safe for a one hour exposure. 100 - 150 p.p.m. in an hour is dangerous and concentrations of 200 - 700 p.p.m. are fatal over very short exposures.

TABLE

	Carbon Monoxide	Carbon Dioxide	Nitrogen Dioxide	Parts Per Mill
Safe	800	10,000	50	"
Dangerous	1,000 - 3,000	10,000 - 30,000	100 - 150	"
Lethal	4,000	30,000	200	"

All for a one hour exposure.

As mentioned previously, the nitrogen dioxide is the most dangerous gas. The gas reacts with water-vapour when inhaled and forms nitrous and nitric acids in the lungs and air-passages. Unfortunately, the syptoms appear 6 - 24 hours after exposure.

In some cases a certain tolerance can be built up by some people to what others would describe as large doses. Some miners working in quite high levels of carbon dioxide and carbon monoxide show no effects of continued exposure. One instance in Western Australia showed two people, used to mines, quite able to tolerate 3% carbon dioxide without discomfort. However, this is not a norm.

The explosive used by Phillips and described as relatively fumeless is a mixture of 18.5% aluminium powder and 81.5% ammonium mitrate. This gives a very powerful explosion with a heat value exceeding that of nitroglycerine. The by-products are small amounts of nitrogen dioxide, water vapour, nitrogen and aluminium oxide.

The interesting feature of this mixture is the formation of ammonia and hydrogen. The percentage of aluminium used will determine the gas-type present after the explosion. - See Table:

% Aluminium produces -	Hydrogen,	Ammonia,	Nitric Oxide.
0	0	0.1	0.1
2	0	0	0.2
10	0	0	1.2
15	0	0	1.0
20	0.1	0.5	0.4
30	0.2	2.0	0.08

Gases Produced in Explosion (in Mols) of 1 Kilogram of Mixture (Cook 1958).

The nitric oxide produced combines with oxygen from the atmosphere to produce the dangerous nitrogen dioxide.

By checking the table we can see that by using in excess of 20% of aluminium powder the resultant nitric oxide becomes diminished with an increase in the less harmful ammonia. The next step is to find out at what stage is the nitric oxide produced in safe amounts.

Chemically, nitrogen dioxide, ammonia and water-vapour react to form ammonium nitrite and ammonium nitrate - the basic compound used in the mixture. By examining the table a figure of between 15 - 20% aluminium(the balance ammonium nitrate) can be determined. Using 18.5% aluminium, 81.5% ammonium nitrate mixtures an explosion was made in a confined area in a Western Australian Cave which produced very low levels of the three toxic gases. Further experiments using a small glass phial of aqueous ammonia, which was pulverised during the explosion, resulted in the nitrogen dioxide and water-vapour reacting with the excess ammonia to form ammonium nitrate and ammonium nitrite.

The large amounts of aluminium oxide formed by the compound points to the inefficiency of using so much aluminium powder. The testing of the compound using less than 10% aluminium powder has yet to be undertaken although the aqueous ammonia additive may be the answer to the problem of nitrogen dioxide production. I.C.I. suggest 7% as the maximum amount of aluminium needed to produce the most economical explosion, however, their usage is unsuitable in confined spaces without the ammonia additive.

Without more sophisticated testing apparatus the experiments become pointless, and although testing by smell and taste is possible, I feel future experiments should be conducted using more reliable equipment.

TESTING APPARATUS USED:-

The apparatus used for detecting and measuring gas concentrations was very elementary consisting of a bicycle pump fitted with a non-