journal 1976

MENDIP CAVING GROUP

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The Journal. No.6. December 1976

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The Salt Mines of Wieliczka, Poland

by Peter Mathews

Situated in the South of Poland, the rock - salt mines of Wieliczka are among the oldest and certainly the most beautiful in the world. They are rightly one of Poland's main tourist attractions with some 300,000 visitors a year.

The small mining town of Wieliczka is about 12 kms. South - East of the old city of Cracow, once the capital, and residence of the Polish kings between the 11 th and 14 th centuries. The growth of Cracow and its importance in Polish history are indeed a reflection of the economic importance of the salt, produced from the local mines which were began in the 10 th Century. The concessions to the mine were granted to the Benedictine Monastery at Tuniec by Kasimir I in 1044. While until recently the Jagiellonion University in Cracow was wholly supported by revenue from the Bochnia Mine, which has been worked since 1251. Both mines are still of considerable economic importance, although the Bochnia Pits are thought to be due for closure; reserves of the two mines are estimated at more than 500 million tons.

Rock salt, or halite, is colourless when pure, but more usually it is only found combined with impurities, when it can be almost any colour. Halite may occur in one of two types of deposit; as normal stratified beds or as salt - domes. The latter are very common throughout Europe, especially Germany, where the plastic rock has been forced up at enormous pressure from considerable depths through fissures in the overlying rocks.

At Wieliczka and nearby Bochnia the salt was laid down in strata, although these have since shown considerable distortion. Typically such deposits were formed by evaporation of saline deposits trapped in partially enclosed basins and shallow bays. They are usually associated; as here, with other sedimentary rocks such as limestones and shales. The Wieliczka Salt Deposits were laid down during the Miocene Period, and are, in fact, located along the limiting northern foreland of the Carpathian Flysch.

The deposits at Wieliczka are found in two separate beds. The upper bed consists of salt bearing clays containing masses of halite known as green salt. These masses are irregular in form and vary greatly in consistency; they reach a maximum extent of 150 m. The lower beds, in contrast, are highly stratified. In ancient times only the upper beds were worked, and the tourist route is entirely located within these.

The beds are some 4 km long, 800 m broad and 25 m thick. Today the mine is worked on 8 levels to a depth of 315m -

1961 by persons unknown.

Grebe Swallet is formed in a fault which crosses Velvet Bottom and which lies parallel to a series of partly mineralised faults running to ruined Bleak House and beyond. The cave consists of a high rift at the end of which one can either go forward over a rock jumble or turn left into a short passage; water disappears beneath the rock pile at the intersection. The left-hand passage leads to a very tight squeeze and a stal lined chimney which once may have acted as a drain from the surface.

The present cavity appears to have been almost entirely formed by flood excavation. Considering the volume of material removed from the shakehole and cave, one might speculate on the existence of a way large enough to allow rapid transport of debris.

The deposits in this cave are of special interest. A section of original fill consists of mud containing fragments of limestone, reddish brown sand-stone and galena. The floor of the entrance rift is littered with interesting pebble deposits. Several fine hand specimens of galena were found in the cave. Silver was not detected in these samples which is surprising in view of the silver extraction plant in the old Charterhouse Lead Works. It seems that occurrence of argentiferous galena is very localised.

At the time of writing the entrance is closed by subsidence and the owners opposed to further exploration.

Middle Flood Entance Swallet

The entrance to this cave, immediately below the track, was discovered by Arthur Cox on the weekend following the flood. His attention to the spot was drawn by the glooping sound emitted from within. On Sunday 27th July Don Searle and Simon Knight cleared away subsidence of the bank and gained entry to a small cave.

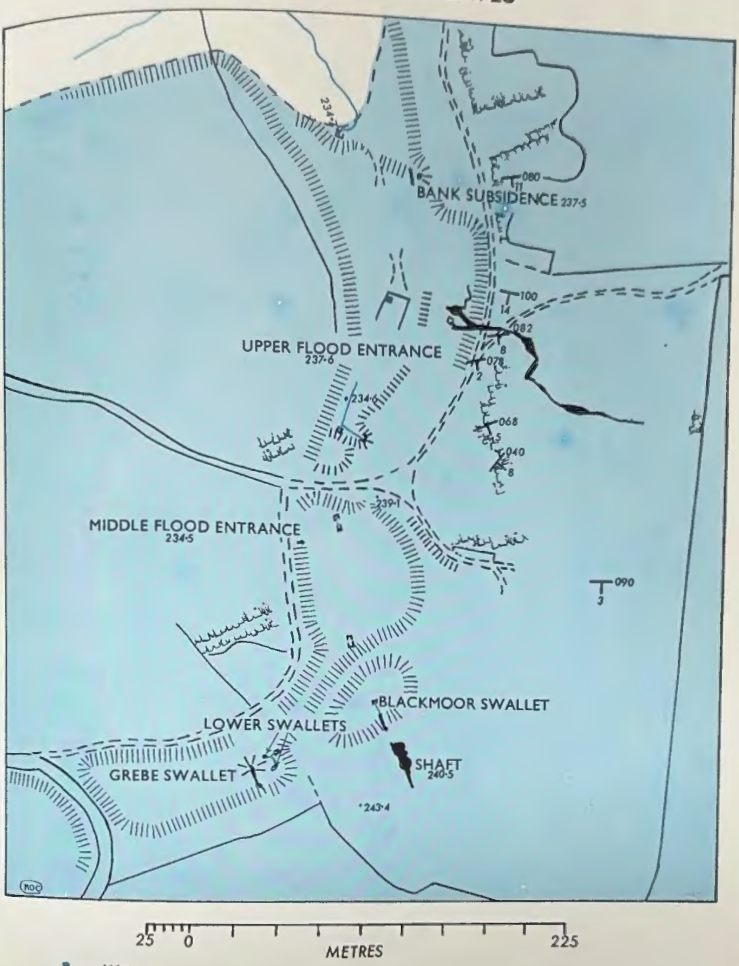
The cave is about 9m. long: a flat out crawl of about 4 m. leads to a chamber where one can stand up. In the floor of the chamber is a boulder choke, which on discovery, contained numerous sods of turf indicating the direction of water flow. The entrance passage has a roof of boulders cemented by calcite, but the passage leads to a chamber in massive limestone dipping towards the valley.

The site was dug for several weekends, and an air current was reported. At the time of writing the entrance is hidden by subsidence.

Upper Flood Entrance Swallet

The entrance to this cave became known to us on the 3rd August 1968, three weeks after the flood.

THE BLACKMOOR CAVES



A digging party composed of Richard Peat, Greg Smith, Roger Wallington and the writer were exploring a leat near Middle Flood Swallet when a camper named Peter Anderson enquired about a 'mine shaft' higher up the valley. The party unaware of any mine asked to be taken to it. I remember walking up the valley with curiosity dosed with a degree of sceptioism. On seeing the hole, however, all doubts were lost. The shaft did bear a superficial resemblance to a mine, being almost a perfect rectangle. Near the bottom, on the north side, a number of old timbers were visible. At the bottom, itself, a square flat roofed tunnel led away.

It was with rising excitment that I entered the cave realising that in it lay the key to the Blackmoor Drainage. After all the hard years of digging it seemed that at last we would be able to explore the great cave which collects the waters of the valley.

A short way in a drop of 3 m. offered a small but sporting climb[1]. From ahead came the voices of Roger and Greg, " This is it ". At the bottom of the drop a hole, which had just been cleared, gave access to a flat out crawl along a drainpipe. Progress along this could only be made by breaking small straw stalactites. We then came to another short drop where we emerged at the side of a small stream passage. This section was well decorated and was named the 'Stal Pot'[2] On this visit there was a heap of sand and turfs on the floor.

Downstream the passage rapidly turned froma crawl into a mud wallow; upstream the way looked fairly large. The downstream exploration revealed 17 m. of passage; the way on being blocked by a flowstone barrier behind a shallow pool. At roof level a slit only inches high continued; it contained a few straws bearing traces of flood debris.

Exploration upstream revealed a roomy boulder chamber the walls of which contained numerous protruding fossils. A side passage gave hope of continuation. Progress at one point was stopped by a band of chert completely dividing the passage. This was easily broken and progress continued to a small chamber containing a chert bridge and good calcite formations. It ended at an impenetrable sump. Blackmoor had closed on its secrets yet again.

Our exploration for the day had ended leaving us somewhat disappointed. The foll ing day a survey was undertaken and this showed that the cave was 83 m. long and 13 m. deep.

There was no evidence that water had flowed over the top of the shaft: the altitude was too high and no flattening of the grass was observed. The shaft presumably, must have been undermined by water from below.

End access was improved by digging mud from the wallow. This was stored in plastic bags and used to construct a dam at the Stal Pot. Attempts to lower the water level and the end of the cave by baling water behind the dam were unsuccessful, even when a hand operated sludge pump was used.

[1] now the first flight of steps. [2] now the second flight of steps.

The Reservoir Hole Team

In late '71 work was started in the entrance passages by the Reservoir Hole Team - consisting of Willie Edwards, Tom Evans, Frank Reynolds, Willie Stanton and Alan Trickey. The aim behind their work was to establish a walk-through to the final obstruction, where more powerful methods could then be brought to bear.

Events at this stage can only be described as bizarre for the Reservoir Hole Team were unaware of the Group's efforts and permission to dig, and the Group for their part were unaware of the Reservoir Hole Team and their permission to dig. By a strange twist this part of the valley had been sold since work originally started. The Charterhouse Caving Committee, who originally controlled access on behalf of Bristol Water Works were uninformed of this. The obvious solution to the situation was a joint dig, and in this way work continued in December 1971.

The excavation of the entry passage resulted in the removal of both the roof and the floor of the drainpipe. Slabs of rock from the roof were used to construct the steps down the first drop, and at the Stal Pot During this work a passage behind the first stops was sealed with spoil (2).

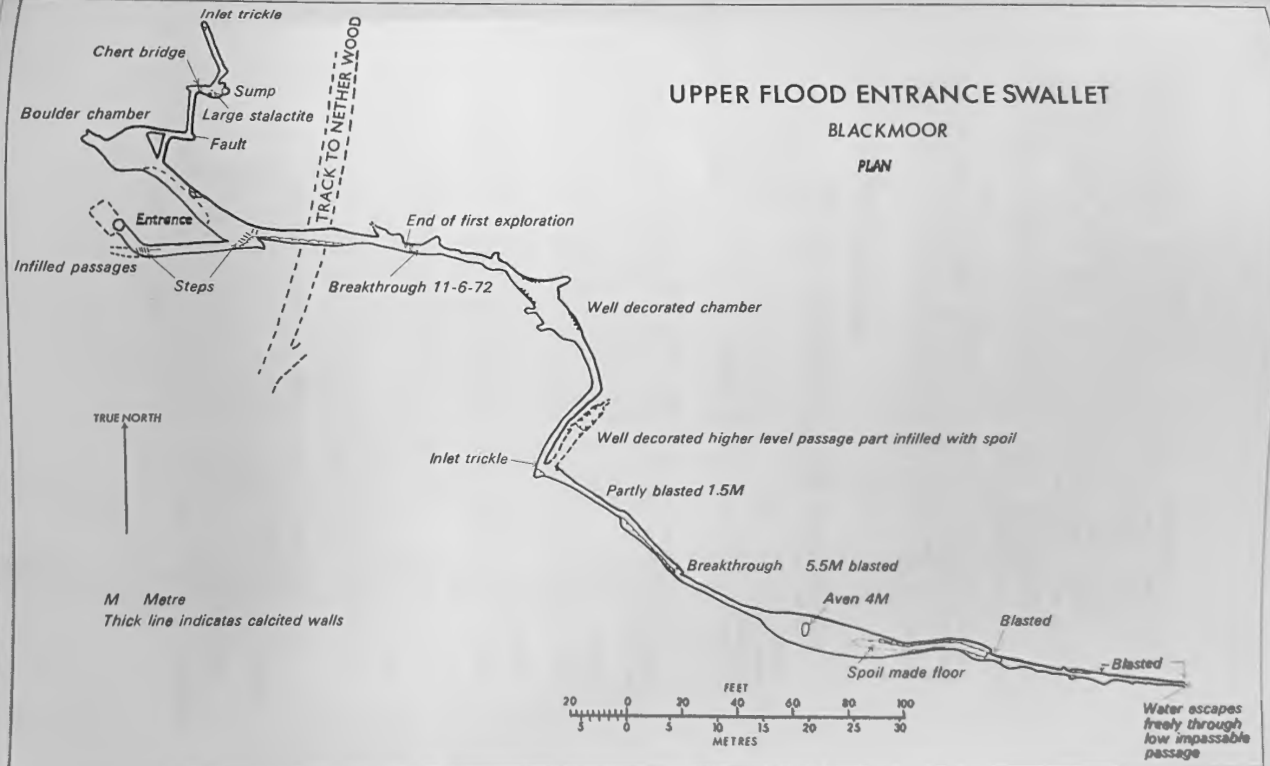
Before the commencement of this clearing operation there was much evidence of the presence of lead miners. Most of the roof above the first drop consisted of large boulders, once held in place by now long rotten timber work, succeeded by calcite cement. In the floor above the drop a board was found buried in the mud, while rope marks were discernible in the left hand wall above it. It is thought that the miners diverted water down the swallet, using it as a drain. As much of this water would have been derived from the buddle pits, used for washing lead ore, it would have been heavily silted. Presumably the swallet required some attention to keep it clear - the board appeared to be part of a sluice, the rope marks are thought to have been caused by dredging out the silt. Subsequent analysis of mud deposits in the cave indicate a very high content of lead.

Work on enlarging the passage continued and spoil was deposited outside the cave behind a wall of heavy boulders. Sections of concrete pipe were rested on the wall so as to preserve access through the increasing depth of spoil which was being dumped outside.

The First Breakthrough

Systematic work on enlarging the small entrance crawls was carried out by the Reservoir Hole Team working midweek evenings and the Group at weekends. By the Easter of 1972 the passage had virtually been enlarged as far as the terminal calcite blockage. Here the water trickled away in an inpeneratable fissure. It was clear that extensive blasting was the only effective means of making effective progress. After some further weeks work a stage was reached when water could be heard running away in the constricted passage ahead.

On the 11th June 1972, John MacMillan, Peter Mathews, Pat Walsh and Don Vosper forced their way through a flat out squeeze with


UPPER FLOOD ENTRANCE SWALLET
BLACKMOOR
PLAN
Inlet trickle
Chert bridge
Sump
Boulder chamber
Large stalactite
Fault
TRACK TO NETHER WOOD
Entrance
Infilled passages
Steps
End of first exploration
Breakthrough 11-6-72
Well decorated chamber
TRUE NORTH
Well decorated higher level passage part infilled with spoil
Inlet trickle
Partly blasted 1.5M
Breakthrough 5.5M blasted
Aven 4M
Blasted
Blasted
Spoil made floor
Water escapes freely through low impassable passage
M Metre
Thick line indicates calcited walls
FEET
METRES

little air space over liquid mud. They found themselves in a well decorated passage which enlarged into a roomy chamber festooned with formations. The chamber descended more steeply at the far end and closed down, but a way on was achieved with little effort. Beyond, a narrow passage was encountered which contained about 0.6 m of thixotropic black mud. On the first crossing the explorers were able to walk on top of it with ease; subsequently it became difficult to extract oneself. The passage lowered to a wallow and ended once again at a stalagmite known as the Stal Boss. The Boss did not form a total obstruction so that an extension could be seen on the far side.

Only one side passage was found, an inlet entering on the left hand side just before the wallow. It originally contained some superb formations, but was later used for storing spoil. A flood mark was noted about 0.7 m above the floor at the top of the inlet.

Subsequent Work and Discovery

The next breakthrough came on 18th August 1972 when Tom Evans, Frank Reynolds, Willie Stanton, Alan Trickey and the writer passed the Boss into 5 m of passage ending in another almost total blockage. Water flowed away through a small slot at the base of the obstruction, and trouble with blockages was frequent - there was some danger of the approach passage flooding rendering the face inaccessible.

After some six metres tunnelling through solid rock another breakthrough was made by members of the Reservoir Hole Team. The passage widened and the floor dropped revealing a long descending chamber. From here the passage continued for 10 m ending in a horizontal slit above the dam of glutinous mud - beyond the stream could be heard cascading over a drop. It was apparent that open cave did not go far as tell tale flood debris was deposited on the roof.

Once the lip of the dam had been breached the obstacle was easily passed, and on the 3rd of December a short drop of 2 m was descended. Almost immediately the stream vanished in a loosely filled floor; progress was halted again.

Ahead the old pre-existing passage was entirely filled with an ancient deposit composed mainly of calcite with pockets of red clay and occasional voids. The infilled passage was sometimes narrow so that bedrock also had to be removed. Below the clay a stalagmite floor was reached on occasions. Drainage of water was again restricted and the passage often became a canal.

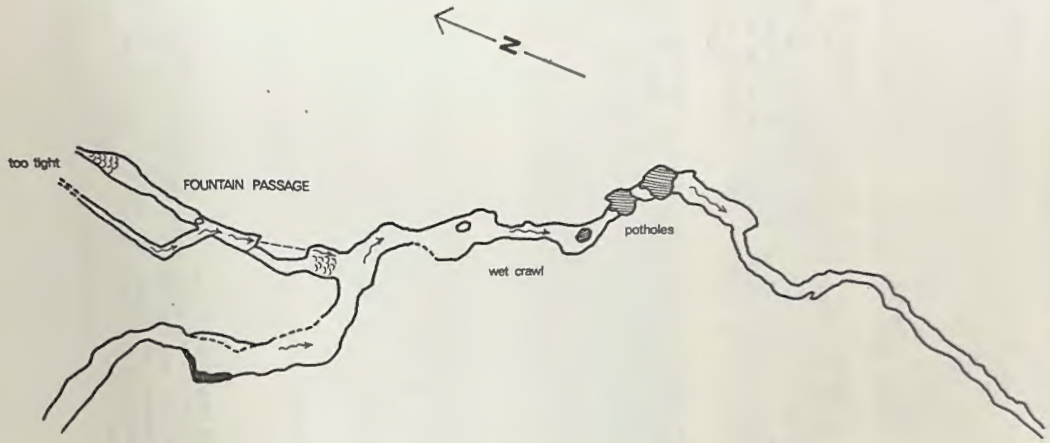
In dry conditions water was seen to drain down two excavated holes on the right of the passage, presumably finding a route through sediments under the floor. This feature of water flow below the stal floor appears to occur throughout the cave. At different stages dams were constructed - at the first breakthrough point, just after the Stal Boss and in this lower section. Dams were made both to keep the working face dry, or at least free from flooding, and to wash away the mountains of mud.

Surveyed to CRG Grade 3 by:
N Brooker
M Cotter
G Smith
D Vosper

Drawn by G Smith

Scale: 1cm represents 10feet

FOUNTAIN PASSAGE in relation to Downstream Series, AUGUST HOLE



To date about 235m. of new cave have been discovered, at a cost of excavating 15m. of totally blocked and 25m. of partly blocked passage.

References

1) A.J. Knibbs, M.C.G. Jnl. No.4, 47-8, 1967
2) P.R. Mathews, M.C.G. Nl. No.80, 1969

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Digs and Discoveries in August Hole

by Greg Smith

The following is an attempt to record MCG work in the cave since 1967.

Fountain Passage

Lying just upstream of the low crawl before the Pots the site was first contemplated by Vic Ingram, Tony Knibbs and the author early in March 1968. We had previously known the cleft and its adjacent slope of calcite, regularly spilling a small stream, merely as a useful spot for drinking water. A more recent examination revealed that behind the infill there could be a sizeable inlet passage. So we started digging, first in the cleft, then at the top of the slope, eventually concluding that a couple of charges would be needed to clear the way properly.

A shortage of explosive prevented an immediate return but during the next month Tony applied some plasters to the obstruction. Vic one Monday, on a solitary clearing trip, discovered that very little prevented entry to a black space beyond. He carefully covered the hole to prevent discovery by another party, then thoughtfully waited until the three of us had the opportunity to return together.

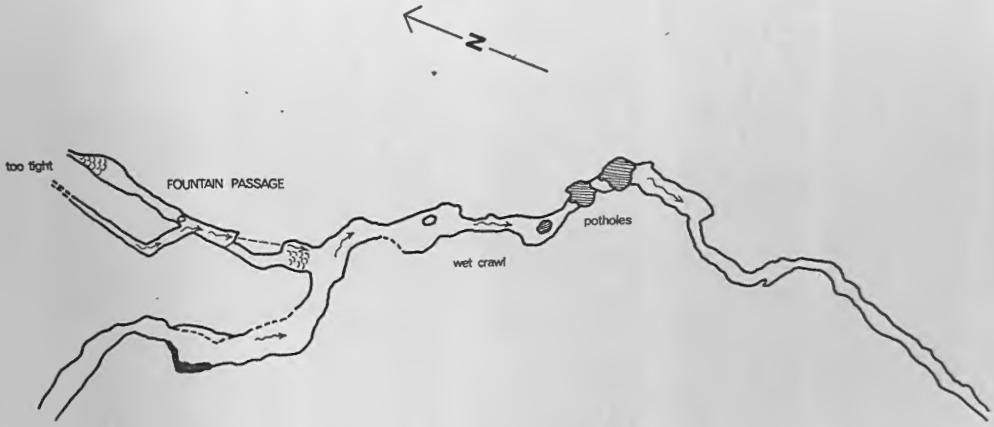
Heeding a phone call from Vic our party, with the addition of Roger Wallington and Dave Hill, shot down the cave on the following Saturday. Upon removing the debris placed by Vic, plus a little more, we had the fortune to enter a passage carrying the inlet stream. A crawl past some fine formations on a bend led us into a small rift passage which, after 13m., became too tight to follow. By the time those of us in front had performed the awkward task of backing out, Tony had found a fist size hole between the formations on the bend - it appeared

FOUNTAIN PASSAGE in relation to Downstream Series, AUGUST HOLE

Surveyed to CRG Grade 3 by:
N Brooker
M Cotter
G Smith
D Vosper

Drawn by G Smith

Scale: 1cm represents 10feet



to be draughting. Feeling that this ight be our "Forbidden Grotto", we decided to demolish the offending formations.

Using a sledge hammer the operation took maybe two hours by which time five exhausted bodies joined the heap of rubble on the floor. However, the hole, now large enough to admit any head smaller than Tony's, allowed a tantalising view of a low passage, adorned with straws and crystal pools. Clearly this passage, the original route of the old inlet stream before it ceased to flow, had been through long periods of heavy deposition. With the prospects of entering open passage on the next occasion, we departed in high spirits.

On the next trip a much larger party returned for the breakthrough. The hole was enlarged using a hammer and chisel, but before entering the new passage everyone stripped off muddy clothing and boots, lest the formations be soiled. After 10m. of delicate crawling and climbing by Vic, doing the first reconnaissance, he reported that the way on was blocked by a large flowstone cascade and that there was no hope of any further progress. We all visited the end and sadly agreed.

To this day no further work, except surveying, has been done in Fountain Passage. The Flowstone is a large, uncompromising mass, with only a very small hole at the top. Preceeding this, the passage is too restricted to allow stacking of debris, and such work would completely desecrate curtains and pools - the crystal pool at the end of the passage is one of the finest formations in the cave. The tight by-pass rift which carries the present stream might repay some attention but it will require patient widening.

Sand Passage

Immediately following the floods of 1968, several parties visited Sand Passage and concluded that water had passed through it. Bill Jones and Vic Ingram started excavating the clean water washed fill underneath a cemented rock roof to find the passage rising into a choke. This was attacked with a long crow-bar and eventually all the loose material overhead was removed, revealing a small chamber. Here a floor of boulders and clay ascended to meet the roof at the base of a large stalagmite boss.

It seems likely that this will enter the large boulder filled chamber seen upstream of Inferior Hole.

Beyond Inferior Hole

Although it had been noted for some time that often a small stream trickled down through Inferior Hole into a small space beyond, it was not until 1971 that we decided to blast past the slot. A sequence of digging trips enlarged and extended the passage to a point where a low water filled tunnel could be seen. This had minimal airspace and was finally pushed by John [illegible] into a canal, with two further ducks. The passage beyond this led to a squeeze into a

tiny chamber, whilst a branch crawl to the left narrowed down after a short distance.

Unfortunately the initial dock into this series is not only constricted but also sumped for much of the year. Never the less work continues in both terminal passages.

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POLLCAN (Crooked Hole)
Doolin, Co. Clare.

by Bill Jones

Eighty five metres east of the local spring in Fisherstreet, at the edge of the Limestone Shale boundary, lies a three metre diameter depression in the Cranagort Stream. Normally this tips over a shale sill to sink at its base and form a pool in the depression, but a pipe has been laid to carry the stream over the sink. During the early part of this century the pool was used by the local residents for washing clothing, and we were told (after the excavation) that in times of heavy rain water rises from the sink.

In June, 1976, having obtained permission to dig, the boulders, together with numerous leeches, were removed from the base of the sill. At a depth of one and a half metres a half metre diameter entrance was revealed in the underlying limestone.

The entrance squeeze, initially a groove in a well scalloped bedding plane, widened at the head of a four metre deep pot, formed in a rift running roughly from North to South. The descent of the pot, with its overhanging lip and smooth walls was awkward but swift. To our disappointment the way on at the bottom was choked with gravel. The rift continued in a southerly direction at floor level, past another small pot, only to end at a narrow slot fifteen centimetres wide. Through this could be seen a small chamber with a partially deflated plastic football at its centre! Several plastic bottles were also observed jammed high up in a narrower part of the Rift, and it seems likely that these items were carried into the cave from below by an upwards surge of water, possibly from the lower reaches of Doolin River Cave.

After investigating every nook & cranny a quick survey was undertaken using a length of rope, a compass, and four portions of a Cornflakes packet. We concluded our activities by returning the entrance to its original condition, bringing the time taken for the discovery, exploration and surveying of Pollcan to under four hours.

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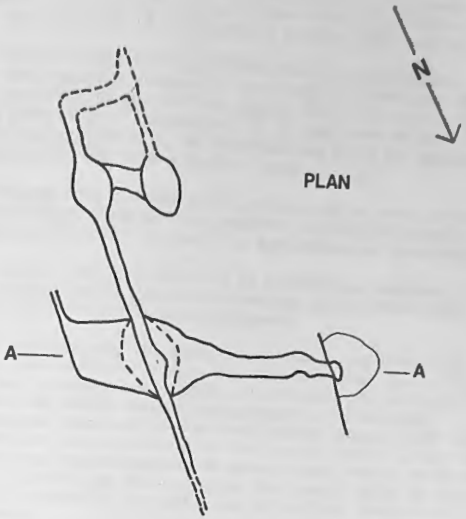
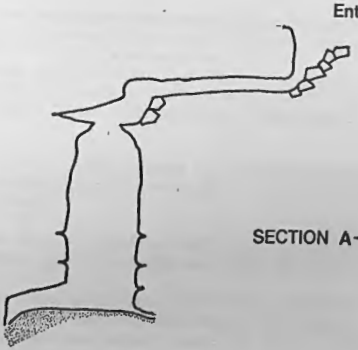
POLLCAN, Doolin, Co. Clare

Surveyed by Bill Jones & Greg Smith to BCRA Grade 3B, June 1976
Scale: 1 cm represents 1 m





A Magneto/ Capacitor Shot Firing Device

by Bernard Reeves

A fully charged nife cell is quite suitable for firing a single detonator under normal conditions. But underground, in a damp or wet atmosphere, with ancient firing wires, a cell just about to extinguish its glow will be found not to perform with such efficacy.

After a spell of shot firing difficulties by some diggers, especially with multiple charges, it was felt that what was required was an exploder with higher voltage capabilities. Preferably this should be a power source independent of the cap lamp battery. The latter point was brought home on observing one would be explosives expert lighting his way with a carbide lamp!

It was obvious that a capacitive system would be best, being charged by a battery inverter or a magneto; a straight magneto system having problems of availability and mechanical fabrication.

Looking through the back pages of an electronics magazine, I found advertised a pocket dosimeter charging device which seemed suitable for modification to meet our needs.

A word of explanation, the pocket dosimeter is an ionisation chamber come electrometer built in the form of a pen. One of the electrodes is a quartz fibre capable of movement; its deflection thus indicates the total charge. On exposure to an ionising radiation the dose received by the electrometer brings about some charge leakage and hence movement of the quartz fibre. In this way the total personal radiation dose is recorded and can be read at a glance. In order to use the dosimeter the quartz fibre is initially charged to approximately 300 volts. And it is this charger which is of interest here.

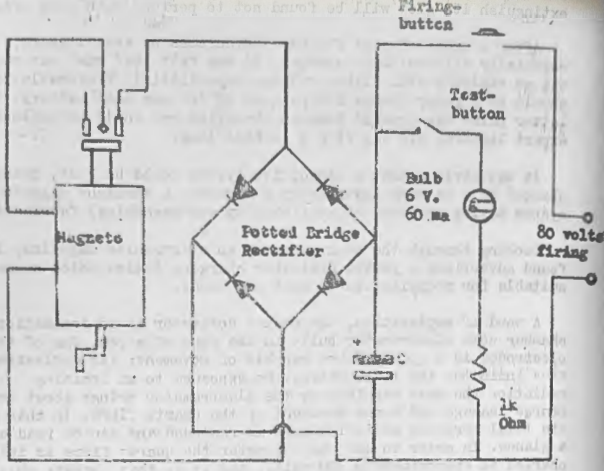
The high voltage rectifiers and condensers were replaced with a 200 P.I.V. potted bridge rectifier, and following some shoe-horning, a large 10,000 micro Farad. electrolytic condenser. Since the condenser terminals were too long for the case a metal mains socket box was bolted on to the case to contain these. This box was also used to hold the main output terminals, switches, and a condenser voltage indicator.

Testing showed that, after running in the electrolytic condenser, 100 turns of the magneto handle would give a 70 - 80 volts charge on the condenser terminals

A single charge of the capacitor was found capable of blowing 12 volt 2 watt bulbs, quite reliably one after the other.

The exploder has been used quite effectively in Group digs for both single and multiple charges. The charger has always operated perfectly first time and has never given rise to a mis-fire.

The Magneto Exploder



C is a 10,000 micro-Farad, electrolytic capacitor, 100 volts working.

The switch gear indicated at the end of the magneto is contained within the main housing, and is actuated by the magneto windings.

Towards Conservation ?

by Peter Mathews

In a conventional conserved site such as a bird sanctuary or nature reserve it is common practice to protect the equilibrium of the environment by limiting the rate of visitors. Thus, allowance will be made for a certain number of visitors per season with usually a limit to the maximum number in any one day. If the rate at which visitors pass through the site is arranged to be compatible with the natural recovery processes then, indeed, the environment will be maintained in a balance condition.

It does seem to be a popular notion in some circles that such methods may also be used underground. The fallacy in this argument is that caves do not possess a natural short term recovery process other than flooding, and even this cannot repair that which has been smashed.

The cave is unable to recover from the after effects of visitors, and damage may be regarded as permanent. One interesting observation here is that damage is independent of the rate at which visitors pass. That is to say damage is a function of the <u>total number</u> of visitors, and not their frequency. It does not matter if the number of visitors per year is restricted; the extent of damage that ultimately takes place will be unaffected. This condition will merely be arrived at, say, in ten years instead of two or three. The end result will be the same.

Following its discovery, deterioration in a new cave will at first be quite rapid; slowing down as less is left to become soiled and broken. Eventually an equilibrium condition will be reached, after which further damage can be performed only with difficulty i.e. vandalism.

In attempting to conserve a cave one should consider events not over the next few years, but the next few centuries! We should not be making attempts to slow down the rate at which our caves become spoilt; we should be stopping it happen.

A high rate of visitors through a cave, associated with rapid deterioration, has indeed one potential advantage in that those responsible for the cave might be prompted to action. Damage occurring at a slower rate tends to go by unnoticed.

The counter argument is that a cave protected by access restrictions is preserved for future generations. The hope is that better education will lead to a higher standard of caving. This hope is a forlorn one. It was shared notably by Eli Simpson. Shortly after the BSA discovery of Lancaster Hole he took lease of the entrance and refused access to all on the grounds that this was the only way to preserve the cave in pristine condition. His actions have had no bearing whatever on the conservation of the cave.

The aim of a conservation policy should be directed towards reducing the level of ultimate damage without imposing undue restrictions on access.

We might reasonably ask for a limit to the size of a party for there can be little doubt that very large parties result in both careless damage and increased vandalism. Carbide dumping should be banned, and this is best done by insisting on electric lamps as the main form of lighting. Caves protected by a leadership scheme appear to fare rather better than their unprotected neighbours. One might argue that novices ought to be prohibited from visiting the better grottoes, but this is difficult to enforce and presupposes that one has a right to bar access to another.

The cave itself might be considered for it may be rendered less vulnerable with little effort. Markers and tapes are respected by most cavers, but the muddy tape buried in a pool is no barrier to those that miss it. Perhaps this is an argument that these should be more substantial. A tired caver is a clumsy one, and fixed tackle in the more vulnerable areas can do much to protect against damage. Here one encounters the old argument of whether a cave is for sport or study. The former view so often won in the past that it is now only too easy to present a case for the conservationist. The author is unaware of any action on the part of a club to by-pass a set of delicate formations or to seriously consider their protection by grilles or whatever.

Perhaps the greatest single reason for the deterioration of caves in this country is that no-one is prepared to admit responsibility for them. It is no coincidence that our most popular caves should be the best protected, and should be making money. The average club has a strong interest in discovering and exploring new cave. They will often go to considerable effort and discomfort to find it. But when they do they immediately pick up tools and move on to the next sight. A notable exception to the general rule is the example of St. Cuthbert's Swallet which has remained under the protective wing of the Bristol Exploration Club - in spite of numerous visitors it has remained in better condition than any equivalent cave in the area.

Unless there is a change in the attitude of club cavers, or in the administration of caves then there would seem to be little hope for the preservation of our remaining grottoes. And here one might reflect on the growing tendency towards general access controls under anonymous regional bodies; bodies where everyone is concerned, but no-one really cares. Access control through the local regional council is the easy solution to every access problem - but who looks after the cave?

Each time we come back to the original explorer, for if he doesn't take an interest in his discovery, who else will? If we are to steer towards conservation then the discoverers of a new cave must accept their obligations. They must consider their cave and its future - or its fate.

AN INTERIM REPORT OF THE EXCAVATION WORK CARRIED OUT AT THE BONE HOLE, CHEDDAR GORGE, SOMERSET, BY THE MENDIP CAVING GROUP, FROM AUGUST 1967 TO AUGUST 1976

This report is intended to give a description of the cave, together with an outline history of the work carried out since its re-discovery in the 19th Century.

The site is reached by turning to the North from the roadway in the Gorge, up the Black Rock Quarry Path, about 200 yards down from the Black Rock Gate. After some 50 yards, a short scramble up a steep ill-defined track to the left brings one onto a grassy plateau overlooking the two arms of the Gorge below. On the West side of the plateau, well-hidden by undergrowth, is the small rift in the hillside which leads into the present first chamber of the cave. At the right-hand end of this rift, just to the northern side of a tree overhanging the abyss, is the original point of entry from pre-historic times until excavation work started in the late 1830s.

Until that time, the rift was entirely roofed-in, leaving only a small overgrown slit giving access to a precipitous drop into the cave. It is quite easy to walk, even now, within a few feet of the cave, without seeing it. Hence, it is quite understandable that, for hundreds of years, no-one knew of its existence, or, if they did, they did not make any written record of it.

It is not known precisely when or by whom the cave was rediscovered, but the first recorded work took place in or about 1837. This was in the nature of an archaeological dig carried out by a Mr. William Long, with the assistance of unknown persons. This William Long is known to have been one of the local landowners, and possibly one of the family of Longs from Wiltshire, who, for some time, held one of the manors of Cheddar. He is also known to have been an antiquary, and it was he who presented a paper at the Newcastle meeting of the British Association for the Advancement of Science in 1838. A summary of this paper is given in Appendix I of this report.

Long, after giving a description of the cave as he found it, reports on the finding of the bones of animals of many species, including Man.

Later, it is rumoured that Prof. William Boyd Dawkins did some digging here, and one calvarium is extant at Oxford, although it is not known by whom it was presented.

In 1889-90, according to the Geologists Association Proceedings, a party visited this site in the course of an excursion to the Mendip Hills. They were told that Boyd Dawkins had indicated this rift as being proof of the way in which gorges were formed in limestone; a cave becoming unroofed by stages from its mouth. It is however, more likely that the "recent blocks" which had fallen were the work of the famous Richard Cox Gough and his sons, who, at this time, were in the habit of removing stalactitic deposits from this cave, often with the use of explosives for the manufacture of souvenirs for the benefit of his visitors to the show cave at the lower extremity of the Gorge.

Thus it is said that, after the combined efforts of William Long, who opened up the entrance to facilitate the removal of the many tons of soil in which the bones were embedded, and the Goughts, we are left with the remains of a small once well-decorated limestone cavern.

So now we come to the present day and the involvement of the Mendip Caving Group.

In June, 1967 the M.C.G. dig at Cooper's Hole, near the Coach Park for Gough's Cave, was suspended due partly to flooding and partly to waning enthusiasm after so many year's work.

Two of us, who had been engaged in the Cooper's Hole Dig were walking over the Cliffs and descended the path which passes close to Bone Hole. We had then no idea that there was a cave there. We entered the rift and were surprised by the very size of the cave mouth and the appearance of the cave to be leading downwards at a fairly steep angle. At Cooper's Hole we had been seeking an entry to the underground streamways of the Cheddar area, and yet here there appeared to be a ready-made entrance.

The floor was covered with a mass of litter of compers and picknickers, whose decaying food remains were somewhat odoriferous.

We later consulted N. Barrington's "The Caves of Mendip" and Harry Balch's "Cheddar, its Gorge and Caves" and these led us to further research back to the report of William Long.

A further visit was made to the cave, during which we removed a lot of litter and examined the cave more closely. There was some indication that the cave was following down the dip towards the South, and at one point, since named "Flake Dig", an intermittent draught was felt, which way synchronous with gusting of the wind across the rift outside. This indicated to us that one of two explanations would fit this phenomenon. Either there was some close connection with the surface outside, or there was some large cavity nearby which was being partly evacuated by the venturi-effect of the wind across the cave mouth.

The former explanation was the less likely, since the whole of the cave floor appeared to be sealed by mud, and there was no obvious opending in the ground above. The second theory was supported by the observation that after stronger gusts of wind at the entrance, the draught was more violent and was followed by slow inspiration during the lulls. Was there really a large cavity close by?

We had read in "The Caves of Mendip" that Bone Hole "had contained" important remains as if implying that they had all been excavated by the 19th century diggers. But was this true?

In July, 1967, we approached the tenant of Piney Sleight Farm, and the head landlords, the Bristol Waterworks Company, with a view of obtaining permission to dig to find the answers to these two questions. Permission was duly granted and we started work on 1st August, 1967.

We first made a survey of the area first to be dealt with. This was the main chamber, from the foot of the huge jammed boulder to the North, to the foot of the debris-pile to the South. We then divided the floor into three sections, East Central and West. The floor was then lowered in each section in turn by approximately one foot until the first signs of the previous excavations were found, in the shape of small bones and fragments which had apparently been discarded in some numbers.

It was very slow, laborious work, since each rock and bucketful of soil had to be carried out to the edge of the hillside, this involving a steep, slippery scramble up the slope of mud. A further complication which hindered us that persons unknown were in the habit of digging in the northern extremities of the cave between the week-ends, often dumping their spoil onto our dig area. This occasionad us to have to cover up our area, especially when bones were exposed, at the end of each week-end's work.

The overburden first removed was a layer of soil and sharp rock fragments - typical of frost-shattering - intermixed with which were large quantities of glass bottles and their slivers. The size of the boulders was generally small - up to football size - though a few were larger, weighing up to, perhaps, one hundredweight. These larger rocks were sometimes long enough to penetrate two or three digging layers; hence the term "approximately one foot" used above. This occasioned much difficulty in determining to which layer the bones should be assigned. However, since all the bones to this point had been already clearly disturbed, it was thought to be not all that serious a problem.

The depth of overburden removed before reaching the first bone-bearing layers varied from four to eight feet; the original floor having been in the shape of a bowl, and the surface of the 19th century dig being found to be almost level in the East and West sections and virtually non-existent in the Central section.

After reaching the upper surface of the previous dig, it was found that the infill changed abruptly. The bones and rocks were lying in a soft grey-grown soil which, for the most part was dry and crumbly, although there were some patches of mud where drips from the roof maintained a supply of water.

The fragments and small bones were mixed in this soil, and there were still a number of glass bottle fragments, although now these were now of a very much thicker type of glass. Some metal items were also found:- a piece of an old oil lamp, the broken-off end of a cold chisel, and an iron hook, though this latter may well prove to be more ancient than the 19th century.

Only two more part levels were removed from the East and West sections before we came upon the first obviously undisturbed bones. Again, a complete and obvious change in the infill was noted. It was now a homogeneous clayey nature, of a light brown to yellow colour and it now filled completely every interstice between the rocks and bones. The bones, too, were of a quite different appearance. They no longer were dried-up and coated in a greyish dust, but had the appearance of being almost of freshly-slaughtered animals. Care was taken not to disturb them, and they were covered with a layer of soil and then a goodly depth of rock, to discourage any attempt at their depredation.

In the Central section, we dit not reach any undisturbed remains, and very few disturbed items were found. It would appear indeed, that some sort of trench was dug across the cave at the location of the Flake Dig. This has been partly borne out in our later work, by the finding of recent items at a curiously low level in Flake Dig itself.

This work gave us the answer to our second question. There were certainly ossiferous layers still in the cave, going to an unknown depth. We had located them and could pass on this information so that any further examination of the contents of the cave would be facilitated and despoliation of the remains might be prevented by the very knowledge of their whereabouts.

For our first question, the answer lay in attempting to dig at the East Wall, adjacent to the rock flake from near which the draughting had occurred.

We tried to sink a shaft at this point, using the wall and the inside of the flake as the boundaries. After reaching a depth of some four feet, we wereforced to give up due to the very great difficulty found in lifting large rocks when in the inverted posture. However, whilst engaged in this impossible task, a candle was accidentally dropped down between the rocks, and by chance, remained alight, at a depth which we estimated was about twelve feet below. By peeping between the boulders we could see by the light of the candle what appeared to be a passable leading off to the South-East, and dipping at an angle of some 45°. We estimated that this passage, if it continued at the same dip and at the same angle, would pass beneath the roadway in the Gorge at a depth of some twenty feet, in the vicinity of the junction with the Black Rock Quarry path.

Hence, we were left with a tantalising dilemma about the quest for the answer to our first question, as to the existance of a large cavern in the vicinity; a further factor made our frustration only the harder to bear.

During the course of the flood water rampage in the Cheddar area in July, 1968, a section of the road surface, some thirty feet in length had been lifted up, and being separted from the metalling below, had been carried some distance down the Gorge from its original position. Early on the following morning, there were seen three holes in the metalling, close by the junction of the Cliff Road and the Black Rock Quarry path; from these holes a mixture of air and water was blowing with considerable force.

This, taken together with our observations in Bone Hole, made it a rather disappointing termination to our work, since to attempt to pursue the Flake Dig would, we were sure, have resulted in the serious disturbance of valuable archaeological remains. This we were not willing to risk.

This was now in December, 1972. For almost a year no further work was done although we just could not stop thinking (and talking) about Bone Hole.

In this hiatus, we re-read the description of William Long and considered his statement that "the fissure of rock by which the cave is entered is about thirty feet in length; a perpendicular descent; thence, bearing to the West is the opening which leads into the cave; from general appearances, and from what was afterwards discovered, this does not appear to have been the original entrance to the cave, and was most likely made for the purpose of admitting light and air".

He also stated that "the entrance to it is from the flat surface and not from any broken chasm in the declivity of the rocks".

We spent many hours in the discussion of these statements, and came to the conclusion that to put his words into more modern usage, it would be put thus; The entrance to the cave is a perpendicular descent from the flat surface of the ground into a rift which is about thirty feet in length at the bottom of the drop, an undercut of the West wall leads down into the cave to the North.

So, if he is correct in his description, we could only identify the entrance as being near to the tree which now overhangs the rift. Here there is confirmatory evidence in the form of flowstone deposit which stands from the very lip of the drop and continues ever wider, as far as the surface of the spoil-heap.

As to the thirty-foot rift, this would have been a pretty precise measurement, if the closed-in rift had been measured from the pitch to the vicinity of the small tree at the southern end of the rift, where it is likely that the roof would have met the floor.

However, when he comes to the height of the roof of the cave, his "sixty to seventy feet" is so exaggerated from the actual twenty-four to twenty-eight feet, that we can only assume that without the present daylight illumination, and with only an oil-lamp to penetrate the gloom, he made a rather wild guess.

His suggestion that the hole by which he entered was made to admit light and air suggested that the hole was quite small. But the curious idea that this was not the original entrance leads us to wonder what it was that caused him to take this view.

Was it that he was persuaded by the prevailing ideas that the Biblical Flood was responsible for the presence of animal and human bones, the animals being of extinct species? Or did he find some evidence that this cave was used as a dwelling, requiring light and air?

His description of the North end of the cavern mentions "an arched way into another smaller chamber". Since he makes no observation of the huge jammed boulder, it can only be assumed that he was referring to the way over, rather than under the obstruction. This gives rise to the question of how high was the floor at that time. Was the rock merely forming part of the floor, and therefore not remarkable?

He also states that, in all cases, the human remains were found beneath the animal bones, and claims thatthe species identified included bear, deer, ox and horse. From our own observations we would agree with these, with the possible substitution of boar for bear. There certainly does not appear to have been any other clear separation of human from animal remains so far.

He then goes on to say that "by comparison with Mr. Beard's extraordinary collection at Banwell, they are exactly similar and apparently of the same era". This a quite reasonable comparison, although, as remarked above, we have as yet no identification of bear.

Having considered these points, we were able to form some assessment of William Long as an archeological observes, and to get some idea of the cavern as he first saw it. We next returned to the text of W.B. Thornycroft in his "the Story of Cheddar; its Gorge, Caves and Ancient History".

Thornycroft summarises Long's account somewhat inaccurately and then records the remarkes of the eminent geologists present at the B.A. Meeting. He then expounds his own theory for the presence of bones in the cave.

He was of the opinion that this was a repository of victims of local wars, and concludes "we are borne out in our surmise as to the origin of the deposits of the remains of man in this cavern....." as though his ideas were somehow proved to his arguement.

A statement of Thornycroft arouses some curiosity as to what unknown source he seems to have had access. He says that "It has only partly been explored, but it is hoped that the gentleman who has been at the expense of the examination, or the gentleman on whose land it is situated, will gratify his own taste and the curiosity of the public by completing the work he has so generously begun".

This was written in 1949, not 1849! To whom was he referring? Certainly William Long would be no longer interested in Bone Hole.

He also goes on to state that "twelve or fourteen human skulls were entire and sound, and fragments of a much larger number in various states of decay".

How do we account for the increase in the number of skulls from Long's figure of nine? It may be explained either by accusing Mr. Thornycroft of exafferation or by his having had access to excavation reports which are not presently traceable. It is more likely to be the latter case, having regard to his obviously thorough research into the matter of his book.

A further point towards his having had more information than that provided by Long's report, is that he also mentions that the rift had been enlarged for the removal of the spoil.

It would be most interesting to us to find if such another source of information exists.

Our studies of these reports gave us one further point of interest. This was Long's brief mention that he found a further and separate deposit of bones "at the head of the cave". These he said, "were more recent", being of fox and sheep.

Having already found the extent of his original dig, we were encouraged to try to find the second area of bone deposit. This could from his words, most surely only be directly beneath the entry shaft, or in the close vicinity, since it seemed likely that the bones could well have been thrown down by the local farmers in quite modern times.

So we determined to sink a shaft into the infill in the outer rift as near as practicable to this area. We chose a narrow point to minimise the amount of shoring which we expected to be required.

After only some four feet, we were surprised to find what appeared to be a bedrock floor. Clearing a short distance along this, we found that this floor was joined to one side only of the rift walls. Between the floor and the opposite wall we found a calcite-rimmed crevice, varying in width from one to four inches, filled with a yellowish clay, beneath which was finely-ground rock, some of which was fine enough to be termed "flour".

We extended the clearance in both directions. To the south, we found that the floor became increasingly fractured, having patches of thick calcite cemented to it. It then became a mixture of small rocks-and-mud of unknown depth. The appearance of this lower part of the rift was similar to that resulting from the use of explosives; in fact, we found the remnants of shot-holes. The Foughs' calcite-hunting raids are the possible cause,

Working along the floor to the north, we soon came to a point where the rock floor ceased, with a descent almost vertical, having the south face composed of large boulders. These were found all to be sloping downwards to the south, and although now separated, had evidently formed one mass of rock.

These signs indicated that here was a small fault-zone, and it could be that a continuation of the old cave might be found beneath the upper rift passages. It had been thought already that a large rift passage would be unlikely to terminate in the small upper closed rift.

We started to sink a shaft at the lip of the floor, with th idea of both testing-out our theory, and also to find out at what level the cave floor at this point had been when first seen by William Long.

In the first two feet we came upon a reminder that wars are still playing a part in the making of history, in the shape of a three-inch mortar bomb. Having examined it a little gingerly, we ascertained that it was harmless, and it was removed.

For the next two feet, we found several further human artefacts suggestive of the Willow Pattern era. These included shreds of chinaware of the type used to contain jam prior to the last World War. It should be noted that further pieces of this type were found also in the East Section of the dig and also, later, in the Flake Dig.

We continued to dig deeper and, at a depth of just on eight feet, we came to a rock-and-mud infill very similar in type to that found in the old cave chamber.

Slight seepage was found here from cracks in the East Wall, this water having formed tubular channels in the mud, also small cavities, near to the larger boulders. In these cavities were found some minute mud "stalactites".

A further two feet down, we came to our first bones. They were in a lighter brown clayey mud, and were, in the main, in whole and good condition. In the wetter pockets, some had been liquefied.

It was at this juncture, while lifting the bones, that a very slight subsidence of the floor occurred. It was not thought then to be significant, merely the slight settlement of a boulder. However, a few minutes later, one foot of the digger sank into a shifting trickle of small rocks, and immediately a strong draught of air was felt, even at the top of the shaft, some ten feet distant.

A hole appeared at the southern side of the shaft, beneath the wall, and it was just possible to see through into a small, well decorated chamber. Beyond the base of the far wall of this chamber, a sloping floor of rocks could be described with some difficulty. This floor disappeared into a black void. On the slope could be seen several bones.

Since this had occurred at a late hour on Sunday night, 31st December 1974, we carefully covered-up the hole and left for London.

During the following week, we informed three of our fellow members, who eagerly volunteered to help the next week-end. On the Saturday, Whilst one party was carefully opening-up the hole, the remainder of the team were busy in fixing temporary shoring in the shaft.

At first, it appeared that we had found only a small cave in the south wall, a small run-in of rocks having covered-up the further slope of the floor beneath the far wall. However, on the Sunday, we at last found the way on clear, and were rewarded by the first sight of Skull Slope, as it was thereupon christened.

A high rift passage, twenty three feet in length and filled to the roof, at the north end, with muddy boulders, which formed a steep and most unstable slope down to a pretty, pinkish-coloured floor of scintillating stalagmite. The whole scene was of great beauty. In the area of the floor, the walls too, were sparkling with the reflected light.

On this floor was the front half of a child's skull, lying in a slight depression in the crystal covering, although not attached to it. A further four human skulls were lying on the rocky slope.

The walls were covered with flowstone formations, off-white in colour, whilst the roof was festooned with hundreds of stalactites. A rather curious feature of this passage wasthat only in two small patches was there any sign of calcite formations on the floor.

It was at once clear that any further exploration would have to be delayed until we had obtained advice as to the treatment of the archaeological remains.

To this end we approached Dr. E.K. Tratman, Mr. Michael Bishop, Mr. Christopher Hawkes, and they, together with Dr. Juliet Rogers, visited the cave. They gave us their opinion that the bones should be removed, there being no likely stratification to be lost in doing so.

This we did, and the way was then open for more thorough examination of the new cave and its possible extensions. The rift which formed Skull Slope was found to continue to the South, with a floor of boulders and thin sheets of calcite interspersed with mud. At least nine such layers were noted. At the highest point of this passage, anmed South Passage, which sloped upwards quite sharply, a roof of jammed sharply-fractured boulders was removed, revealing a higher roof of dark grey soil and small rocks; this rather resembled a head deposit, such as is found in the Burrington area.

The west wall of this passage was formed of massive sections of bedrock, cleaved along both bedding-planes and vertical joints, the joints being freely coated with a soft "moon-milk" calcite.

On the west wall, a number of very small flies were seen, also marks like root tendrils, although not apparently connected to any possible crevices through which roots could have entered.

To the west of the calcite floor at the base of Skull Slope, a slightly inclined rift led at the same level to a T-junction, completely sealed with calcite-covered boulders. At a lower level it was possible to reach the right-hand arm of the T-junction, only to find that the passage to the North, tapered to an end, closed by calcite formations. At the lowest point it could be seen that the other arm, to the South of the T-junction, continued and apparently widened and deepened as it went.

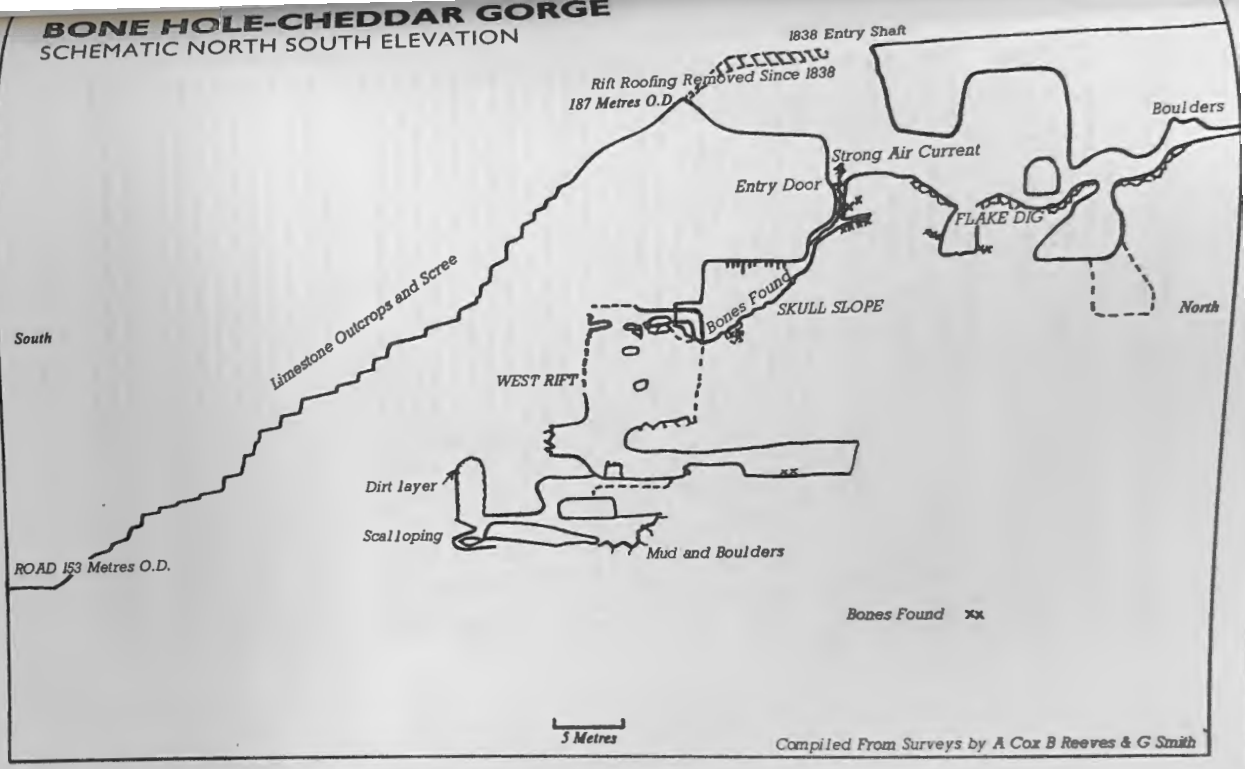
Owing to the restricted space at the lower part, it was found impossible to gain access to the south. Therefore, a further examination of the upper part of the T-junction was made, and by removal of one slab, access was gained to a further extension of the cave, although, at first, a squeeze limited entry to a slim number of persons.

This was now named West Rift, was initially of somewhat forbidding appearance. Although quite wide enough to move freely, and of some forty feet in height, a number of huge boulders were jammed insecurely between the walls, defying the force of gravity only by reason of the friction afforded by the contact of their apices with the walls.

A number of these were sent crashing down below, and when the way appeared to be reasonably safe, a party descended to the bottom of the rift - a drop of thirty-six feet - and found that the south end was blocked by a boulder-pile. The only way on to the south was by way of a tight squeeze under the west wall and then, crossing beneath the floor, numerous gaps between the massively-shattered rocks gave hopes for further extensions, both to the south and to the east. A total depth of approximately 100 feet has been reached in this area. This puts the lowest point at the level of the roadway in the gorge. A survey is being made to establish the exact horizontel location.

It was during one of these first visits that one of the insecure boulders in the West Rift fell, without any human hand disturbing it. It fell, fortunately, between two members without injury to either. A certain amount of work is very necessary here before the passage of the rift can be considered as less than dangerous. Further progress will undoubtedly be made in this region.

To the north, the West rift continues in a finely-decorated passage covered with calcite, the roof forming a pointed arch of crawl height and the floor being of crusty calcite overlying mud. The west wall of West Rift is of fairly solid rock, but the whole area to the east side of the Rift is


BONE HOLE-CHEDDAR GORGE
SCHEMATIC NORTH SOUTH ELEVATION
1838 Entry Shaft
Rift Roofing Removed Since 1838
187 Metres O.D.
Boulders
Strong Air Current
Entry Door
FLAKE DIG
Bones Found
SKULL SLOPE
North
South
Limestone Outcrops and Scree
WEST RIFT
Dirt layer
Scalloping
Mud and Boulders
ROAD 153 Metres O.D.
Bones Found xx
5 Metres
Compiled From Surveys by A Cox B Reeves & G Smith

completely shattered, and this appear to continue thus as far as the east wall of South Passage atloast.

At this time, thanks to information supplied by Dr. E.K. Tratman, we were informed that the Bristol Waterworks Company had, some time previously, transferred the ownership of this area in which Bone Hole is situated, to the National Trust for Places of Historic Interest or Natural Beauty, without informing us.

This news naturally caused us great concern, since to dig on property without the owner's consent is anathema to anyone having the good name of speleology at heart. However, shortly a most amicable agreement was reached with the National Trust, who soon appointed an archaeologist for the area, Mr. David Thackray with whom we now have a close working relationship, and to whom we are most grateful for his advice, assistance, and encouragement.

Since the first fever of exploration has died down, we have been in the process of making a section in the Flake Dig, which has proved to be most interesting. We have found a floor to the old cave at a depth of some 15 feet below the original infilling, thereby delimiting the depth of the talus-cone at least in that area. This floor is separated from the east wall, for the whole length of the chamber, by a gap of between zero and two feet. It is nearly horizontal, but is fractured along the bedding and calcite-covered, this calcite forming a flow over the eastern side and forming a floor to the gap at some points. This floor of calcite is quite thin and covers more mud below for a distance of four feet. Otherwise the gap is unimpeded except by fallen small rocks. These rocks are most surprisingly clean, dry and well-rounded-off, being patinated to a light, silvery-grey colour. To the north of the huge jammed boulder, the rift is quite open, and was covered only with a single layer of rocks. A descent of this rift has been made at that point, and the rift becomes larger and there are many gaps through which it is possible to see extensions in all directions. A depth of 25 feet has been reached here. The area is completely free of infill in foe form of mud or small rocks, and no bones have been seen yet. This is quite amazing, having regard to the nature of the infill of the chamber above, which is very muddy indeed, and to the fact that no impediment was apparent, to the free passage of mud to this region.

In the Flake Dig section we have noted several layers of bone-bearing infill all dipping to the north. At the level of the floor, the bone deposits cease, except for a very few which have been carried down with that portion of the infill which has been apparently moving downwards behind the Flake. At this part of the Flake Dig, also, the infill is of small loose rocks, of silvery-grey colour, and no mud whatsoever, although some of the bones are partly mud-filled, as though they had at one time been in the muddly talus-cone and then moved into this position later, and then been cleaned up

Whether or not this is the result of water seepage in the past, (which is not borne out by our observations, since the area does not appear to have been subject to any drip, or wall

drainage, in the past nine years) or whether these deposits have been protected by a false floor at a higher level, and therefore never been subject to mud-discoloration, is a question which will only be answered by a complete excavation of the talus-cone (which at present is not our intention). Further work awaits the construction of protective shuttering to support this deposit.

To the north end of the Flake Dig section, a number of lightly-cemented boulders form a protective (?) wall. Beneath them, a continuation of the gap between the floor and the east wall is seen to continue to the north, and an open small low chamber, extends across to the west wall of the chamber.

This, then, is the present position of the excavation work. The bones are being listed, numbered and transported to Dr. Juliet Rogers, who will provide a report on the human remains.

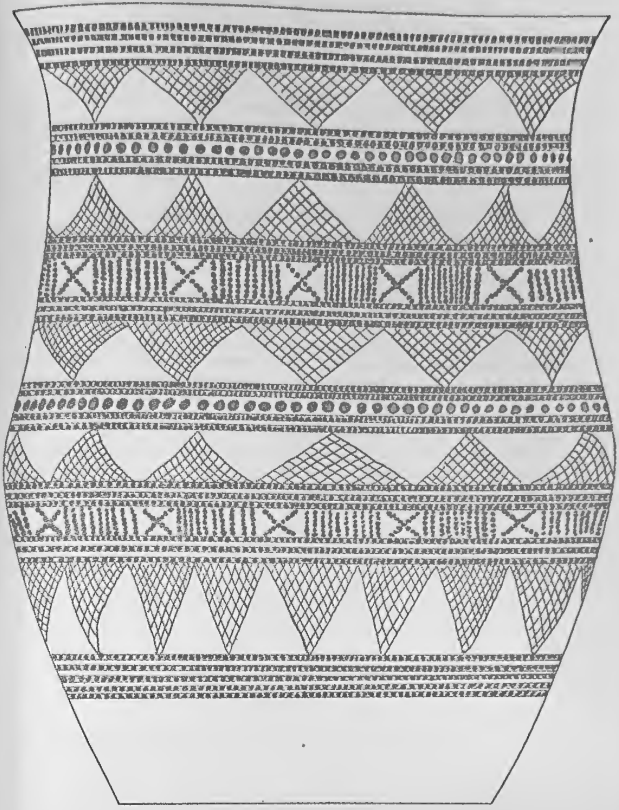
Some fine sherds of pottery were discovered, notably a one-third section of a finely-decorated urn, from the junction of Skull slope and the passage to the West Rift. This junction has since been named "Pottery Corner".

Further, small sherds were foundin the floor of the ante-chamber to Skull Slope, at the very top of the mud infill. These included one small fragment of what appeared to be Samian ware, and some larger portions of black pot which was decorated with a double criss-cross shallow design.

The urn, which is illustrated, is being studied at present by experts, and, although one opinion has been that it is of Late Neolithic of Early Bronze Age date, the decorative work is quite similar to that found on an item from Carloggas Camp, Cornwall, and dated at around the second century, B.C. However, its shape and some aspects of the decoration are suggestive of the Early All Cannings Cross Group from the eighth or seventh centuries, B.C. We shall have to wait for the experts to decide, since many visits to museums have failed to discover anything remotely to be identified with this item.

A brief description of the urn, is that it is quite regular in shape, and is coloured a dull reddish-brown, probably haematite-stained, and burnished. The indentations appear to have been made with a toothed implement, although whether this could have been a wheel is not certain. Those indentations appear to have been originally filled with a white paste, and the general effect is most impressive. Altogether, this is a fine piece of workmanship and a most pleasing design.

The future of this cave and its contents is a matter of concern to us. It would be most valuable if a properly-conducted intensive and meticulous archaelogical dig were made in the region of the central part of the talus-cone. This would be a massive operation and it would need protection that is not within our means to provide. The small amount of human artefacts recovered so far, in proportion to the numbers of



Scale in Inches

RECONSTRUCTION OF URN FROM BONE HOLE

drawn by B. Reeves

human remains, is perhaps only explained by the fact that we have only so far dug in the outer extremities of the cone. The main deposit of such items would be more likely to have been towards the centre of the area, although one would have expected to have found more in the roll-off areas, than has been found to date.

The means of disposal of the vast quantity of spoil would, of necessity, be somewhat costly. Harry Balch's idea of a hoist, coupled with a staging over the rift, and a small track to carry away the rock and mud, is certainly the most realistic, but quite beyond our financial means. Also the protection of such equipment would be most difficult in such a remote spot.

The possibilities for further extensions to this cave are many. The lower part below West Rift is at present looking most likely to provide a way under the Gorge, although the rift belwo the north end of the old cave chamber also has possibilities which have not yet been explored. There is a way south under the stalagmite floor at the base of Skull Slope, although this would be a major task, since as far as can be seen, it is almost filled with rocks, and a top layer of crumbly mud. The remaining slight possibility is South Passage, where there is some indication of a downturn of the passage beneath the loose roof.

This, then is the position at the end of August 1976. For the next year progress is bound to be slowed by the other major commitment of building our new headquarters, quite apart from the ever-increasing cost of week-ending on Mendip from London, which is certain to restrict the number of working days.

APPENDIX I

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John Wright & Sons Ltd.,
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Description, history and mentions Wm. Boyd Dawkins digging in Bone Hole.

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pp. 85-86.

At the Newcastle Meeting, August, 1838
William Long's report on the excavation.

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pp 53-56

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Netherworld of Mendip

Ernest A. Baker and Herbert E. Balch; prior to 1935.
Brief mention regarding cave forming into go

Procs. of the Geologists' Association, Volume the XIth., 1889-90.

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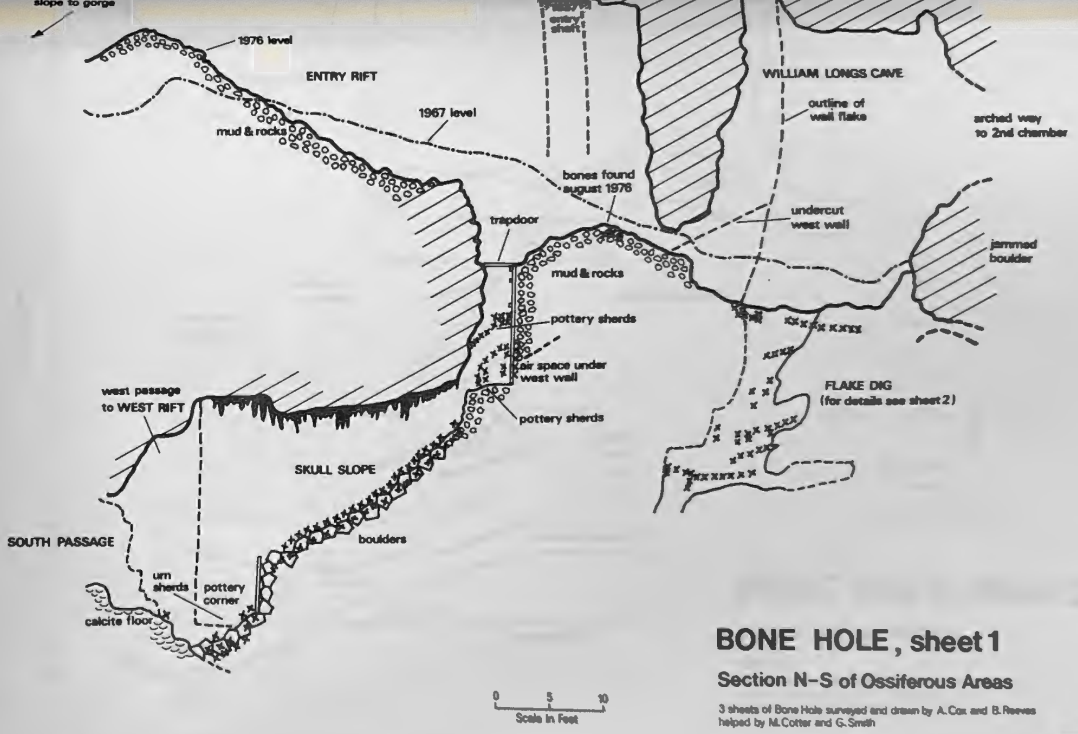
A brief mention, quotes Boyd Dawkins' theory of gorge formation by cave unroofing.

Limestones and Caves of Mendip Hills. Compiled and Edited by D.I.Smi
British Caves Research Assoc. 1975.

Chap. 8. The Caves Archaeology and Palaeontology of Mendip. Dr. E.K.
p. 388. Tratman.
Suggests that the main source of bones may ha
been from the north end of the cave, and that
the bones could have been more recent than
Pleistocene.

A. pamphlet. Messrs. Light and Ridler. Bristol 1842.
This merely relates the report of Wm. Long.

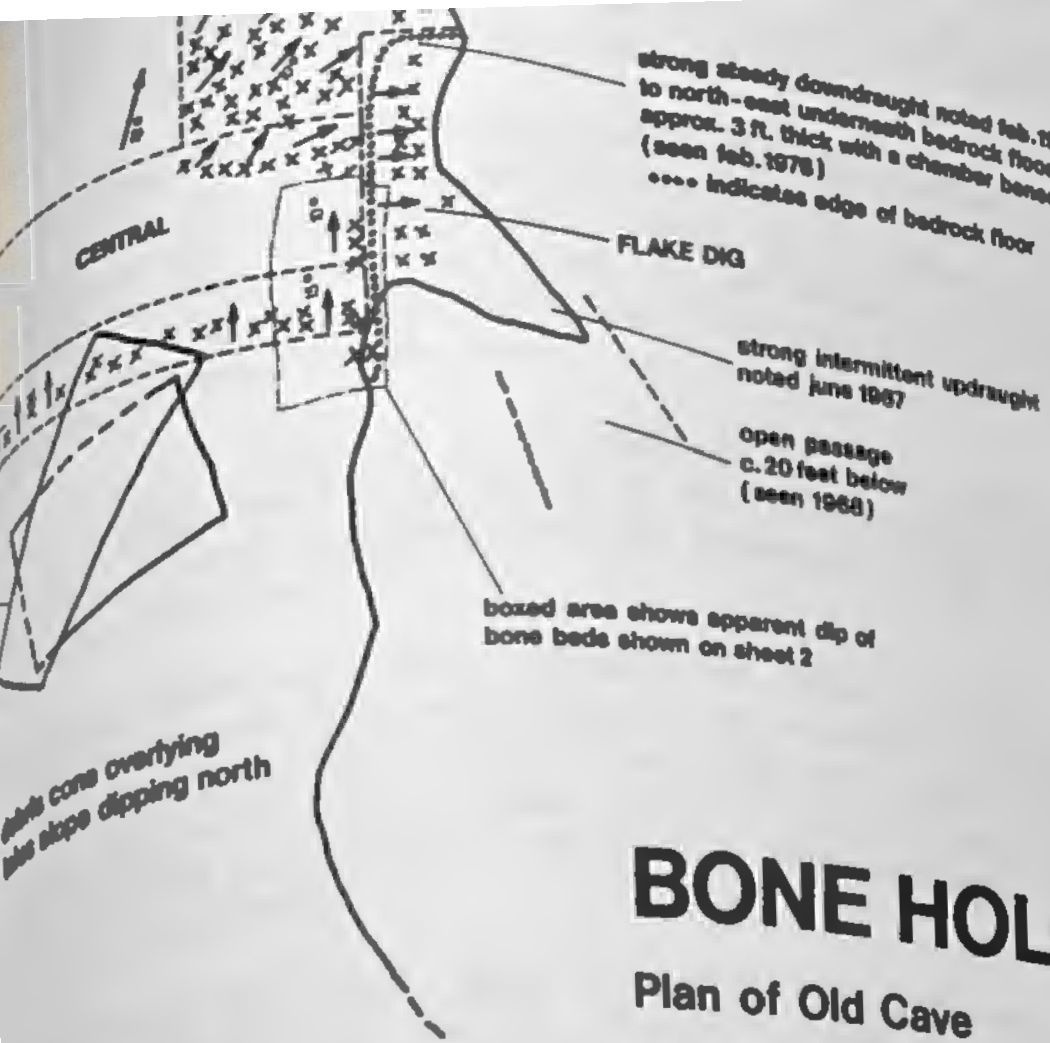
See Appendix I at rear of Journal for Abstracts of William Long's Report "Notices and Abstracts of Communications to the British Assoc for the Advancement of Science".



BONE HOLE, sheet 1

Section N–S of Ossiferous Areas

3 sheets of Bone Hole surveyed and drawn by A. Cox and B. Reeves
helped by M. Cotter and G. Smith



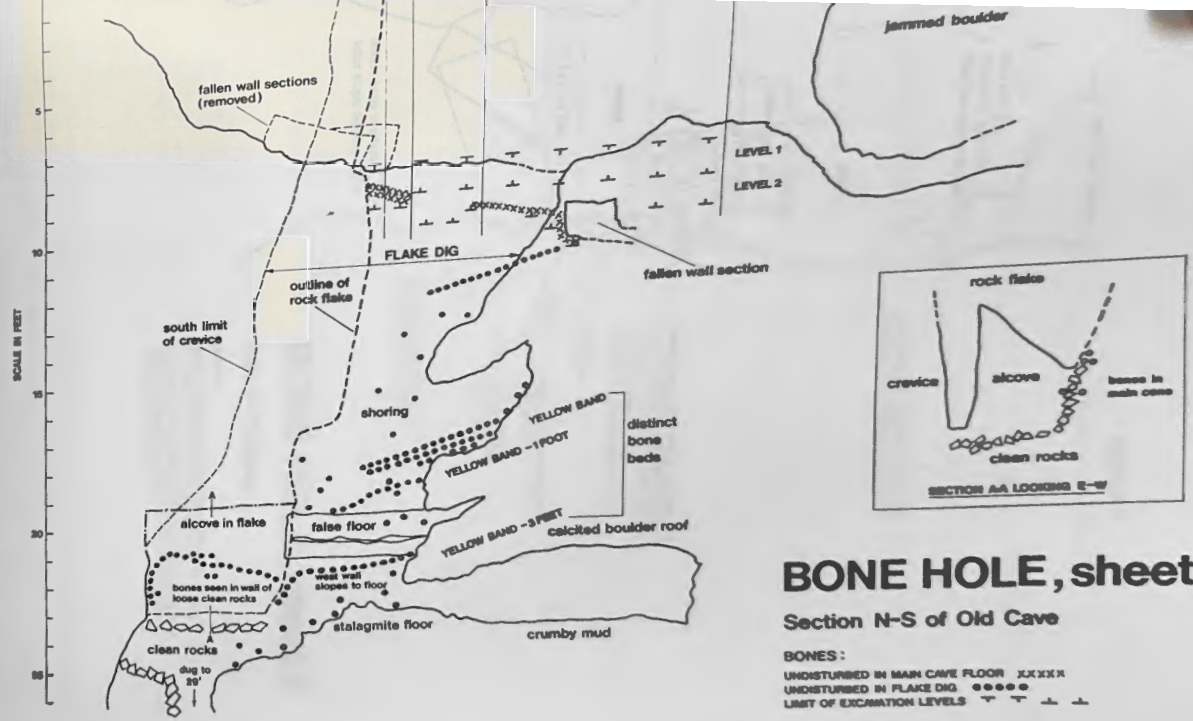
BONE HOLE, sheet 3

Plan of Old Cave

BONES :

UNDISTURBED BED WITH APPARENT DIRECTION OF DESCENT OF TOP OF BED UNCOVERED

DISTURBED ROCK & SOIL CONTAINING BONE FRAGMENTS AND SMALL BONES FOUND OVER TOTAL OF WEST, EAST, CENTRAL & FLAKE DIG AREAS

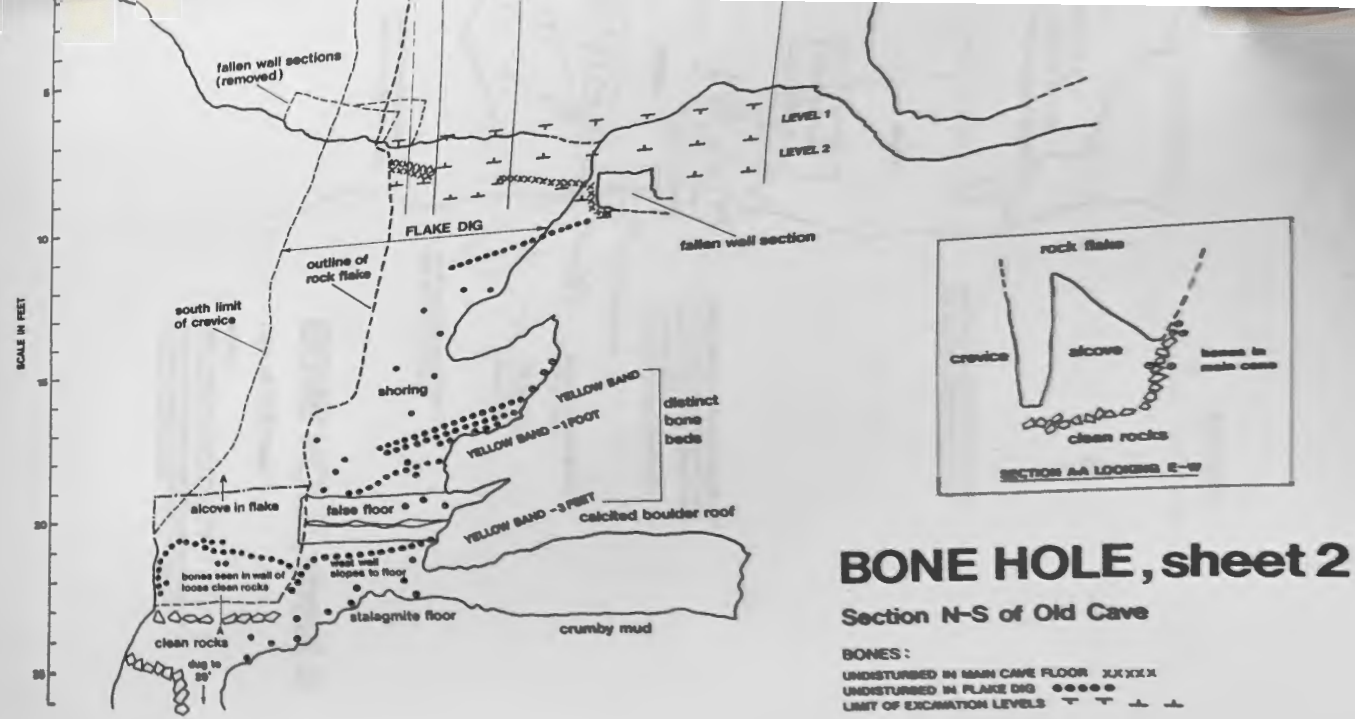


BONE HOLE, sheet 2

Section N-S of Old Cave

BONES:

UNDISTURBED IN MAIN CAVE FLOOR XXXXX
UNDISTURBED IN FLAKE DIG ●●●●●
LIMIT OF EXCAVATION LEVELS



BONE HOLE, sheet 2

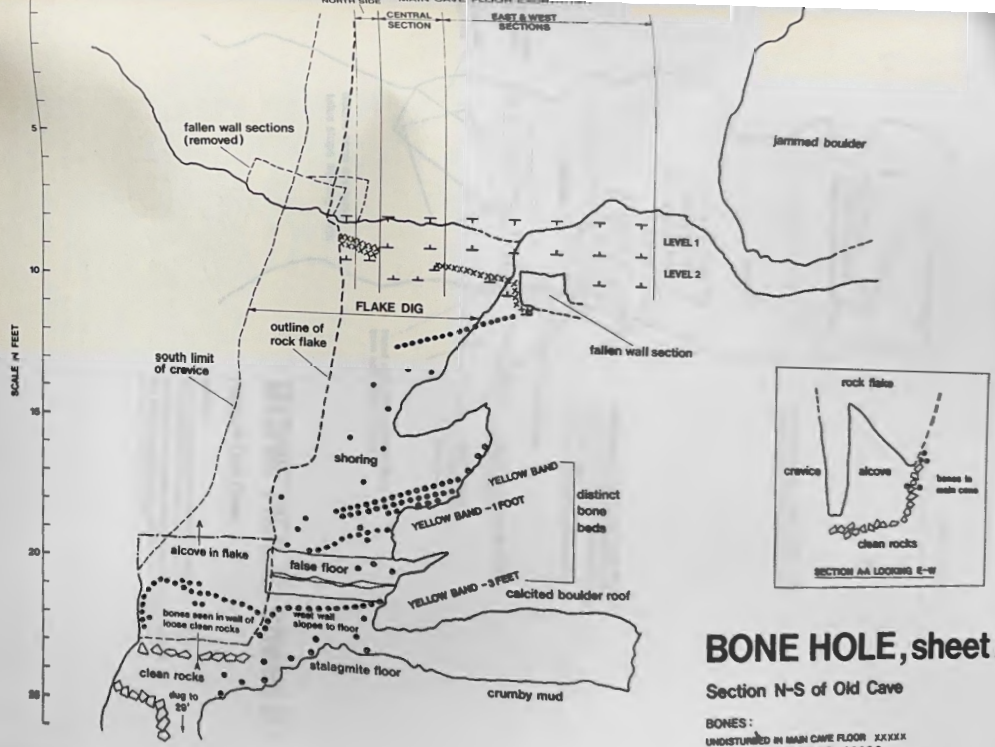
Section N-S of Old Cave

BONES:

UNDISTURBED IN MAIN CAVE FLOOR XXXXX

UNDISTURBED IN FLAKE DIG ●●●●●

LIMIT OF EXCAVATION LEVELS



BONE HOLE, sheet 2

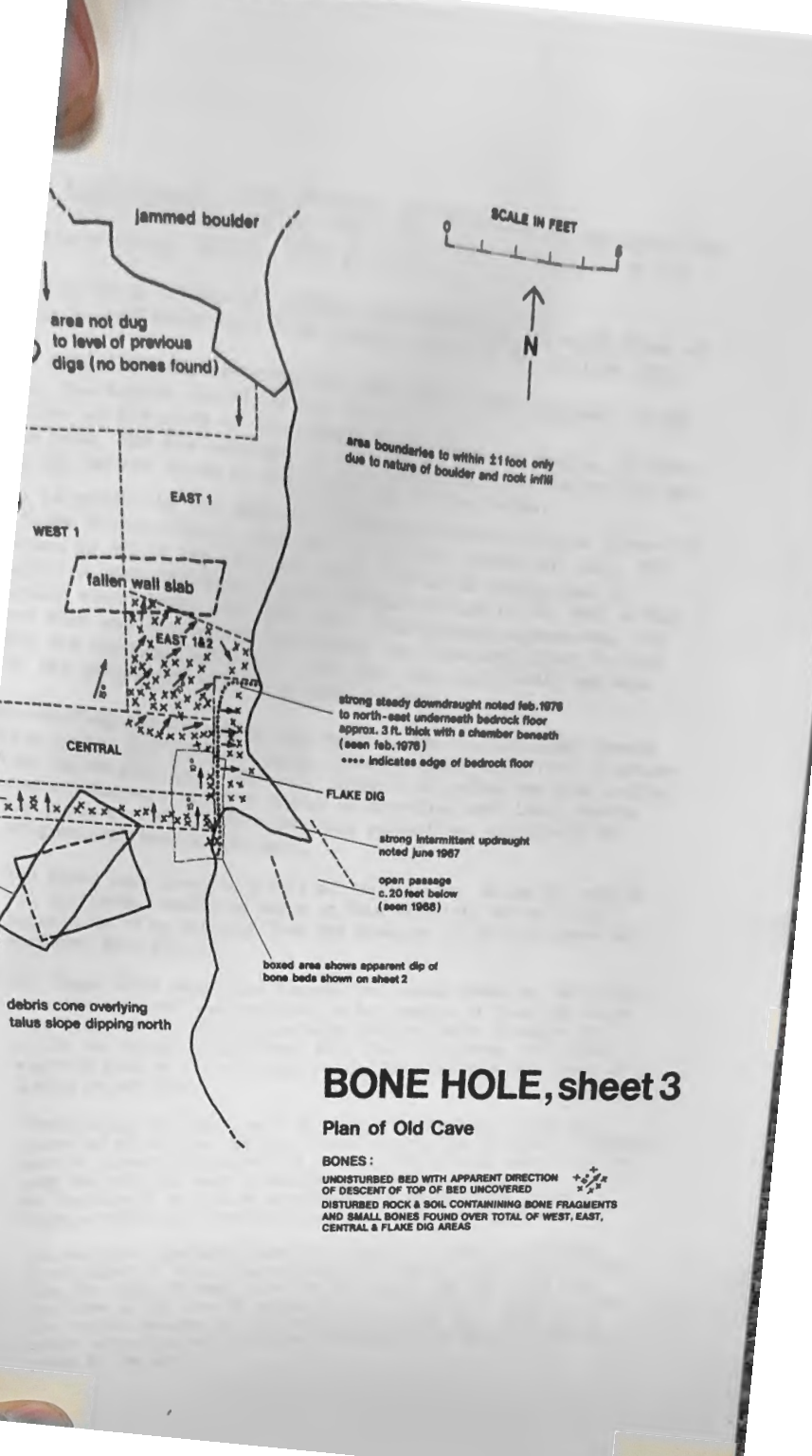
Section N-S of Old Cave

BONES :

UNDISTURBED IN MAIN CAVE FLOOR XXXXX

UNDISTURBED IN FLAKE DIG ●●●●●

LIMIT OF EXCAVATION LEVELS



BONE HOLE, sheet 3

Plan of Old Cave

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The First Tunnel Under The Thames

by Peter Mathews

At the beginning of the 19th Century the Port of London was at the hub of the Empire. Cargoes arrived from all over the world, and were transported back and forth across the busy Lower Pool by Thames Watermen. With increasing trade this became more difficult so that more often than not goods were taken upstream to cross via London Bridge. The narrow congested streets of the City were not designed for rapit transport; and the river crossing often took most of the day. A tunnel underthe Thames would seem to be the answer to the problem.

There were several attempts made to tunnel under the river one as low as Gravesend. These were all disaterous and were rapidly abandoned once the tunnel got below the river bed.

An attempt which came closest to success was made by a Cornish miner Robert Vazie who employed another Cornishman, the stream engineer Richard Trevithick. On the 17th August 1807 they began digging a narrow driftway from Rotherhithe to Limeshouse. The tunnel commenced at the bottom of a shaft, 76 ft, below Trinity High Water Mark. The drift-way was only 5 ft high and 2 ft wide at the top enlarging to 3 ft at the base. The plan was first to complete the drift-way, and then enlarge it to take a carriage way. Unfortunately work was abandoned after 1,080 ft when on the 22nd March 1808 quicksands flooded into the passage.

Brunel's Plan

At this time the French engineer Marc Brunel was considering current methods of tunnelling. One of his schemes was based upon a huge auger - similar to that used on the L.T. Victoria Line. In those days such a machine was impractical as it could not be powered.

His next scheme was promptly adopted by the newly formed Thames Tunnel Company. The method was based upon the use of a cast iron digging shield. This was made up of 11 frames (eventually 12), each over 21 ft high, 3 ft wide and 6 ft deep, and weighing a total of over 90 tons. The frames were mounted side by side on a cast iron ankle which in turn was attached to a massive cast iron foot. Each frame was divided into 3 cells, one above the other, and high enough for a man to work in. Facing the digger each frame was faced by rows of horizontel wooden plands, which held back the working face, preventing it from collapsing into the tunnel. The wooden boards were held in place by jacking screws at each end. Each board was removed in turn and 9 inches removed from the work face, and the board replaced. After clearing the face the shield was jacked forward and the cycle repeated.

The frames could be angled back and forth with respect to each other. The tunnel, thus, could be made to dip or bend according to the plan. In the perimeter cells masons would be at work bricking in the newly formed floors and walls. The cross-section of Brunel's Tunnel was ti be 630 sq. ft.

With the aid of the shield, Brunel argued that a tunnuel could be pushed through soil of any consistency. It would resist any weight of earth, protecting its occupants against cave-ons. The clay stratum just below the river silts was thought to be ideal for digging, and would also give addod protection from water.

Work Begins - Rotherhithe to Wapping

Whilst soundings of the river were in progress, Brunel tested the materials he was going to use. He intended using the then new quick setting Roman Cement. This was tested by constructing a trial wall and dropping if from a crane.

In Cow Court, Rotherhithe, Brunel's work began to worry his backers. On the ground stood an iron hoop 50 ft. in diameter and weighing 20 tons. This formed the foundation for a brick tower 42 ft. high. At the top a steam engine drove an endless bucket chain to remove soil from the bottom of the tower to the top where it was loaded into wagons. As the soil was removed from its centre so the tower sank. When the tower had sunk to its full depth the resulting shaft was completed in more conventional fashion.

The masonary walls were completed by underpinning with the North side left open to take the tunnel shield. The shaft bottom was 64 ft. below High Water Mark. A reservoir was later dug at the bottom of the shaft to fadilitate removal of water.

The Tunnel Begins

On the 28th November 1825 the cast iron shield was positioned and digging began. As the shield advanced so the open tunnel behind it was reduced to two 15 ft 4 ins. high barrel vaulted passages. Each had sufficient floor width for an 11 ft. 9 ins. carriage way and a 30 inch footway. The minimum thickness of brickwork was 2ft 7 ins. and the maximum at the outer edges of the structure was 4 ft. 6 ins. Each foot of the tunnel took 5,500 bricks, and every one was individually checked for flaws. Masons worked to an equally high standard, maintained by a system of fines for careless work.

The Tunnel was brightly lit by gas lamps; the gas was generated from whale oil. The company wishing to make the project pay for itself as arly as possible opened the Tunnel to visitors at a shilling a head. This proved a great success, but brought in comparatively little money.

At the age of 17 Isombard Kingdon Brunel took on the position of Site Engineer. As the Tunnel reached the middle of the River, on 18th May 1827, water began to pour in behind the shield. With the water came mud and rubble, glass and crockery and other rubbish from the river bed. The Tunnel was quickly flooded. The Young Brunel inspected the river bed using a diving bell, and located a pit scored out by dragging anchors. Clay was dumped

into the bed of the river in an attempt to stem the hole, and the Tunnel then pumped dry. During inspection of the partially flooded Tunnel a boat loaded with workmen and engineers capsized drowning all but one of the occupants. The shield was badly damaged by the flood, but fortunately, the design allowed any part to be replaced in situ. And so work began once again on the 11th September.

However, in the Spring of 1828 water began to flood into the Tunnel once again. Isombard Brunel came close to drowning in this disaster, but six of his workmen were not so fortunate. This time the funds of the Thames Tunnel Company were nearly exhausted and work on the Tunnel was abandoned.

The Brunel's, meanwhile, worked on other engineering projects, and the Tunnel was almost forgotten. After many years of discussion Goverment backing was eventually forthcoming and a new shield was constructed in 1835. The new shield weighed 140 tons and incorporated several improvements. In February 1836 the new shield was fixed in position, and work restarted.

Troubles were not over, for the Tunnel flooded a further three times. But on each occasion clay was used to plug theriver bed and the Tunnel pumped out. During the latter stages of construction many of the workers were plaqued by ill health, and many died. The cause was thought to be due to polluted water and gas pockets in the clay ahead of the shield. The stench in the Tunnel was ofter overpowering, and men were carried unconcious from the face.

A second shaft was sunk at Wapping using a similar technique to that used at Rotherhitho. And, on the 16th November 1841 the shield finally broke through into the wall of the Wapping shaft. The length of the Tunnel was 1,173 ft. and the final cost £431,000.

On the 25th March 1843, the first Thames Tunnel was opened to the public for foot trafic. Over 2,000,000 people visited the Tunnel during the first year. This figure was quite fantastic for the time and was roughly equivalent to the population of London. But, perhaps one should remember that the Tunnel was brightly lit and filled with stalls and sidw shows - it was more a fairground than a thorough-fare.

Money to complete the roadway and approaches to the Tunnel was not forthcoming, and so it remained for foot traffic only. But as the years passed and the lights dimmed the Tunnel was used less and less. It was clearly a financial disaster, and had become the haunt of prostitutes and pick-pockets.

In 1869 the Tunnel was sold to the East London Railway Company, which eventually became part of the London Trnsport system. The Tunnel is still in use between Wapping and Rotherhithe stations on the East London section of the

Metropolitan Line. The original shafts and much of the old staircases are unchanged, though lifts have also been installed. The Tunnel has remained in perfect condition and has never required any repair or maintenance.

After the Thames Tunnel Brunel suggested using his shield for a similar tunnel under the English Channel to France.....