SOUTH WALES CAVING CLUB
NEWSLETTER

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1. THE ORGANISATION TENDENCIES WITHIN THE CAVING WORLD

It may be of interest to club members to know how the committee has approached the following requests, that we should form part of (a) a "National Caving Association" and (b) a National Caving Council within the British Speological Association.

The initial organisational tendencies appear to have been instigated by clubs in the North of England, and it was from the Council of Northern Caving Clubs that we first received a request for our views on the subject; the request from the B.S.A. followed a little later.

The committee believes that associations of this nature can not but interfere with club affairs, and to find someone to sit in on the national, regional, inter-regional, inter-inter-regional committees would be an almost impossible task, it would be quite easy to forget that the club was formed for caving. Without too much imagination one could easily forsee some future secretary doing the rounds of the South Wales Club complete of course with loudhailer and soap box chanting - 'Vote for me as your regional representative and I will see that you do not have to crawl into those damp old caves again'. Reverting to a more serious note again, in order to put members completely in the picture I have included below a copy of the letter sent to the secretary of the Northern Caving Council; a similar reply was sent to the B.S.A., from which incidentally we have now resigned our affiliated membership.

In its actions the committee is not endeavouring to isolate the South Wales Caving Club from the rest of the caving fraternity. We shall continue to co-operate fully with all other clubs in the same amicable manner as in the past.

To summarise - we see little point in belonging to something which, in our opinion, we do not need.

Copy of the letter sent to the Northern Caving Council

> Your circular appertaining to the proposed formation of a National Caving Association was discussed in some detail at our last committee meeting and I have been instructed to write to you as follows:-
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> Whilst we concede that there may be some need to form a Council of Northern Caving Clubs and that a National Association may well emerge from such initial organisational tendencies, we in the South Wales Caving Club can at the moment, see no need to interfere with or change our present caving routine. We have a large active club with individual club members belonging to practically every Southern Caving Club. We co-operate freely with the local education Authorities, the scouting movement, The Central Council of Physical Recreation, and also possess an extremely amicable relationship with all landowners. We accommodate numerous visiting caving parties during the course of a year and supply cave leaders whenever it is practically possible.
>
> To summarise - caving in South Wales is as active and healthy as it has ever been and we cannot envisage anything in the forseeable future which might have a derogatory effect on this pleasant situation. We feel, also, that the independence of caving clubs must be maintained with the minimum of outside interference, and that club affairs should be governed solely by the individual club members through their elected committee.

GWYN THOMAS

2. SOLUTION HOLES ON THE CARBONIFEROUS LIMESTONE AND MILL-STONE GRIT OF THE NORTH CROP OF THE SOUTH WALES COALFIELD AND THEIR RELATION TO THE KNOWN CAVES

ABSTRACT

The distribution of solution holes has been plotted over known caves in two areas of the South Wales limestone and no significant increase noted. Details from several papers relating to the distribution or formation of such holes are included, and various theories for their formation discussed.

INTRODUCTION

Limestone terrains and areas where the rock is underlain by limestone are often characterised by the large number of conical depressions pock-marking their surfaces (37). The South Wales caving area is an outstanding example of such an area and ideally suited for an investigation into the relationship between solution holes and the underlying caves. There are many names (34) used to represent these conical depressions, shake hole or swallow hole being the most common. The use of this last term should be restricted to such holes into which a stream sinks. Although there are many shapes, sizes and varieties of these holes they have been divided (34) into three main types, those caused by solution from above (solution sinks), those caused by surface collapse into caves formed by deep seated solution (collapse sinks) and those caused by the sinking of streams (stream sinks). For the purpose of this paper, however, no differentiation has been made between these types and as they are all due to solution of one form or another, the term solution hole has been used to represent all the depressions.

Thus there are several special types of solution hole. Swallow or swallet represents such a hole into which a stream sinks. The term "Shake Hole" suggesting unstable blocks etc., is used for such holes on the Grit.

"Roof collapses" are self explanatory and "stream sink" refers to points at which a stream sinks without being a swallet.

Where the work of others is mentioned their term is used.

The north crop of the South Wales coalfield has been aerially photographed at a scale of approximately six inches to a mile. These photographs cover the outcropping Limestone and Millstone Grit from the Twrch valley to Blorenge Mountain and have been used by T. M. Thomas to carry out an investigation into the distribution of solution holes of various sizes.

In order to investigate the relationship between solution holes and known caves two areas were finally selected (See Fig. 1). In these areas the surface is reasonably level and densely covered with solution holes. The rock, both limestone and grit, is not disturbed by faulting and both outcrop in the areas considered. Each area contains a cave large in cross section of passage and length. The caves contain streams, they run at an even depth below the surface and they contain large chambers, avens and roof collapses.

Pant Mawr is the moorland west of the village of Ystradfellte. The area is bounded on the north by the sandstone of Fan Fraith, 2150 ft., on which rises the stream that sinks into Pant Mawr Pot (2). The Avon Nedd also rises here. This river flows north to south forming the eastern boundary and it possesses cave systems of its own where it crosses the limestone. The cave stream reappears in this river (3) approximately lthree miles south east of the sink and 600 ft. lower. The Millstone Grit continues far to the south and the western edge is roughly defined where the slope towards the Tawe valley starts. The average elevation for this area is 1300 ft. above sea level and the limestone is in the region of 500 ft. thick here (1). The surface slopes to the south at about 10^{o} which is about the dip angle and the cave also approximates to this slope, aligning itself along the direction of dip.

Mynydd Llangattock is an area, similar in size and elevation to Pant Mawr, situated north of Brynmawr. It is naturally bounded on three sides by the edge of the mountain and in the west it is separated from Mynydd Llangynidr by the B 4560 road. The narrow limestone outcrop is again north of the grit and runs for the most part along the escarpment. The cave, Agen Allwedd (4), is very large and formed mainly in the colitic bed 400 ft. below the surface. Thus both the surface and the cave slope gently to the south at 5 - 10^{o}.

There is no large sinking stream for this cave. The entrance is on the side of the escarpment and the stream inside the cave is formed mostly by underground collection. This stream rises $2\frac{1}{2}$ miles south-east of the entrance and 300 ft. lower in the gorge of the Clydach river (5).

In the west Mynydd Llangattock continues naturally on to Mynydd Llangynidr. This area has far more collapsed holes on the grit outcrop but is not suitable for inclusion in this survey because it possesses no known large caves.

Six inch to the mile maps of the two areas were constructed from Ordnance Survey Maps and aerial photographs. The important geological boundaries were marked and the medium and large solution holes included. The main passages of the caves were plotted using the surveys from C.R.G. publications and the areas across the caves were gridded in half mile squares. The grid above

Agen Allwedd was aligned with the Ordnance Survey Grid. This cave is a network of passages and offers no obvious direction of its own for the axis. In the case of Pant Mawr Pot the cave runs in a definite line N - S, and this was used as the axis.

The photographs varied in scale from $5\frac{1}{2}$ to 7 inches to the mile and it was necessary to measure the scale in two directions at right angles against prominent features also shown on the maps. These photographs were then gridded into half-mile squares corresponding to the similar grids on the maps, ie. Figures 3 and 4*.

The holes were considered as three sizes: small - under ten yards diameter; medium - ten to twenty yards diameter; large - above twenty yards diameter. They were counted for each half-mile square and the number of small holes entered in the top left-hand corner of the square. As mentioned above the numbers of medium and large holes were small enough for them to be plotted onto the maps individually. Although the scale and quality of the aerial photographs varies, holes of ten feet diameter could always be detected, and smaller diameter detected frequently.

Graphs were plotted for east-west rows of squares showing the variation in the number of holes with distance from the cave. An example of such a graph is shown in Figure 5 but this method of presenting the results does not show the change in geological features. Graphs were also plotted in the case of Pant Mawr for grids at different axis angles in case a different pattern would show. As these graphs were similar whatever axis angle was used only the one grid has been included.

A half-mile square of the Pant Mawr area was measured off and the number of holes counted. The number agreed closely with that found from the photographs. There were few holes of diameter below ten and most of these were detected.

Although some very small holes have escaped detection and therefore are not included in this survey, it is unlikely that their inclusion would alter the relative overall distribution.

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*These maps are copied from the original six inch O.S. map and have lost some of their accuracy in the process.

Discussion

The distribution of holes across the Pant Mawr area shows considerable variation but there is no significant change in the vicinity of the cave. The stream enters the cave via a solution hole and the cave entrance is a 50 ft. pot hole at the bottom of a conical depression. Frequently several solution holes align themselve to form irregular lines with some of the holes overlapping. One of the larger associations cuts across Pant Mawr cave running away from the ultimate direction taken by the cave stream. One hole near the entrance shaft corresponds to one of the roof collapses in the cave but as the other collapses are not so represented it is thought that this is coincidence. The decrease in the number of holes as the grit cap thickens is very obvious.

On Mynydd Llangattock the larger number of small solution holes on the limestone is also apparent. Here the rather narrow limestone outcrop coincides with the escarpment and this is also a reason for an increase in solutional activity. Although this area does show the usual increase in medium and large holes on the grit outcrop, its continuation in the west, Mynydd Llangynidr, shows this increase better than any other. The faults on the outer edge of the area show no increase in solution holes although the stream passage of Agen Allwedd may continue along one of the faults on its way to the Clydach Gorge. Pwll Gwy-rhoc is situated exactly over part of the cave and Waen Rudd, another large solution hole, is very near. There are no holes corresponding exactly to roof collapses.

The distribution of solution holes whether measured as small, medium, large or total shows no significant increase in the vicinity of known large caves. The frequency with which these holes occur is directly affected by surface changes such as drift cover, sudden variation in height above sea level, i.e. sudden drop in the water table and with structural changes such as grit capping, faults, etc. These fluctuations on the number of holes will completely swamp any subtle variation possibly caused by changes in the zone or type of limestone or by the presence of a cave. But if the holes on these hillsides were formed by collapse into caves then a very significant increase would be expected above these large systems. Of course, the solution holes which take surface seepage must be drained by small channels and these could be called embryo vadose caves. The quantities of water involved are very small and the "caves" unlikely to reach the size of a cave proper, i.e., large enough or almost large enough to take a man.

SUMMARY OF PREVIOUS SECTIONS

Thomas (1) used the term 'swallow hole' to include all the crater like deparessions. He found that there are far more holes on the limestone outcrop than there are on the Basal Grit. Classifying the holes into three sizes of average diameter:- small five to ten yards, medium fifteen to twenty-five yards and large forty to sixty yards, he found that some 6500 acres of the limestone outcrop are thickly pocked and the predominant sizes are:- small over 4800 acres, medium over 1600 acres and large over 100 acres. For the Millstone Grit an area of 4100 acres is divided into small over 600 acres, medium over 1500 acres and large over 2000 acres.

The holes vary in diameter from a few feet to 100 yards and in depth from 1 - 2 feet up to 60 feet. The ratio of depth to diameter is normally below 1:6.

Major concentrations of holes on the limestone occur where the rock is covered by glacial drift or grit debris up to a maximum thickness of thirty to forty feet. There is a distinct tendency for groupings or irregular alignments of medium sized holes over lengths of 100 to 200 yards, often found along dry valleys or the bases of rocky outcrops. A N.N.W. to S.S.E. fault line near Ystradfellte closely coincides with a line of small or medium sized swallow holes over a distance of nearly a mile.

Medium sized holes coalesce more freqently than smaller ones. Both small and medium holes rarely expose the bed rock. The medium sized holes are most conspicuous in areas immediately adjoining the junction with the overlying Millstone Grit, where grit debris is at a maximum.. Groups of large holes on the limestone outcrops are most conspicuous at points just before the water table undergoes a sharp drop. Holes on the Millstone Grit outcrops appear to be most frequent where the lower beds of the Basal Grit do not give rise to a significant topographical feature and where the junction zone with the underlying limestone forms little interruption on a long south dip slope. The larger holes are very conspicuous where a uniform dip slope is immediately underlain by massive quartz conglomerates or coarse quartzitic grits.

Flow beneath the grit is greater than that beneath the limestone outcrop and as the grit usually has wider jointing the cavities in the limestone beneath it can grow to a larger size before collapsing. The thick drift usually present on the limestone outcrop often tends to block the joints and so reduce solution. When the overlying grit thickness exceeds thirty to forty feet there are few small holes. Thomas also found indications that some of the more southerly located large holes on the grit are more recent than those nearer the limestone outcrop suggesting cavern migration down dip.

A. C. Swinnerton (7) mentions the tendency for 'sink holes' to migrate down dip giving rise to asymmetric holes, vertical on the down dip side, gently sloping and soil covered on the opposite. He also notes a tendency for elongation along the strike direction.. In steeply dipping rocks he found no tendency for migration but the strike elongation was still present. Alignments of sink holes along the outcrop are also noted.

Pohl (8), in a paper dealing with the formation of large vertical shafts or dome pits in Kentucky, states that they were formed by solutional enlargement of vertical cross joints by seeping surface waters. They are formed along the edges of steep sided valleys and are part of the method of valley widening or have been modified to form sink holes. The drainage through the vertical shafts descends to ground water level and makes use of whatever paths of lateral drainage are developed. Sometimes these paths of lateral movement coincide with the caves but more often new paths of flow have been developed. He believes that the distribution of the vertical shafts is not determined by the position of large cave passages for the volume of water seeping into them is always small and small lateral tubes are capable of draining them. Rather their disposition is thought to be entirely independent of the large cave passages and any relationship to such passages is entirely fortuitious.

Referring to the formation of these same Dome Pits, Davis (9) suggests that they may be vettical joint intersections widened by solution below the water table. Several other papers (10, 11, 12) have postualted formation by vertical cross-joint enlargement by surface seepage.

E. A. Glennie (30) has suggested a phreatic origin at major joint junctions followed by collapse for tall conical chambers some of which do not reach the surface.

T. M. Thomas (23) has also recorded the outliers of Basal Grit occuring on the limestone of the north crop and suggests that they mark the position of large swallow holes. Thus the surface has been lowered by solution through a vertical distance of up to 600 ft.

In a paper (24) dealing with the occurrence of cold karst type at high altitudes in tropical climates, Jennings and Bik say: "In New Guinea fields of evenly scattered dolines, both in normal doline country and in association with pyramids and towers, cover large areas on divides as well as in valleys. It seems unlikely that all these dolines could be due to regular collapse patterns into underground river systems. Surface solution must be dominant here."

In the Maritime Alps (28) some of the enclosed type of potholes beneath a polje were entered with the help of explosives. Their walls were found to have fantastic solutional forms like blades of rock attached by narrow ribs. Solution was thought to occur when they filled with water after heavy rain.

Similar chambers in the Trieste area (29) suggest combined solutional and collapse development upwards towards the surface.

Geze (13) suggests that many large chambers are beneath large dolines under high ridges and are developed by solution and collapse under vadose conditions. Continued collaspe might produce an open hole. He also recognised the opening of joints at zones of tension and the separation of nearly vertical beds of limestone by movement along joint planes near the edge of steep mountain slopes. He mentions the formation of "gouffres" at these points (39).

Jugoslavia has open depressions with no infill and no cave passage at the bottom which are attributed to solution (17).

"Often dolines or shakeholes may be due to a combination of solution, collapse and wetting by seepage" (17).

Jugoslavian dolines (19) vary widely in dimensions froma few feet to half a mile diameter and from a few feet to 200 - 300 feet deep. The usual ratio of width to depth is about 3 : 1. They are thought to be formed by rain water seepage enlarging the cracks and joints by solution into funnel-like hollows.

G. T. Warwick (20) lists instances of shake holes formed by drift cover over potholes sometimes infilled to depths of more than one hundred feet and also by roof coll apse of caves.

Enlargement of small swallow holes by melt water from the snow during the last glaciation possibly formed many of the small potholes in Yorkshire whicl today take very little surface water and have no opening at the bottom (21).

Similar abandoned swallets formed by melting snow were found by Cullingford (22) in the Forest of Dean.

The melting of ice following the formation of ice bodies during Pleistocene peri-glacial conditions has been postulated (15) as the cause of depressions in partly calcareous rocks.

The majority of France's large potholes are in areas which received large snowfalls (32). This may be because colder water holds more carbon dioxide and so has greater dissolving power. R. Ciry (31) has discussed the effect of ice melt water upon small caves in valley sides and E. A. Glennie (18) reviewing Thomas's paper (1) suggests that deep freezing below the grit has caused fracture leading to local accelerated weathering of the grit.

North (14) has noted recent coll apses into solution holes in the Liassic Limestones at Bridgend caused by the removal of fines by concentrated run off water.

T. D. Ford (16) commenting in British Caver on Thomas's paper visualises the erosion of gritstone blocks at the bottom of the collapsed hole by run off water. The sand being removed through the limestone.

P. Renault (33) recognises ten agencies for the formation of cavities by collapse including rapid emptying of water from cracks.

Coleman and Balchin (34) investigated the formation of surface depressions on the Mendip Hills. They conclude that the majority of the depressions on the Mendips are formed by collapse and a complete development sequence is worked out for such holes. Glennie (35) in another paper dealing with the formation of caves considers the association of sinkholes with large caves beneath to be wrong, even when the sinkholes form regular lines. "Sinkholes are mostly due to the erosion of the upper beds of the limestone and the leaching down of surface soil through minute channels. It would be optimistic to suppose that one sink hole in ten leads down to a passage which can be entered, and often, excavation will show no detectable passage at all".

The Stride brothers (36) have proposed a development series for the various types of these holes based on a solution mechanism.

Another paper, expanding and endorsing the work of E. R. Pohl, has been published by G. K. Merritt (38). Again dealing with the Kentucky caving area he considers the the embryonic domepits are formed by the downward percolation of acidic surface waters along joints. If sufficient water is present the pits continue to enlarge in depth and diameter. As the size increases so does the regularity in shape. Often where the shafts are formed under a sandstone cap the water drips from the ceiling directly onto the floor. This additional force, the abrasive impact of dripping water, tends to increase the depth of the domepit in relation to its diameter. Dripping water is probably the principle erosive agent in the deepening of most domepits allowing quite small diameter to depth ratio pits to form.

Formation of Solution Holes on the Limestone Outcrop

Solution from surface seepage and collapse into cavities formed by solution from below have both been used to account for the formation of solution holes. It is probable that both types exist and that some are formed by a combination of both mechanisms.

In South Wales large areas of the limestone are densely covered with solution holes and this tends to rule out collapse directly into caves. Also holes formed by roof collapse into known caves are comparatively rare. If collapse is the mechanism then it must be collapse into cavities which have formed pipe like upwards towards the surface. This assumes solution from below so that they must have stopped forming when the water table was lowered and any collapse today is initiated by surface seepage. Many workers believe that the formation of these holes is continuing, if this is so then the main mechanism must be solution from the surface. Either way they are formed at vertical cross joints of the limestone and are certainly modified by surface seepage. If a wholly solution mechanism is accepted it is possible that the joints were widened under phreatic conditions or they may have been widened from the start by surface seepage. In holes so formed collapse will have a secondary role. The limestone outcrop is covered with drift and soil. This, bound together by the grass and heather, will allow voids to form as the fines are washed away through the limestone. Eventually the top soil will slip into this void leaving a collapsed appearance. Also as the solution lhole widens it will take a little more of the larger grit debris and this need not be a slow, even process. It is significant that the small and medium holes do not show Bedrock and that the medium sized holes are most frequent where there is thick drift cover.

The larger part of the conical depression of these holes is actually in the surface cover not in the bed rock. Where such holes have been sectioned by quarrying the amount of belling out in the limestone rock is small compared with that formed by the tendency for the sides to reach a steady angle.

On Twyn Swnd, the moorland west of the Afon Twrch the solution holes do not have this large conical depression. There is little depth of top cover and the holes are mostly cylindrical, fluted pots going down approximately ten feet before narrowing or dividing. These show no sign of collapse. Similar holes although not common can be found on most of the other parts of the limestone outcrop.

In the nearby cave Pwll Swnd there are two fluted pots which might be comparable with the American "Dome Pits".

It is of course always possible that the presence of solutional features or the absence of collapse features are caused by recent modification, but again I would stress the very large numbers of these holes densely covering the limestone outcrop.

Formation of Solution Holes on the Grit Outcrop

It has been shown (1) that whilst smaller holes are very common on the limestone outcrop and large ones rare, the reverse is true of the Millstone Grit outcrop. Thomas attributes this partly to the closer jointing of the limestone and to the greater flow beneath the more southerly situated grit. These holes show obvious signs of collapse of the grit roof. It is natural to assume that the jointsin the limestone beneath the grit are widened similarly to those on the outcrop. The relatively few small holes on the grit would be expected because only large holes will cause sufficient instability to allow their presence to be transmitted to the surface. Frequently very great thicknesses of grit roof collapse, sometimes as much as two hundred feet and this seems an enormous thickness to callapse into even a "Gaping Ghyll". These very large holes occur more frequently on the grit outcrop and several suggestions have been made to account for this.

As mentioned above, the grit capped limestone is to the south and down dip of the limestone outcrop. It therefore takes more water and at some line the water table will meet the grit limestone boundary.

This grit cap lies directly on the limestone in South Wales and according to Thomas (23) the grit originally above the limestone outcrop has been lowered in places through a vertical distance of six hundred feet by the solution of the limestone. Thomas believes that these outliers or remnants of the old grit cap mark the positions of previous large shake holes. It would be interesting to measure the rate of erosion of the grit cap compared with that of the grit blocks in the collapsed shake holes for it would seem more likely that weathering would be greatest where the grit is broken and exposing a larger surface area. Subsidence on this scale indicates much greater solutional activity than is now present.

Gritstones are acidic rocks and can be hydrolysed to form silicic acids, but usually even if hydrolysis occurs alkalis are also formed tending to nullify the acid. There is no evidence to suggest that direct contact with gritstones causes increased solution of limestone.

The possibility that large collapses on the grit were due to clusters of small cavities in the limestone was considered. The shape and depth of these large collapses does not suggest this but clusters of holes do appear on the limestone outcrop. It was not possible to estimate accurately which clusters might be considered to give a single large collapse if a grit cap had been present, so no comparison could be made between the number of large holes on the grit and possible large holes on the limestone.

Certain gritstones are easily broken down by weathering but the large collapses occur where the rock is of all types. The large holes appear to have formed at a single collapse with minor slumping at the bottom later. Some large holes have well defined small holes at their bases but the shake holes do not appear to have well defined small holes at their bases but the shake holes do not appear to have grown steadily. Whilst weathering and frost action can break up the grit blocks in the collapse little mechanical abrasion is likely to be brought about by the small amounts of slow moving water that trickles into these holes. Waters main action is to transport away the fines and widden by solution the joints on the limestone beneath.

The possibility that the cavities into which the grit collapses are formed actually in the grit must always be considered. Deep seated frost action has been suggested (18). The fact that the grit cap has receded from so much of the limestone indicates that it is prone to erosion.

The receding edge of the grit with its thick grit debris shows many medium-sized holes. Possibly this is due to the depth of cover allowing deeper and therefore wider holes or perhaps the grit - limestone junction initiates solutional activity. On the sloping east bank of the Mellte valley there are many shake holes. In some of these the top soil and rock has slipped away from the side allowing access to the cavity beneath the grit. These cavities are formed in the top beds of the limestone. The roofs are flat and of grit and there are deep, narrow shafts in the floor. The larger of these shafts sometimes lead down to short horizontal passages and then more shafts. The shafts are fluted and often, where shafts have run into one another, long sharp blades like stalagmites are left standing up from the floor. The floors are covered with small pieces of limestone but the only signs of collapse are the grit at the top. In the limestone deep, narrow fluted shafts are formed by solution from above.

The cavities at the top of the limestone may be due to the high initial acidity of the surface run off water.

Conclusion

Caves and solution holes are both products of the limestone area. In South Wales they are not normally one caused directly by the other but are dependant in a secondary way. The solution holes act as drainage paths for some of the surface run off water carrying it down to the water table, sometimes:-

> without any connection with caves proper, i.e. normal secondary permeability for limestone.
>
> with eventual connection with a cave, i.e. the water that a cave collects other than from a stream sink.

with direct or almost direct connection into a cave. This third type is normally only apparent when the connection has a free air space or when it is used by a stream. Examples of these are the pothole entrance and the stream sink into Pant Mawr Pot. Other than these easily proved ones such connections can only be assumed when a trickle in the roof of a cave passage is known to coincide with a solution hole above.

When a stream runs onto limestone dominated areas its water will use to some extent the existing drains. These will then enlarge and normal vadose cave formation take place. This is a case of a solutional hole leading directly to the formation of a cave but this occurrence is comparatively rare in Wales and usually occurs where the sinking stream finds an exit at a much lower level a short distance from the sink. Examples are sinks at the top of outcrops or valley sides rising below, e.g. Lewis's Pot, or where a surface stream invades a cave, e.g. Pant Mawr Pot where the stream sinks one hundred yards from the cave and has cut a vadose passage which rapidly joints the main system. Examples of streams having invaded old systems are relatively common on South Wales.

Examples of holes formed by the roof collapse of known caves are not common in Wales. Pant Mawr entrance is a possible example and there is a large collapse into the Mellte in the dry valley above Porth-yr-Ogof.

In the limestone under the grit solution holes form as they do on the outcrop. As previously mentioned the thick grit capping is the reason for the absence of small holes, only very large holes would allow the collapse of the grit roof. The mechanism for the formation of these very large holes in unresolved. Whether the distribution of the water onto the limestone through the grit causes large cavities to form at certain points or whether localised erosion of the grit at certain places initiated by solution holes in the limestone beneath is not known. Certainly the large scale erosion of the top beds of the limestone allowing the lowering of the grit cap must leave large cavities at fracture points.

It would seem very likely that the majority of the solution holes formed under the grit cap with no indication of their position on the surface. The roof of grit would allow the seepage water to be distributed over the whole cross section of the solution hole not only at the edges. This would lead to deep narrow fluted pots, the lower sections of them remaining after the removal by erosion of the grit cap. The holes would then be modified by the remaining grit debris leaving conical depressions of the type found at present on most of the limestone outcrop. Some of the open shake holes above the Mellte have several shafts leading down from the chamber directly under the grit roof. Many of these shafts have overlapped showing that with the grit-roof distributing the seepage water over the whole floor space there is a tendency for very large, deep pits to form. Also

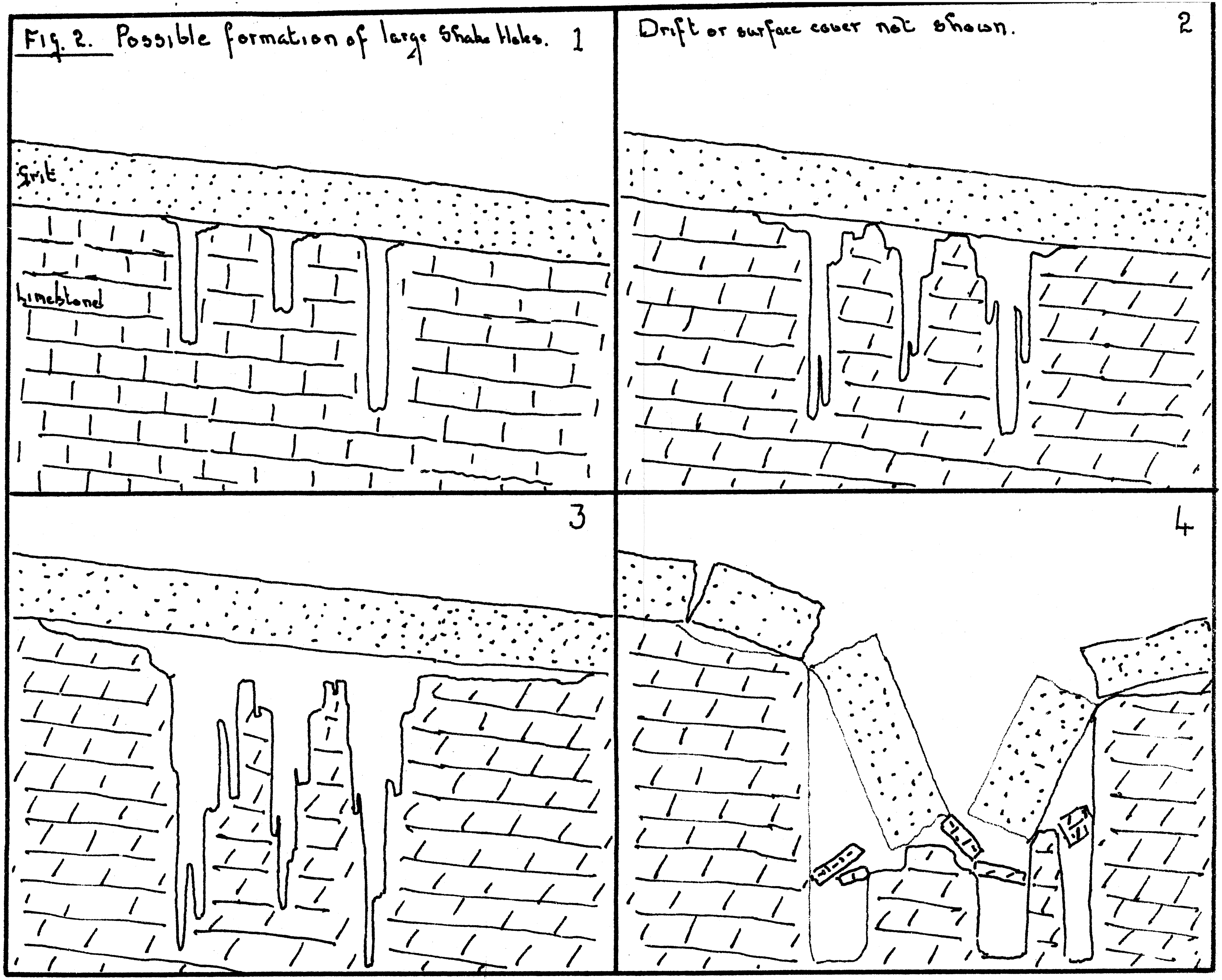

Fig. 2. Possible formation of large Shake Holes.

solution by run off water at its highest acidity acting at the junction of the grit and limestone will tend to increase the effective roof span. These conditions may account for the very large shake holes often found on the grit. This suggested mechanism is shown in Fig. 2.

Holes of all types do occur and probably several mechanisms combine to form some but in South Wales solution by surface run off is dominant. Collapse occurs where there is a grit cap but solution by surface run off is dominant. Collapse occurs where there is a grit cap but solution by surface water finding its way to the water table is still the cavity forming agency so that these holes are solution holes modified by collapse.

Points that suggest one mechanism for the origin of these holes can frequently be argued to be modified holes originally formed by another mechanism, but the enormous number of these holes densely covering the limestone outcrops makes it unlikely that they could be directly connected with cave systems proper.

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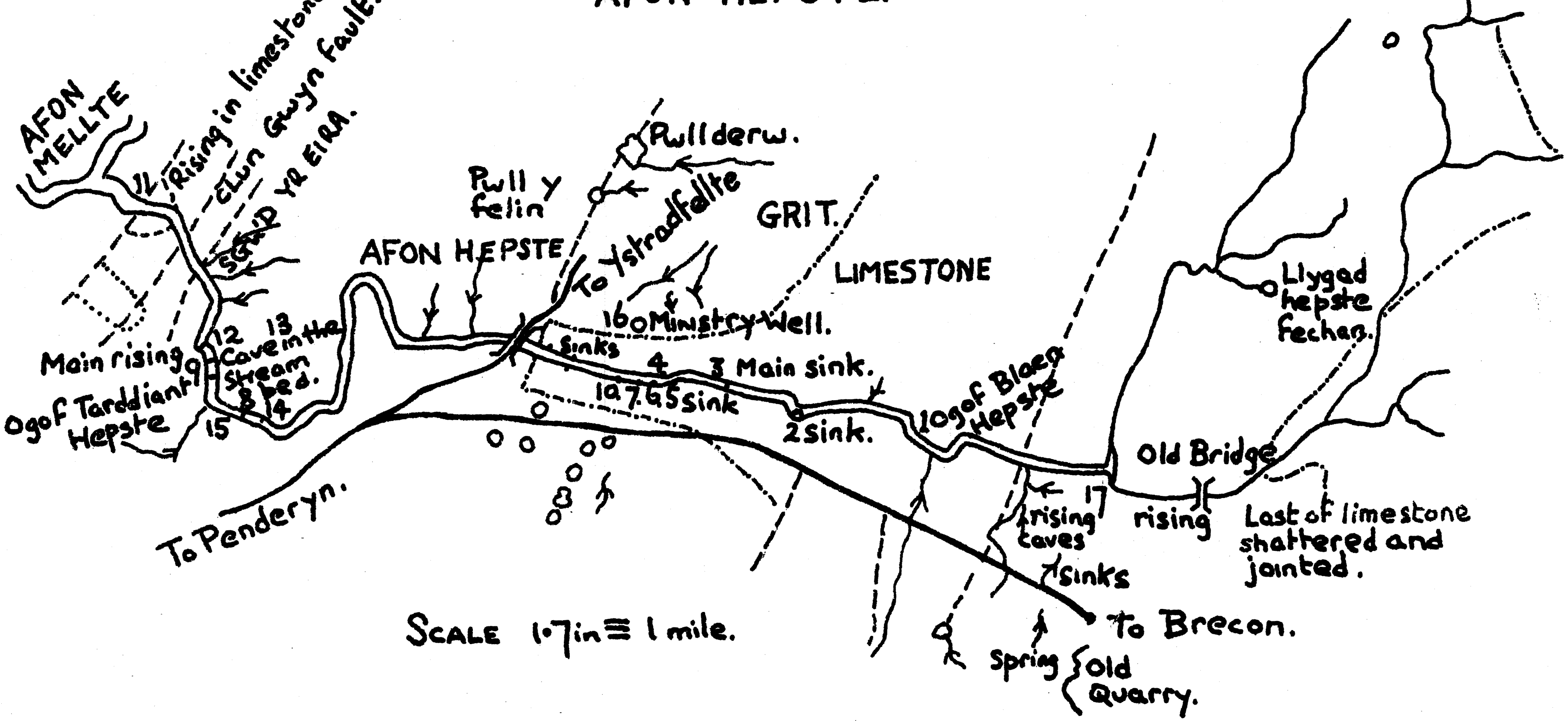
J. M. HARTWELL & A. JONES

AFON HEPSTE.


AFON MELLTE
Rising in limestone.
CLun Gwyn fault.
SGWD YR EIRA.
11
5
Main rising
9
12
13
Cave in the stream bed.
8
14
Ogof Tarddiant Hepste
15
To Penderyn.
AFON HEPSTE
Pwll y felin
To Ystradfellte
Pwllderw.
GRIT.
LIMESTONE
16 Ministry Well.
Sinks
4
3 Main sink.
1a 7 6 5 sink
2 sink.
1 Ogof Blaen Hepste
17
rising caves
Sinks
Spring
Old Quarry.
To Brecon.
Old Bridge
rising
Last of limestone shattered and jointed.
Llygad hepste fechan.
SCALE 1·7in ≡ 1 mile.

3. The Hepste Valley

This article is meant to supplement that by M. Davies in South Wales Caving Club News Letter 45. The two papers cover the Hepste from source to its junction with the Mellte and we would like to receive details (Preferably via the newsletter) of any solutional activity that we have missed.

11. A rising 926098. A small rising discovered by W. Harris on the north bank of the Hepste below Scwd Cilhepste Isaf (Lower Cilhepste Falls). It is in a small limestone outcrop a few feet above stream level.

12. The main Hepste rising. There are no sinks below this point.

13. A cave 935096. This cave which was discovered by F. Baguley is 150 feet down stream from the Main Cave (9). There are two entrances on the river bed and the stream flows approximately north to south which is opposite to the flow in the main cave (9). (An over-turned tram in the river bed locates its position).

15. The tributory stream from the old mineral railway on the south bank joins the Hepste 350 feet up stream from the main cave (9) and sinks at once.

14. There are one or two small caves 50 ft. and 150 ft. above this point (15) including cave (8) and there are many places in the bed where tributary water sinks, one in particular is in the north bank below a large tree which has collapsed to 45° from vertical.

16. The Ministry of Agriculture well situated near an old quarry was built on the site of a spring and supplies three farms.

17. Possibly two caves on the south bank half a mile above Ogof Blaen Hepste (1). This is an area of intense solutional activity with sinks, risings, a shallow dry valley and many solution holes.

Llygad Hepste Fechan:- This is a pool not a rising and this tributory contains no sinks or caves.

The other branch is more interesting having a rising with diggable fissures at the base of the rock outcrop supporting the old bridge 975139. A little above this just before the limestone ends there is an area of shattered and collapsed rock. Above this the river runs over sandstone.

Conclusion

The bed of the Hepste is a sieve of small sinks so that any tributary water soon disappears but the cave system is small, recent and can take little flood water. It is unlikely that this system is worth the excessive work needed but the possibility of an old system above the present river level can never be excluded. It is interesting to note that the fault running across the Hepste at the bridge cuts through the sinks at Pwll-y-Felin and Pwll Derw.

F. BAGULEY and J. M. HARTWELL.

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4. Dan-yr-Ogof

The management of the Dan-yr-Ogof caves will now allow members of the South Wales Caving Club to enter both Dan-yr-Ogof and Tunnel Cave, providing the following conditions of entry are upheld. Visiting parties and non members are also allowed into the caves on the recommendation of the South Wales Caving Club. Cavers who are unknown to the cave management must first obtain a written introduction from a S.W.C.C. committee member, this is to be presented to the Manager, namely Mr. Trevor Lewis on arrival at the cave. Printed cards have been produced for this purpose and these may be obtained from the club headquarters.

For many years the committee have been seeking permission to enter the Dan-yr-Ogof caves, and now that this has been obtained, we request that every assistance and co-operation be given to the management by those who wish to visit the caves, this we believe will help to strengthen and bind the very amicable relationship which now esists between the Dan-yr-Ogof Cave Company and the South Wales Caving Club. Bad manners and unthoughtfullness have led to many strained relationships between cavers and cave owners in other caving regions of the British Isles, we cannot, and will not allow this to South Wales. People who cave in this area have been fortunate in so far that none of these problems have arisen, and with the help of everyone there is absolutely no reason why this pleasant situation should not continue indefinately.

Conditions of Entry into Dan-yr-Ogof and Tunnel Cave

1. All parties must be accompanied by a competant cave leader, this leader is to be appointed by a Committee Member of the S.W.C.C. The leader must be familiar with the route across the lakes.

2. No more than five cavers per leader will be allowed.

3. The cave log is to be signed and the manager is to be given written details (in the form of a printed card) of the party before they enter the cave. The log is kept in the manager's office.

4. All cavers must be in the cave before 10.00 a.m. on weekdays and 11.30 on Sundays.

5. No more than 20 cavers will be allowed in each cave at any one time.

6. Changing into and out of caving clothes is to be done in the hut provided for this purpose.

7. Cavers are not allowed to loiter in the show cave section and they must pass through this section as unobtrusively as possible.

8. Novices are not to be taken beyond Davey Price's Hall in Tunnel Cave.

9. The cave manager can refuse cavers permission to cross the lakes, if, in his opinion, the water level is too high.

10. No charge is to be extracted from visitors by the S.W.C.C.

11. The rules and regulations which appertain to the show cave are to be observed at all times, and the management reserve the right to withdraw all priviliges in the event of an infringement of the above conditions being committed.

GWYN THOMAS
HON. SECRETARY.

6. CLUB NEWS

Obituary

It is with deep regret that I have to inform you that Dr. Margaret Nichols passed away on Saturday, 18th July. Dr. Nichols had been an honorary member and very generous benefactor of the club for a number of years. I am sure that I speak for everyone when I offer our deepest sympathy to the bereaved members of her family.

Congratulations

Congratulations are offered to the following:-

Mr. William Birchenough and Miss J. Upton on their recent wedding.

Mr. Martin Gilbert and Miss Janet Elmes on their engagement.

Change of Address

Mr. & Mrs. R. Smith, 58 Woolaston Avenue, Lakeside, Cardiff.
Mr. G. T. Stark, 20 Penydre, Clydach, Swansea.
Mr. P. Millet, "Brigfield", 39 Rochdale Road, Middleton, Manchester.

New Members

We welcome the following new members to the club:-

Terrence Moon, 31 Hirst Crescent, Fairwater, Cardiff.
Noel Christopher, 106 Van Road, Caerphilly, Glam.

7. BOOK REVIEW

Doolin - St. Catherine's Cave by Dr. O. C. Lloyd, University of Bristol Speleological Society. A Monograph published November, 1964; 30 pages; 8 plates; 2 surveys; 10s. plus postage.

Any publication should mirror its author, and through the looking glass of his words one should be able to see him. This is my first criterion on reading any work - is he there? Yes, from first to last, singing songs in the first chapter, discussing geology and cave formation through it all and supplying photographs to round it off. This work is Oliver as we know him in South Wales - a thoroughly competant and excellent production; a mine(pardon) of information most entertainingly presented. A model of how things should be produced. Even though parts of this work have been published before,in a world where publications increase in number out of all proportion to the discoveries, the gathering together of information about one cave system is essential and worthwhile. For the visitor to the system, he will find all he needs in this book: History of Exploration, cave names, geology, description of main caves and tributaries, and Oliver's theory about the development of the system. The whole being rounded off with two large scale plans.It is asimportant for the visitor as his cap lamp since so much light is shed. One notable feature of the plans is that the above ground and below ground features are correlated so that one can 'see' where one is in relation to the countryside above. A lesson to be learned here by South Wales cave surveyors perhaps for any future publications on our own caves; similarly the bed survey produced in this document could well be mirrored in our local publications.