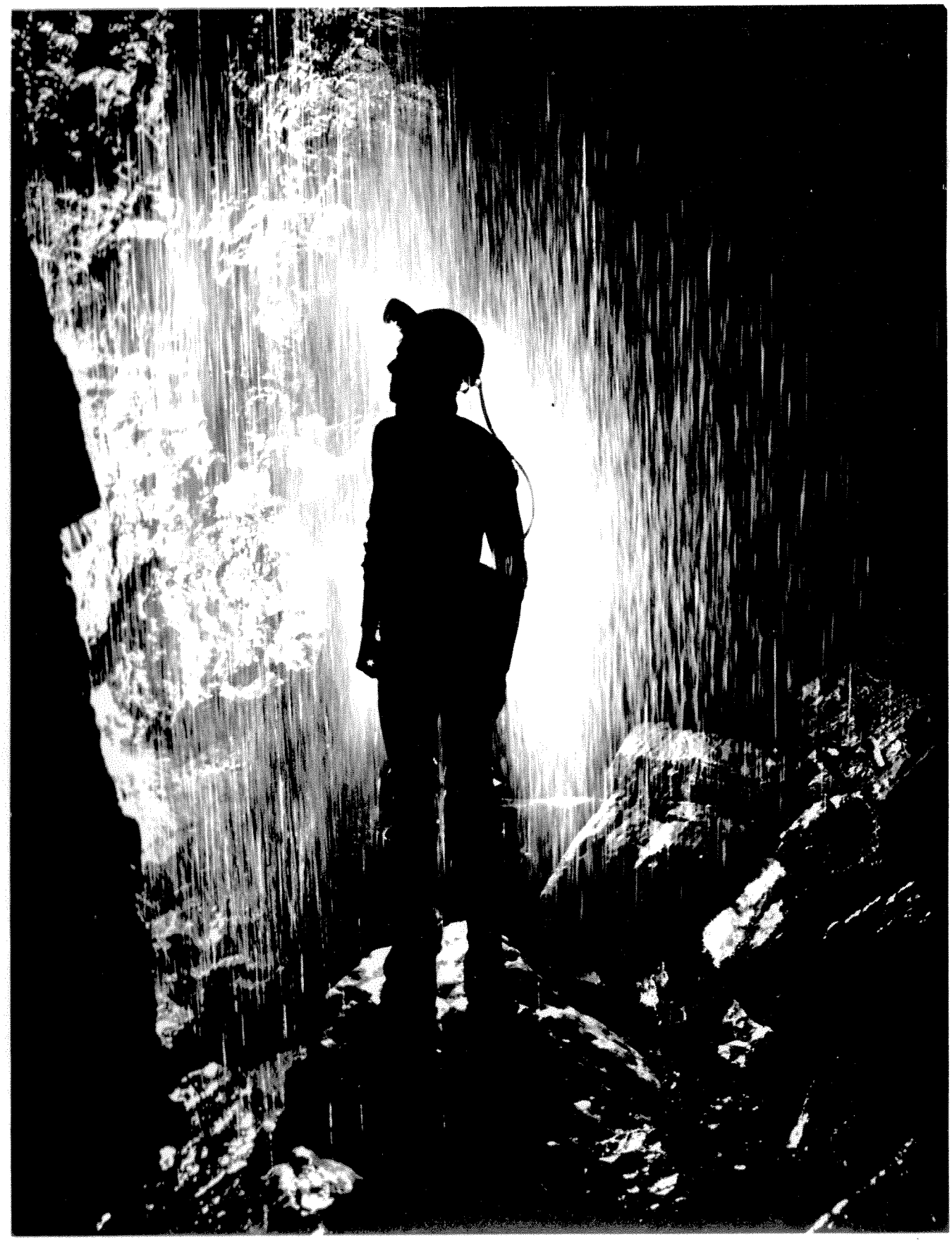
SOUTH WALES CAVING CLUB



NEWSLETTER No. 97 1983

DR.G.T.WARWICK

Older Members and all speleologists will be sad to learn of the death of Gordon Warwick on the 18th March at the age of 64.

Gordon was not an active Member of SWCC although he has been a supportive Member since our Club started until recent illness caused him to retire.

A Lecturer in Geomorphology at Birmingham University, he obtained his PhD for work on the Reef Knoll Limestones of Derbyshire, his home county. Since then he has always been in the forefront of speleological theory. A leader in BCRA and in international speleology, he was one of the Founder Members of CRG and promoted the amalgamation with BSA, this new organisation becoming the national institution for speleology.

Above all he was a gifted and patient teacher, liked by everyone. He will be missed by cavers and scientists. Our sympathy is extended to his widow, Phylis, and his daughter Helen.

W.H.L.

SOUTH WALES CAVING CLUB

No.97 NEWSLETTER MARCH 1983

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THE AGE OF OGOF FFYNNON DDU

In 1977, Bob Charity and I were asked to write a part chapter on Ogof Ffynnon Ddu for the final book of the 'Limestone and Caves of Britain' series: the Welsh book, by Pete Bull. The script was delivered more or less on time but, despite a launching symposium in 1979 at Craig y Nos Castle, the book is still unpublished and, as far as I am aware, there is no prospect of publication in the immediate future.

Whilst the chapter was a reasonable synthesis of information then available, Gerry Eldridge's thesis (1978) has since been presented and the wealth of detail that it includes renders much of the chapter superficial.

I had originally intended to publish the geology and geomorphology sections in this Newsletter, but this would now largely be pointless in view of the much better study now available in the Club Library. However, when reading Gerry's thesis it became apparent that he was not aware of the full detail of our structural surveys of Ogof Ffynnon Ddu I and Top Entrance Series. This is hardly surprising because, apart from a twenty minute presentation at the 7th Int. Congress of Speleology at Sheffield in 1977, it has not been published. This is unfortunate because, in my opinion, the evidence is overwhelming that: structural control by the train of plunging anticlines/synclines and faults/fractures/veins is very strong throughout the surveyed area and, superficial surveys of other parts of the system, e.g. OFD III, indicate a similarly strong control. Therefore, as an interim measure, we are publishing here the geology section of the chapter.

I have, over the past 18 months, had discussions with Keith Ball over publication of the full evidence and I hope to present it in the next Newsletter.

Gerry also has a radically different view of the age of Ogof Ffynnon Ddu to the more conservative estimates presented by the authors. I am therefore also presenting our chronology section as an alternative view. I conclude this article with a discussion of factors that lead us to our more conservative view of the age of Ogof Ffynnon Ddu, together with a review of how, in the light of modern techniques, the debate could be resolved.

Geology: Structure

The area lies within a Variscan compression belt influenced by structures in the underlying lower Palaeozoic Block (Weaver 1975). The tectonic fractures associated with the Cribarth anticline and the Henrhyd Fault appear to act speleogenetically in influencing major directional trends. The uppermost cave passages in Ogof Ffynnon Ddu, which make up various series within the system, are, however, influenced by several factors. These develop predominantly along north-south trending fractures frequently calcite infilled, with secondary east-west and minor NE-SW, NW-SE passages that also follow tectonic fractures. Structural surveys show that a chain of minor, southerly-plunging, asymmetric anticlines and synclines pass eastwardly from the Henrhyd Splay Fault at least to the sink at Pwll Byfre. High level passages of the cave off the main stream follow the crests of these tectonic features. Passages may therefore be ascribed to the longitudinal, transverse or shear fractures of these minor folds. Additionally, 15 to 20 per cent of the passages so far surveyed are not associated with fractures. They pass usually from NE to SW down the shallow dip limb of the anticlines to the next tectonically influenced area, presumably following one bedding plane along the line of maximum hydraulic gradient: a good example of which is Gnome Passage.

It is also significant how many of the north-south passages of Top Entrance Series are relatively straight, reflecting strong fracture control of the primary dip tubes. However, the shorter east-west passages are sinuous, following a meandering roof tube, which indicates their origin as strike leakage along bedding plane anastomosis similar to the conceptual model of Ewers (1978) for the development of caves in dipping limestones.

The lower portions of OFD I were studied in detail by Glennie and have been re-examined recently by the present author for structural features. Glennie describes the general structure as gently dipping limestone beds divided by a single fault, with a throw of 3.4 metres into a west and east system. The west system had a generalised dip of 16^{o} in a direction of 179^{o} to the North, whilst the east system had a dip of $14\frac{1}{2}^{o}$ in a direction of 176^{o} to true North. The present author has found this to be a considerable over-simplification as dip angles of 6^{o} to 16^{o} over a total directional range of 245^{o} either side of South have been recorded during my investigations, together with a complex of N-S faults and an anticlinal structure.

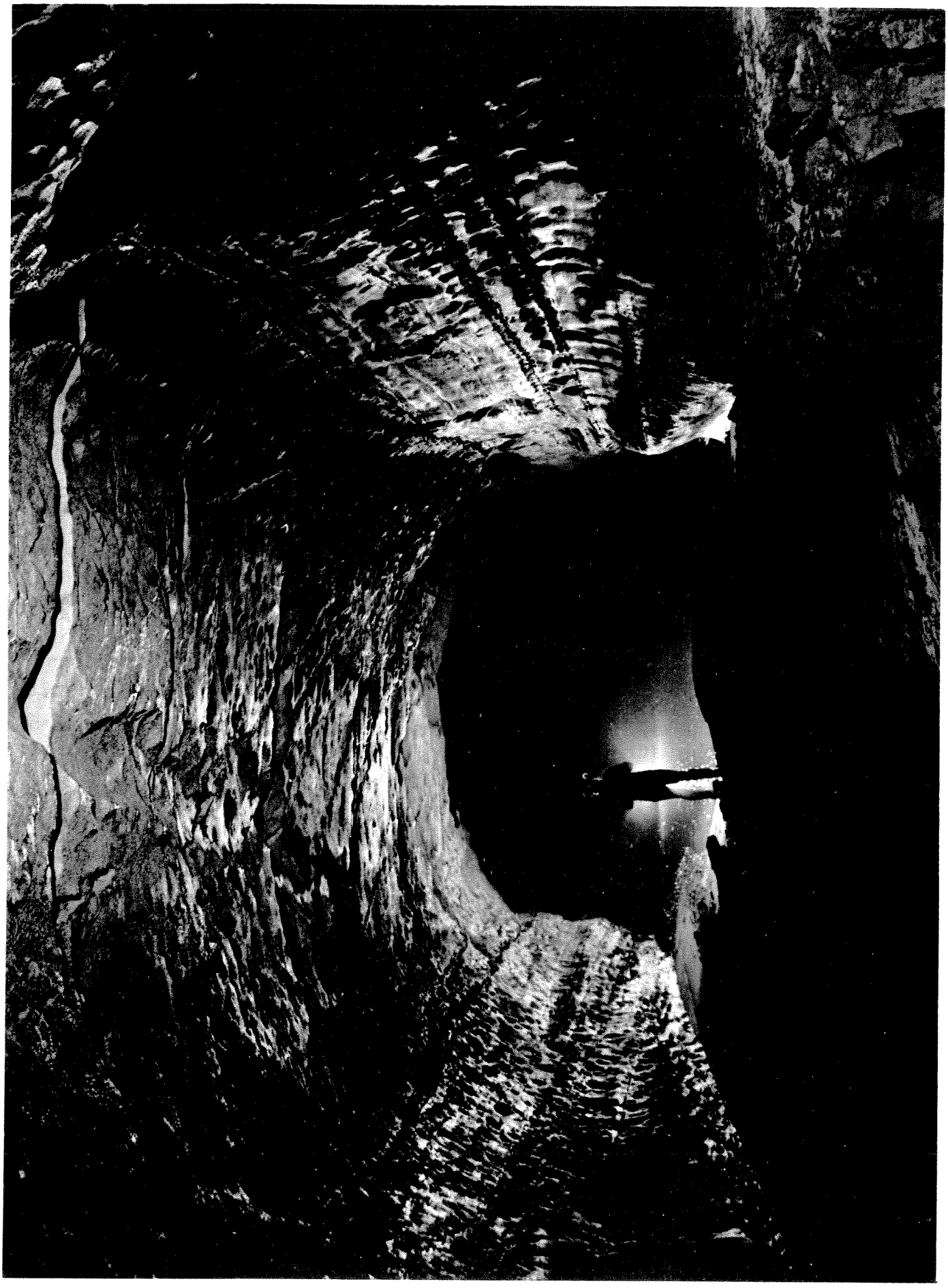
The author has collected evidence which establishes major faulting with N-S trend to the East of Pwll Byfre. Here, Dinantion Limestone lies beside beds of the Namurian stage, indicating substantial downthrow. The straightness and length of this contact zone, together with sub-surface visual evidence of faulting on the east wall of Smith's Armoury, contradicts the previous work of Thomas (1957) who suggested that the grit outlier near Pwll Byfre was the result of collapse into a huge, pre-existing cavern. The work of Thomas would have supported later work by Harvey (1962) who suggested that Ogof Ffynnon Ddu should extend beyond the catchment of the Tawe towards the Nedd and should therefore connect with Pant Mawr Pot. To suggest such now would have far reaching implications. An eastward connection with Pant Mawr Pot would have to pre-date this major fault, which at best would have occurred no later than early Tertiary times, but probably Armorican, and completely ignores one of the strongest structural features of the area which has been shown to be so important to the cave's development generally.

The evidence of this fault does, however, allow us to postulate that strike slip movements between it and the Henrhyd Fault resulted in minor compression of the enclosed block, accounting for the presence of the anticlines on which the cave is predominantly built. This hypothesis is supported by Ball (1981).

In reiteration then, tectonic movements during the Variscan Oregeny created fractures along sets conforming to N-S trending anticlines and synclines. These were accompanied by shattering and subsequent calcite-infilling of incompetent beds during major slipping. Simultaneously, the NE-SW trending anticline of Cribarth developed strong fractures of the longitudinal (strike) set. Submergence below the water table developed phreatic capilliaries within incompetent bedding. These tubes found directional influence when meeting the calcite infill of tectonic fractures and here the major phreatic tubes developed to maturity. Lowering of the water table created vadose conditions and the development of deep rifts and canyons in intraclastic beds. Denudation above and removal of the pressure from glaciation brought relaxation and modification by collapse.

Chronology

The sequence of surface morphology development is not fully understood and whether the 'terraces' that can be seen at about



400-450m OD and around 300m OD at Penwyllt represent the remains of peneplains, as a consequence of subaerial denudation as postulated by Brown (1960), or as a consequence of marine erosion and pulsed sequential uplift as favoured by George (1970), is unresolved. What is reasonably certain is that the Proto-Tawe followed its present course to about the region of Penwyllt, but at a higher level and probably extended further North before the capture of its headwaters by the River Usk. This Proto-Tawe would then have flowed South-East through the Banwen wind gap (altitude 300m) to join the Pyrddin-Cynon system (Jones 1939).

The present course of the river is the result of a river capture at Craig y Nos by a rejuvenated Tawe cutting back along the line of the Cribarth Disturbance, possibly additionally aided by glacial downcutting of the valley during the Pleistocene.

The relationship between the inland erosion surfaces and the coastal raised beaches is uncertain but it is possible that the 400-450m surface at Penwyllt is graded to the coastal 180m raised beach. The date of these coastal features is also uncertain but the 180m raised beach is assigned to the late Pliocene sea level, by North (1968), and logically lower beaches at 120m and 60m would be of Pleistocene age. Jones (1939) considers that the present Tawe developed after the cutting of the 120m coastal platform, but before or during the development of the 60m platform. This would date the downcutting of the Tawe as approximately middle Pleistocene.

Based on the exposition of scenery development and the other views expressed above, we would propose the following chronology:

1. Initiation and development of the highest levels at around 425m in Pliocene or very early Pleistocene times. This would include Gnome Passage, Chasm and the Fossil Series of OFD III.
2. Glaciation causes clastic fill, collapse and drainage of this system, followed by vadose development to a level at about 300m and the development of mature passages at this level (e.g. Cwm Dwr, Smithy, Rawl).
3. Lowering of external base levels due to the structural adaptation of the Tawe Valley brought further vadose development and probably a fill stage in Wolstonian times, and stalagmite deposition in the subsequent Ipswichian interglacial.
4. The cave was largely complete by Devensian times, minor modifications, some clay fill and finally the invasion of Pwll Byfre at the end of this episode. However, it should be noted that all these chronologies are only based on speculation.

The suggestion of a Tertiary age for Ogof Ffynnon Ddu was first proposed by Paddy (O'Reilly 1967). However, Gerry has augmented this proposal with a well-argued case. However, the significant difference between my proposition set out above and Gerry's, turns on the assignment of ages to the coastal raised beaches/erosion surfaces, the ages of which are uncertain. However, there are more geomorphological features in the Penwyllt area that indicate a more recent age to the landscape and cave.

A key part of Gerry's argument is based on Thomas's (1974) assignment of collapses/slumped masses of grit, such as Pwll Byfre, to mid-Tertiary age. As we have seen above, evidence exists to strongly suggest that the Pwll Byfre grit outlier is attributable to more conventional reasons, i.e. faulting in Armorican times. Further, if the Byfre sand deposits are of Tertiary age, why were such easily eroded and vulnerable deposits not removed by Pleistocene glaciation, and if they survived this, why are there no

overlying deposits of glacial till as are present in what would be analogous deposits of the Brassington Formation, Derbyshire, which are of Miocene age (Ford 1977)?

Secondly, he proposes that the 425m and the 331m erosion surface at Penwyllt is a remnant peneplain. If this is true and the upper parts of OFD are contemporaneous with it, why is the cave in such an excellent state of preservation and not decayed and heavily disected? Ogof Ffynnon Ddu is undoubtedly a mature cave, not the decayed remnant one would expect to be associated with a remnant peneplain.

Finally, if the Penwyllt karst is very old, why isn't the overlying limestone heavily cavernised like the Central Kentucky karst surrounding and enclosing Mammoth Cave, for which real evidence of an age of at least 690,000 years exists?

During the past 10 years three techniques for dating caves have been developed to the stage where their application is almost routine, being limited only by resources. These are uranium/thorium dating of speleothems, O-16/O-18 measurements of paleo-temperature from speleothems and finally, paleomagnetism of studies of cave sediments.

The uranium/thorium method of dating stalagmites has now become routine for the investigation of cave systems. It has an age limit of 350,000 years (350 Ka) which covers the late and middle Pleistocene. It has now been applied to the majority of British caving areas, but not South Wales. Whilst some speleothems have been discovered with ages in excess of 350 Ka, the majority have been younger, suggesting a relatively young age to most British caves. The U-238/U-234 is capable of giving dates back to 1 million years, but unfortunately the method is unreliable when applied to fresh water carbonate deposits due to spatial and temporal variations in the initial activity.

Stable oxygen isotope studies allow relative estimates to be made as to the temperature of the groundwater from which the speleothem was formed, thus glacial and interglacial episodes can be identified. A correlation between O-16/O-18 ratio and speleothem age is also possible using U/Th data but the method cannot, by itself, give absolute ages. It can, however, be used on material older than 350 Ka to obtain an idea of the climatic conditions during deposition. Comparisons can also be made with deep sea cores that can be dated back to 1 million years BP.

It is now well established that the earth's magnetic field auto-reverses more or less at random; i.e. north-pointing compasses would point South when the field is reversed. The field has been reversed on many occasions during the past 4.5 million years.

The most recent reversal was from 690 Ka to 750 Ka and magnetically reversed sediments have been discovered in the highest levels of Mammoth Cave, Kentucky, and in several Matlock caves (Derbyshire). However, as with stable oxygen isotope measurement only inferential, not absolute, ages can be obtained.

Thus, having rambled around the nether reaches of geomorphology, geochemistry and geophysics, let me bring it back to Ogof Ffynnon Ddu. To establish a pre-Pleistocene age one would have to find in the cave Fluvial or aeolian sediments, overlain by stalagmite of U/Th age greater than 350 Ka. The calcite should have stable isotope pattern indicating a sequence of cold and warm phases. Also, the sediments would then have to show a cyclic pattern of normal and reverse magnetism. It could be argued that

such deposits will have been removed by subsequent Pleistocene erosion; however, it is very unlikely that in some remote corner of Ogof Ffynnon Ddu or Dan yr Ogof some have not remained, such is not the way of the world.

The techniques are available. All we are short of is the money and resources. Is there no-one in one of the Welsh Universities with the bottle to get on with it? It would settle a lot of geomorphological arguments.

Noel Christopher

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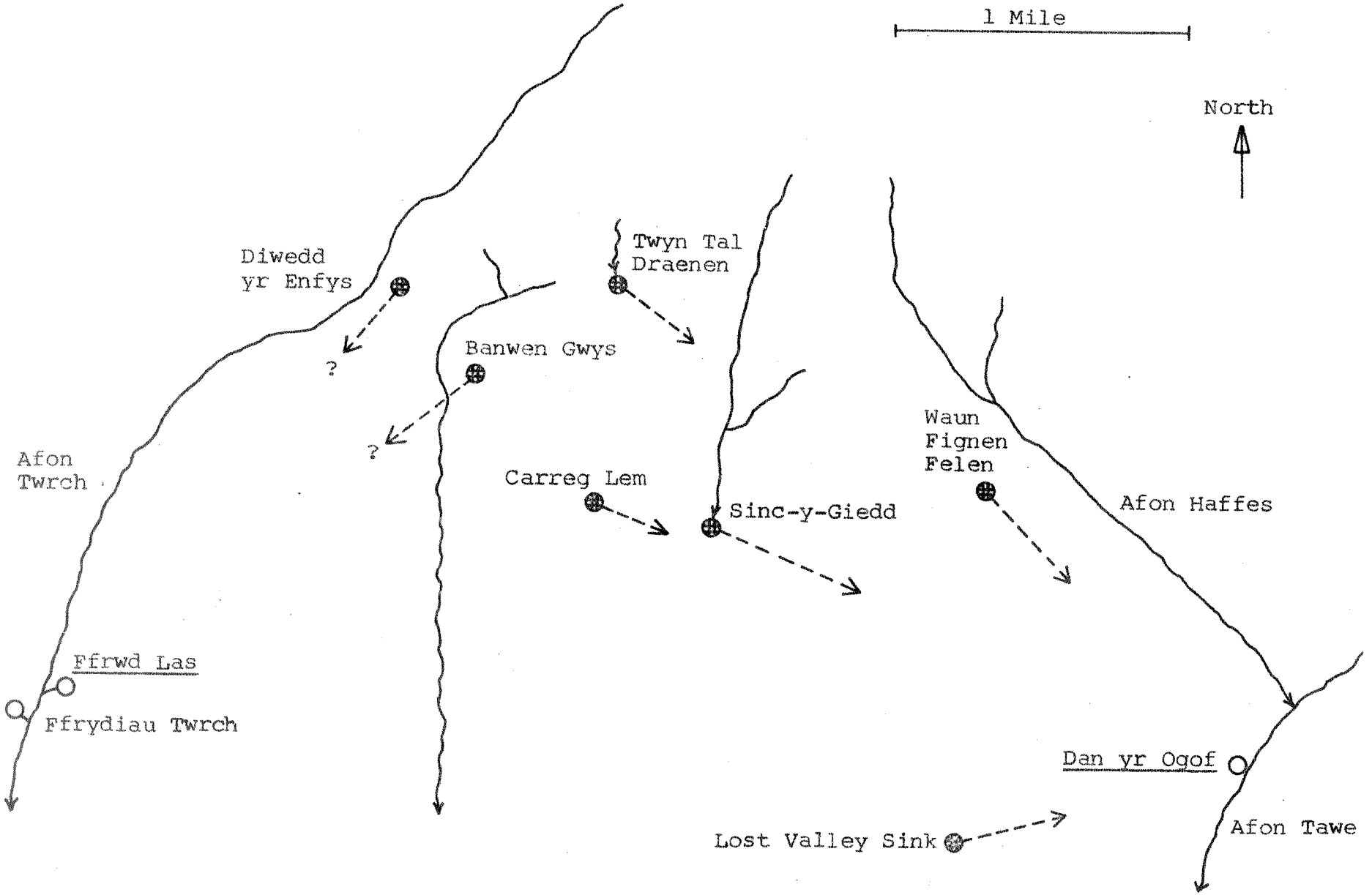

1 Mile
North
Diwedd
yr Enfys
?
Banwen Gwys
?
Twyn Tal
Draenen
Afon
Twrch
Carreg Lem
Sinc-y-Giedd
Waun
Fignen
Felen
Afon Haffes
Ffrwd Las
Ffrydiau Twrch
Dan yr Ogof
Afon Tawe
Lost Valley Sink

A HYDROLOGICAL STUDY OF THE DAN YR OGOF AND FFRWD LAS RESURGENCES

OBJECT To ascertain the area of the water catchment using the Lycopodium spore method of water tracing and thus determine the western limit of the Dan yr Ogof system.

METHOD The method of tracing underground water courses using Lycopodium spores is as follows:-

Lycopodium spores are small, pollen-like objects, 30 microns across, which come from the Lycopodium plant - a small, heather-like plant found mainly in arctic regions. They can be dyed several different colours using biological stains and have the special property of neutral buoyancy in water, thereby enabling them to pass sumps with the water flow.

They are introduced as a slurry into likely sinks on the surface of the hill and are collected in 20 micron mesh plankton nets held in metal frames which are submerged in suitable places in the likely resurgences.

The contents of the plankton nets are examined under a microscope at suitable time intervals and any coloured spores collected and identified, thereby linking sinks and resurgences positively. The spores are clearly visible at 100x magnifications and can be studied in detail at 400x magnification.

The main advantages of using Lycopodium spores, instead of water soluble dyes like fluorescein, are that they do not contaminate the water and can be used in public supplies without risk of pollution; also, dilution does not really impede the success of the trace as one spore collected in the net will confirm a trace from a sink.

THE STUDY After a period of unsettled weather which included very heavy showers and thunderstorms, dyed spores in 1Kg aliquots were introduced into sinks in the Black Mountain area to the North, West and South of Sinc-y-Giedd. Nets were placed in the river Llynfell just below the entrance to Dan yr Ogof and in Ffrwd Las resurgence in the Twrch Valley, North of Ystradowen.

The details of the results obtained are listed below:-

14th August '82: 1Kg of spores were put into:

(1) Carreg Lem sink at SN 805178 (dyed Methylene-blue).

(2) Twyn Tal Draenen at SN 807191 (dyed Magenta).

(3) Diwedd-yr-Enfys at SN 796191 (dyed Safranine-orange).

(4) Lost Valley sink at SN 826156 (dyed Malachite-green).

(5) A sink South of Banwen Gwys at SN 798184 (dyed Bismark-brown).

The nets at Dan yr Ogof and Ffrwd Las were inspected for the presence of spores on the following dates and with the results indicated:-

16th August '82: The Dan yr Ogof net tore under flood conditions but contained the following spores:
Magenta - a considerable number,
Malachite-green - a few,
Methylene-blue - one spore identified.
The Ffrwd Las net contained no spores.

17th August: The Dan yr Ogof net was repaired and kept in place.

18th August: Both the Dan yr Ogof and Ffrwd Las nets contained no spores.

20th August: The Dan yr Ogof net was clear of spores. The Ffrwd Las net tore and was removed for repair.

22nd August: The Dan yr Ogof net was considered too damaged to be of further use so it was removed and the repaired Ffrwd Las net put in its place.
Also, a further 750g of Magenta spores were put in Diwedd-yr-Enfys sink during flood conditions.

24th August: The Dan yr Ogof net contained a few Malachite-green spores.

27th August: The Dan yr Ogof net again had green spores in it.

29th August: The DYO net was clear.

30th August: The DYO net was clear.

4th Sept: The DYO net was clear and was removed for cleaning and future use.

CONCLUSIONS AND COMMENTS The water which resurges at Dan yr Ogof had already been positively linked with sinks at Waun Fignen Felin SN 822177 and Sinc-y-Giedd, SN 810178. We can now add to those sinks at Twyn Tal Draenen, Carreg Lem and the Lost Valley near Pwll-y-Wydden.

The recurrence of so many Magenta spores within 48 hours from Twyn Tal Draenen must give this sink a good chance of being connected to good cave, even though it is so far distant from the resurgence.

The lack of spores (one only) from Carreg Lem can probably be attributed to the tearing of the net happening just as the spores came through the system; Carreg Lem may well feed the cave stream, as does Twyn Tal Draenen, although after a longer period of time.

The green spores from the Lost Valley sink appeared over many days (13 days in all) and this must surely indicate an intermittent water connection from sink to cave, probably only during or after heavy rain: the relevant weeks were punctuated with heavy showers.

The failure to detect spores from Diwedd-yr-Enfys, either Safranine or Magenta from the later test, would seem to indicate that this cave is beyond the limit of the Dan yr Ogof catchment, as is the case with the sink near Banwen Gwys; however, the spores from these two sinks did not appear in the Ffrwd Las net either, at least not for six days until it tore and was removed. This must raise the question, where did they go?

My assessment is that Diwedd-yr-Enfys and the other sink probably do feed Ffrwd Las but via the water table, i.e. as 'ground water'. This could explain why the spores did not appear within 6 days, groundwater can take weeks or even months to travel to the resurgences; also, Ffrwd Las was noticeably unresponsive to heavy rain, only varying slightly and slowly in volume even though the weather was very unsettled. The Dan yr Ogof resurgence flood-pulsed rapidly and frequently over the same period.

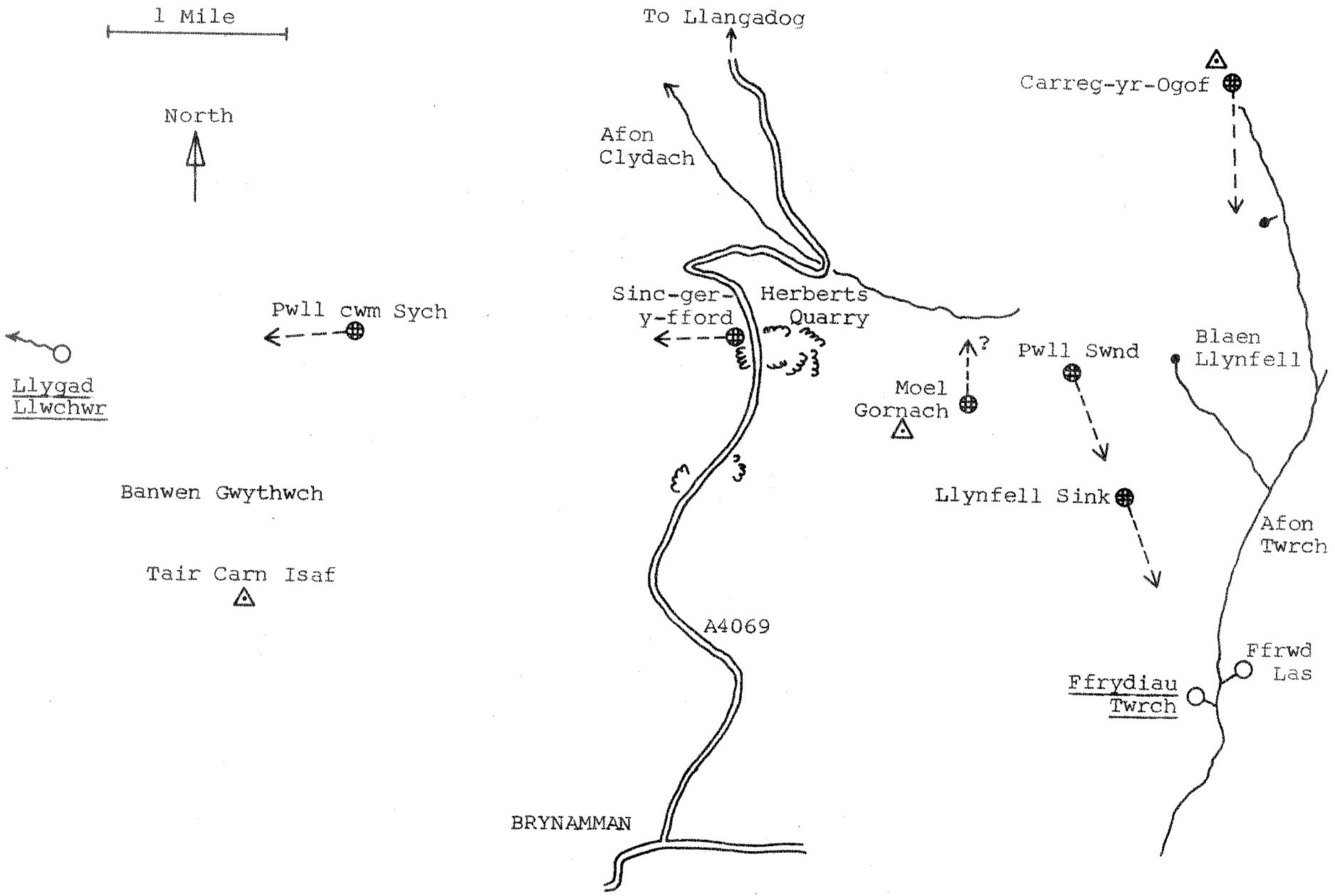
The indications are, therefore, that Ffrwd Las water is largely saturation zone water, only responding in flow to a general raising of the local water table after a considerable period of heavy rain.

This completes the first part of the study; there are still 5Kg of dyed spores to use in more suitable sinks in this area, or more likely further West, and this will be undertaken in late Autumn or Winter when the weather permits.

The failure of the nets to withstand the sort of turbulence experienced in the Dan yr Ogof stream should also be rectified for the next tests as modifications are being done at present.

Thanks are due to all SWCC Members who helped deposit the spores, set up the nets, examine for the spores and dismantle the nets; especially those who, like me, went out in the most appalling weather.

Bill Gascoine


1 Mile
North
To Llangadog
Afon Clydach
Carreg-yr-Ogof
Pwll cwm Sych
Sinc-ger-y-fford
Herberts Quarry
Llygad Llwchwr
Moel Gornach
?
Pwll Swnd
Blaen Llynfell
Llynfell Sink
Banwen Gwythwch
Tair Carn Isaf
Afon Twrch
A4069
Ffrwd Las
Ffrydiau Twrch
BRYNAMMAN

A HYDROLOGICAL STUDY OF THE LLYGAD LLWCHWR AND FFRIDIAU TWRCH RESURGENCES

OBJECT To ascertain the area of water catchment for these two large resurgences and thus stimulate the search for caves associated with them.

METHOD The method of introducing dyed Lycopodium spores into sinks on the mountains and collecting them in nets placed in the resurgences has already been described in the previous account of the study at Dan yr Ogof and Ffrwd Las. The same method was used with these two resurgences also.

THE STUDY A scrutiny of aerial survey photographs, O.S. maps and geological data on the Black Mountain area, kindly donated by Roy Machin of Hereford C.C., led to three H.C.C. Members, Nigel Rogers and myself meeting at Herberts Quarry on the Brynamman-Llangadog road (A4069) on Saturday 23rd October '82. The previous week had seen heavy showers in generally unsettled weather so we hoped for many active sinks for the dye tests. In the event, only two small streams were located sinking in the Moel Gornach area and no surface streams at all sinking in the Blaen Llynfell area in spite of the presence of several large dolines bearing evidence of flow in recent times. As a positive test from Pwll Swnd to Ffrydiau Twrch had already been done by H.C.C. in the early 70's, we ignored that area and headed South from Blaen Llynfell to Llynfell sink, a large stream sink in an intensively quarried area.

Dyed spores were thus deposited in sinks:-

1Kg of Malachite-green spores in a sink on Moel Gornach (Grid Ref. SN 748182).
1Kg of Bismark-brown spores in Llynfell sink at SN 762173.

The net was put in the Ffydiau Twrch resurgence on our way back to Ystradowen and transport to Herberts Quarry.

On Sunday 24th October in appalling weather, heavy rain and high winds, I met Roy Machin at Herberts Quarry with a view to putting spores in sinks to the West of the quarry and another net in Llygad Llwchwr resurgence on the western edge of the limestone outcrop. A sink by the roadside was persuaded to take a stream by a little trench digging and 1Kg of Magenta spores were introduced into Sinc-ger-y-fford at SN 732189. We then turned our attention to Pwll Cwm Sych, a large, peaty sink at SN 691184, which was taking a fair-sized stream which would no doubt increase in flow as the day was, if anything, getting wetter and windier - so, 1Kg of Methylene-blue spores were introduced into Pwll Cwm Sych.

Another set of sinks in an area South of Banwen Gwythwch was inspected but, as none was taking a stream, no spores were deposited. The net was put out at Llygad Llwchwr to finish a very wet day and results were anticipated over a bowl of hot soup that evening at Glanamman.

THE RESULTS

Wed 27th October '82: the nets at Ffrydiau Twrch and Llygad Llwchwr were inspected for the presence of spores:-

Bismark-brown spores were in quantity in the Ffrydiau Twrch net.

One Methylene-blue spore was identified in the Llygad Llwchwr net along with much rotted vegetable matter and fine sand.

Sat 30th October: the Ffrydiau Twrch net again contained brown spores. The Llygad Llwchwr net contained more blue spores and five Magenta spores were counted.

Sun 7th November: The Ffrydiau Twrch net was still holding brown spores; no green spores were found.
The Llygad Llwchwr net again gave Magenta spores; no green spores were found.

The nets were removed after sampling and the test brought to a conclusion.

COMMENTS The presence of spores from Llynfell sink in the Ffrydiau Twrch net was not too surprising but, as Pwll Swnd had already been tested to the Twrch Rising, it surprised me that Moel Gornach sink spores did not appear in that net. It may be that same underground water flows North from Moel Gornach as there are small resurgences in the Clydach valley - this theory will be tested using more dye later in the year (or early in '83).

The presence of spores from Pwll Cwm Sych in the Llygad Llwchwr net was also 'half expected', especially as so much peaty debris was also in the net, Pwll Cwm Sych being run off from a large peat bog.

The presence of spores from Herberts Quarry area, over four miles from Llygad Llwchwr, was a real surprise; especially as a fault divides the two features. Water travelling from Sinc-ger-y-fford to Llygad Llwchwr in around four to seven days must surely be an exciting find for cave researchers.

The lack of sinks to the West of Herberts Quarry may mean that it will be difficult to get further information on the catchment for Llygad Llwchwr but I still have 1Kg of Safranine-orange spores in hand for such a study and suggestions for their use will be welcomed.

The nets and frames behaved well in these tests without any modification of design as was indicated after the failure of the nets at Dan yr Ogof. Llygad Llwchwr especially is a fine site for such a net with a substantial flow but little turbulence.

NOTE The indication on the map of a test from a sink on Carreg-yr-Ogof to Ffrwd Las refers to a test done by SWCC in the early 70's using fluorescein dye. It was included to complete the picture of the area tests.

My thanks to all who helped and advised.

Bill Gascoine

BOLT HANGERS FOR SINGLE ROPE TECHNIQUES

Last summer I was very nearly led astray to Jugoslavia to examine some deep shafts near Triglav using S.R.T. Now that it is all over and I didn't go, it would seem useful to examine one aspect which worries me and seems to have received precious little thought and that is the little bolt on which everything hangs.

The present system consists of an aluminium hanger resting on the threads of an 8mm bolt which is screwed into the sheath previously locked into the rock by its cone, with its face flush with the rock and the hanger (if the fixer has got it right).

Before examining the strength of this bolting system, it would be useful to deduce the load that it is expected to carry. I would say that this would be one wet caver carrying gear, plus the weight of the rope already hanging from the bolt: let's say (250+50+50)lbs, i.e. 350lbs. Now this is not a static load. The caver is struggling up and down the rope so say the load on the hanger is 350 plus or minus 350lbs (i.e. up to 700lbs).

Figure 1 shows the bolt and hanger properly assembled.

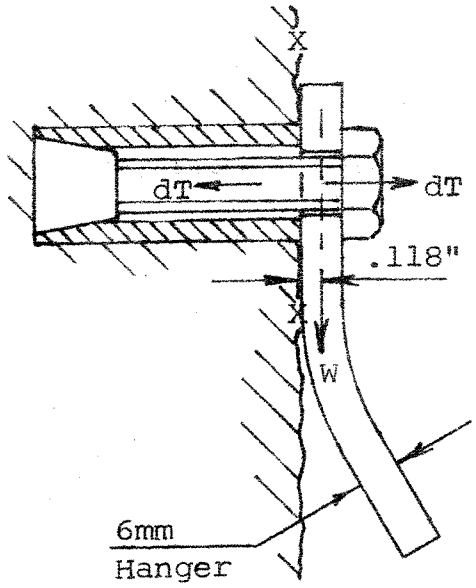


Figure 1.

A = Area of thread root of 8mm bolt.

$$= \left(\frac{6.5}{25.4}\right)^2 \times \frac{\pi}{4} = .05147 \text{ in}^2$$

I = Moment of Section

$$= \left(\frac{6.5}{25.4}\right)^4 \times \frac{\pi}{64} = .0002108 \text{ in}^4$$

There are three stresses to be considered at Section X-X through the root of the threads:

(a) Tensile Stress - depends on the nut tightening torque and could well be 25 tons/sq.in.

(b) Maximum Bending Stress

$$= \frac{.118 \times 700 \times .128}{.0002108 \times 2240} = 22.4 \text{ tons/in}^2$$

(c) Shear Stress

$$= \frac{700}{.05147 \times 2240} = 6.07 \text{ tons/in}^2$$

In consideration of the above results it is obvious that the Shear Stress of 6 tons/sq.in. is fairly reasonable. Against a shear proof stress of, say, 30 tons/sq.in. the safety factor is 5; not enough for a vital bolt, but not too bad. It is when one looks at the tensile and bending stresses that I am thankful I never went SRT'ing in Jugland.

Some may say that the tightening stress of 25 tons/in^2 would not occur because the bolt is only to be done up lightly, but it is easy to tighten up an 8mm bolt to the yield point, say 45 tons/sq.in, so 25 tons/sq.in is very possible when considering that a firm bolt would give some confidence. The bending stress associated with this is the frightening part of the setup, i.e. in the root of the thread at the top (a lovely notch by the way which should have a concentration factor added to the calculations), there is a 25 ton tensile stress with a 0 - 22 tons/sq.in fatigue stress; i.e. 36.0+/- 11 tons/sq.in, and this is for a correctly installed bolt. It would be possible, if the bolt were tilted very slightly, (see Figure II), for the bending stress to be considerably more:

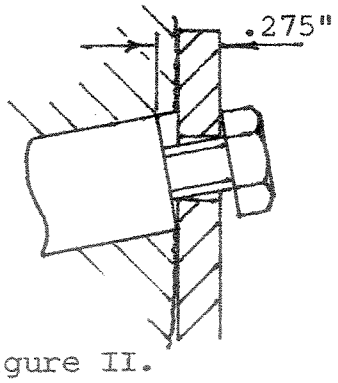


Figure II.

say $\frac{.275 \times 700 \times .128}{.0002108 \times 2240} = 52 \text{ tons/in}^2$

Of course, the bolt would yield slightly until the load was carried nearer the sheath.

It is not worth carrying this discussion any further because it is obvious that the hanger is wrongly designed in the first place. After all, the Redhead was designed for holding things to factory walls etc., - not for holding the lives of cavers over 600ft drops!

The basic design alteration that I consider essential is to put the hanger on the sheath. The following sketches show the idea with various methods of locking.

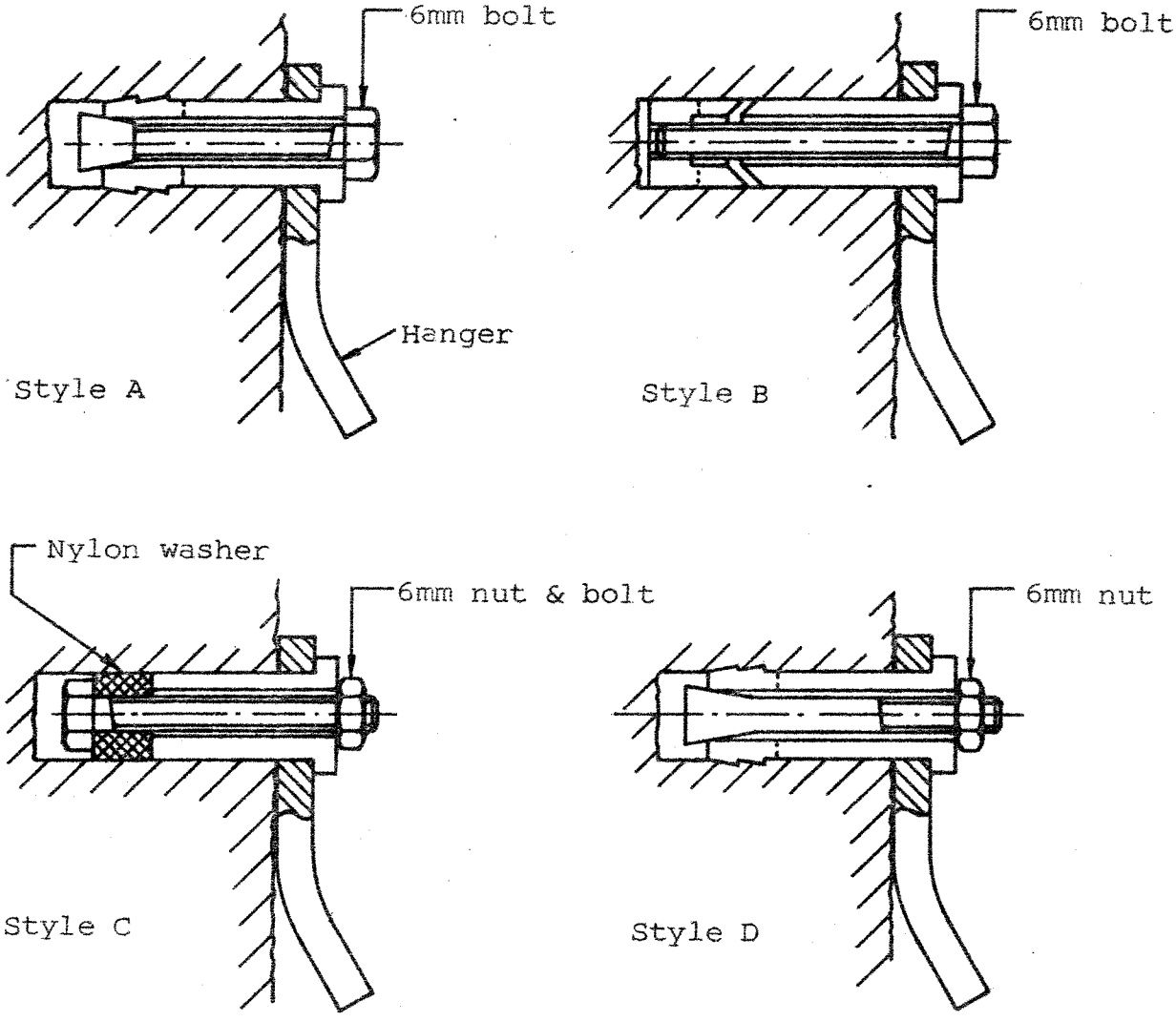


Figure III.

The stressing now boils down to a shear stress in the end of the sheath:

$$\text{i.e.} \quad \frac{700 \times 4}{(.5^2 - .25^2) \times \Pi \times 2240} = 2.2 \text{ tons/in}^2$$

The sheath now has a safety factor of 14 which is plenty. The only thing to worry about now is the integrity of the rock (!) which is up to the user. The 8mm bolt can be forgotten.

Peter Harvey

THE BLUE HOLES

It was August 1981 and we had abandoned the normal concept of 'roughing it'. We were in the Bahamas: sun, sea and sand; a tourist playground. But this was a trip with a difference - a cave diving expedition with no hope of any 'dry' discoveries.

The image of an 'island paradise' was quickly dispelled as within hours of arrival we found that north Andros Island, our chosen area, was plagued with mosquitoes, sandflies and a whole host of other nasties. Another little shock proved more gruesome. That very afternoon, the advance party had made a recce dive at a local inland blue hole - Uncle Charlie's - and had discovered the body of a cave diver. Could this be something of an omen? No one ever went cave diving on Andros and, apart from a single fatality out in one of the sea caves many years before, there was no record of anyone having gone missing. The police were informed (they didn't give a dam) and we left the corpse where it was.

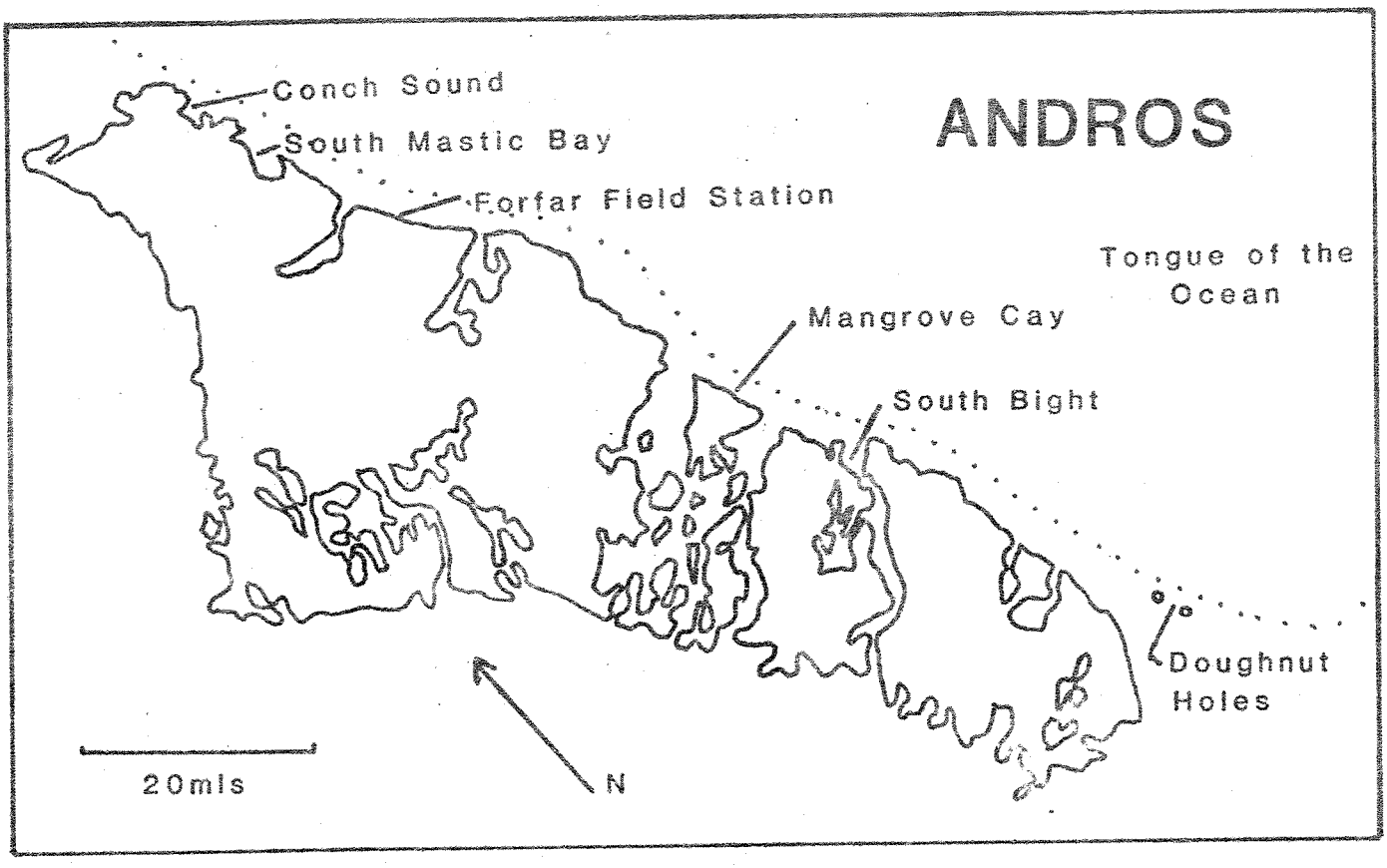
Chastened by the experience we set about our activities. From a cave diving point of view the conditions were unbelieveable. At 26°C the water felt so comfortable that for short dives one didn't even need a wetsuit. The visibility was excellent and the general passage size so large that I wondered what the hell I'd been doing for the last ten years. Obviously there had to be snags. Depth, with all its associated problems, was the number one consideration. In no way could we hope to make significant contributions to deep diving exploration in the area and from the outset we were looking for sites that 'went' shallow; that is, less than 150 feet depth.

Looking back, we were very lucky to find the system underlying Conch Sound in the extreme North-East of Andros. With hindsight, we were even more lucky on our first dive at this site; one person at least experiencing a real 'frightener'. Tidal currents sweep through nearly all the blue holes of the Bahamas and it is essential to time one's activities very carefully. When the current is blowing out of the cave it is generally unsuitable to attempt to enter as so much air is used battling against the flow. Likewise when the current is sucking into the cave, exit could well prove impossible. The best and safest time to dive is the period of slack water prior to the blowing cycle. During this interval one can explore unhindered by the force of the water and, as the changeover only lasts about twenty minutes, eventually exit assisted by the current.

Our first dive at Conch Blue Hole was exciting; an unintended situation occasioned by a 'cock-up' in tidal calculations.

"Oh, it'll go slack in a few minutes", muttered Rob Palmer as he set off laying the first line. We were so keen to get in and we had waited around on the beach for an hour that caution was overruled. Little did we realise that we dived at least an hour before we should have done.

Rob and I were diving together with two tanks apiece, while behind us, biologist George Warner and Bomber Beaumont were intending following for a short distance using just a single cylinder. No sooner had we got out of sight of the entrance than the current intensified and swept us along at breakneck speed. Our heavy line gave some reassurance but it was a most disturbing feeling, barely being able to fin along against the flow. The first reel ran out at 330 feet and it was my turn to lead on using a second. At 400 feet we entered a large chamber, possibly a hundred feet across, where huge stalagmites were revealed in the beams of our powerful 50 watt light units. The depth was less than 80 feet at this point and the current dispersed through the large



space. We pressed on. At 660 feet the line expired and we had emerged at the edge of another vast chamber with an even greater profusion of stal.

The current was still whipping past as we started on the exit. Not until we reached the 'constricted' area from 350 feet out did we fully appreciate the seriousness of the situation. We were thankful for the fact that we had installed line capable of being pulled upon and equally as glad that we hadn't been able to push on further. Our air reserves were low as we broke surface but infinitely greater than those of George who was looking distinctly shocked. He had drifted in to 350 feet before realising his predicament and by the time he had fought his way out his air had gone completely. Apparently, all Bomber could get out of him for five minutes or so after he returned was "Bloody hell, bloody hell". From that moment we were rather more careful.

As the dives at Conch Blue Hole became longer - to 1300 feet, then 2000 feet - we adopted extra cylinders, firstly to our backs and then hand-held. The latter we breathed in and dropped off about 400 feet or so from the surface. This 'staging' technique was originated by the Americans and it was to be the key to all the future explorations at this cave. On the final dive here in '81, I made a solo dive to 2,300 feet and 85 feet depth using a total of five cylinders. By this point the overall length of passages surveyed had risen to 3,000 feet. Various other sites were also explored, the most significant of which being a blue hole at Rat Cay. Here we covered 2,000 feet of passages. By the time our month had drawn to a successful conclusion we were unanimous that the cave diving in the Bahamas was the most enjoyable that we had ever undertaken. We had to return.

Plans were soon afoot for a more ambitious expedition in 1982: but bigger expeditions spell bigger problems and financially

we were more than slightly embarrassed by the mega-overdraft incurred by the '81 trip. The original team slowly disintegrated - harassed by the prospect of bankruptcy - and a new one was drawn together. Completely unpeturbed, Rob soldiered on. Fourteen people were eventually to end up on Andros; all bar our leader, the diving team consisted of S.W.C.C. Members: Rob Parker, Julian Walker, Tony Boycott and myself. Likewise on the scientific side, Kitty Hall was to make invaluable contributions to the water analysis.

The main objective of the trip was to be an all-out push on Conch Blue Hole. It appeared that the limit set in '81 was something of a world record for a submarine distance penetration into a cave. Rob certainly capitalised on this and for the duration of the '82 trip we were under the ever watchful eyes of a film crew. John Gow Productions had been 'persuaded' that they couldn't really go wrong shooting a documentary and, with the bashful Rob Palmer ever ready to lead his men before the cameras, the circus commenced.

Rob Palmer, Rob and Julian had been out on Andros for a fortnight when the main group arrived and had already started work on Conch. Teamwork was to be the essence of the renewed assault and without the selfless support of Rob, Julian and Tony there is considerable doubt that the ultimate achievement could have been made. Transporting fresh cylinders deep into the system, then bringing out the 'empties', was no easy task and frequently all three lost out on their own projects by assisting with the filming, or rectifying some error on the part of the lead divers. There were certainly no other group of people that I would rather have had along.

Four days after the main body of the team arrived, the first push took place. Rob and Julian saw Palmer and myself in to about 1100 feet and from this point we continued alone. A 'squeeze' was passed at 2,300 feet and the reel was eventually dropped at 2,700 feet in what was to prove to be a cul-de-sac. The main route led off at 2,640 feet. After this penetration we came to the conclusion that, logistically, it would be extremely difficult supplying two lead divers in the water at the same time: we would have to alternate leads.

Two days later, Rob and Julian were again in action supporting me to 1,600 feet. Here I swapped over from my hand-held unit, which had been breathed en-route in, to yet another stage unit which would hopefully get me to about 2,200 feet. A full cylinder was then left at 1,600 feet, ready for the exit. Having just exceeded my one-third safety margin on the stage unit, 2,250 feet was reached, the cylinder deposited, and I continued with three full sets. From the previous limit the route descended gradually to over 90 feet depth, all comfortable stuff in a passage 30 feet wide and about 8 feet high. Suddenly, at 3,000 feet, the character changed from a half tube to a keyhole-shaped rift. The route continued along narrow ledges at the same depth while the floor lay at about 110 feet depth. At 3,070 feet, a quick wriggle and I was forced down to floor level, now at 100 feet but still a narrow, awkward and intimidating rift. The current still indicated that this was the main route but enthusiasm finally waned at 3,150 feet: the line was tied off and I surveyed back. Exit was uneventful and the whole dive took two hours and three minutes, followed by two hours decompression.

Owing to tidal inconvenience and various other hassles, it was the 17th August before Palmer made his push. We were all involved - five divers using twenty-one cylinders. Having reached

2,000 feet Rob realised that he had lost his line reel somewhere but, rather than turn back and look for it, he opted to collect the one that I'd dumped in the cul-de-sac at 2,700 feet on the 7th August; then he continued to 3,300 feet. For weeks Rob had been getting into the filming with increasing eagerness. His aspirations were clear: if he couldn't be in front of the camera, he carried one around mounted on the side of his helmet - and this was his moment. The environment was merciless; what better place to erect a miniature Union Jack? The camera whirred.

For the next major push, Rob Parker and I made a preliminary dive to install cylinders as far into the cave as we could safely get using four cylinders apiece, (2 x 80 cu.ft side mounted and 2 x 80 cu.ft back mounted). We reached 2,250 feet easily with a total of three hand-held bottles and a 1,000 feet line reel. Having deposited his two bottles, Rob set off out while I decided to carry on with the other one and the reel. The squeeze was passed and at 2,400 feet it was time to drop the gear. I knew that I had exceeded the 'third margin' on all three cylinders used so far. It was definitely time to swap to the fourth bottle and start out: just a routine swap.... Unfortunately, set number four was defunct - a completely useless valve rendered one quarter of my supply unuseable. An air of tension developed instantly but I certainly wasn't about to breathe any of the hand-held units which we had taken such pains to bring in. The decision was taken to head out leaving all the stage units untouched. If difficulties arose I could pick up a bottle at 1,000 feet; a bottle which Tony was installing while we were deeper in the cave.

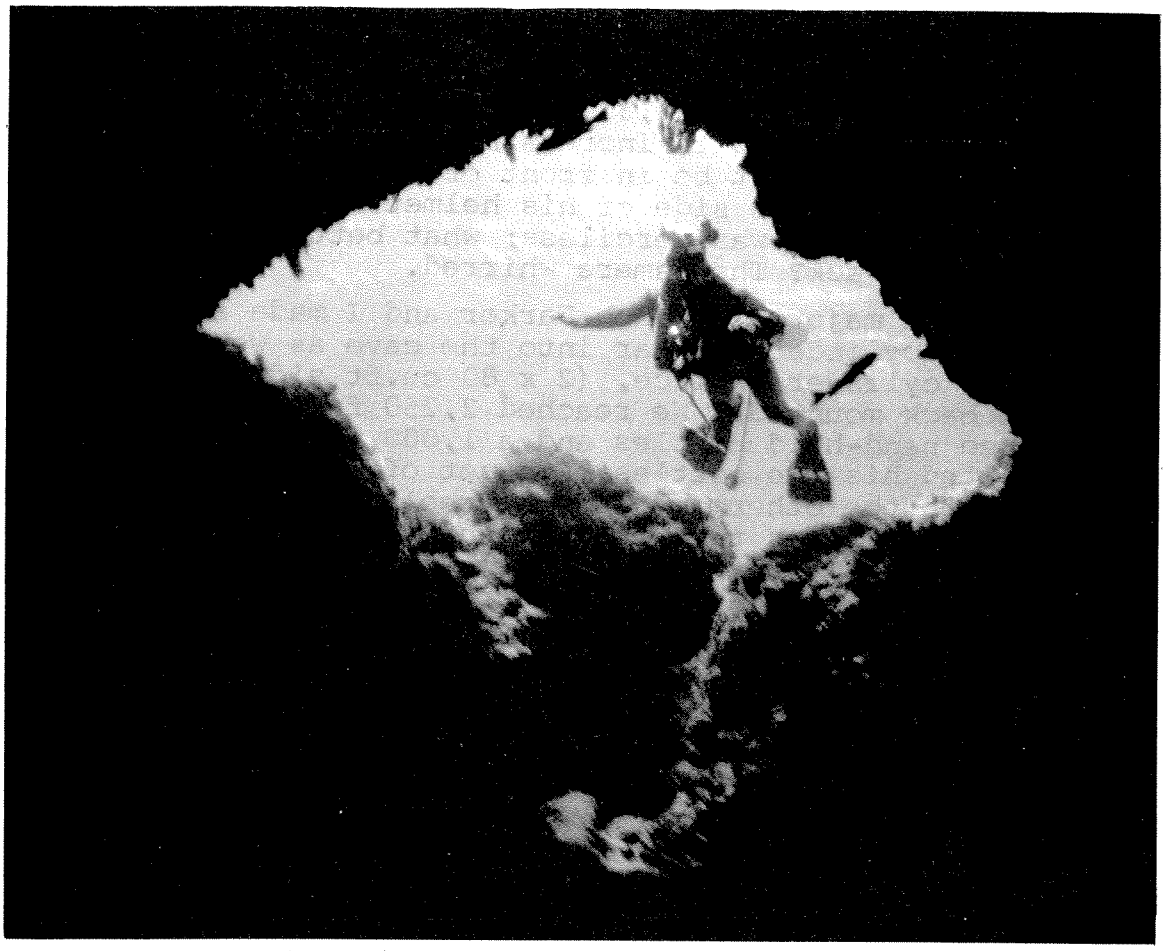
The journey back to 2,000 feet went smoothly but, on reaching this point, I was amazed to note that the current was still sucking. We had taken advantage of the strong, in-going flow earlier but I was now fighting it - with a lot less air at my disposal. The breathing rate increased. At 1,600 feet the situation looked even more grim; the tide was about slack and it would be twenty minutes or so before I could derive any benefit from it. And - what if some other emergency should arise and the 'bail out' bottle not be at 1,000 feet as arranged? At 1,500 feet, the unthinkable occurred - the line wrapped itself around one of my back-mounted bottles. Hmm...

I gave it a minute at the most, then cut myself free. Moving on as fast as I could it seemed almost a miracle when, at 1,400 feet, there was Rob; waiting to see what was up. Instantly my worries were over - a safe exit was assured. The breathing rate returned slowly to normal. At 1,000 feet the spare bottle was gratefully taken but I was under no illusions; it had been a close do.

The push had been scheduled for the following day. Having satisfied myself that I was up to it, Julian volunteered to go in that night to repair the severed line and install a fresh cylinder. Without this action there was every possibility that the main dive would have to be postponed. In the early hours he was back and the lines had been joined; we were all set.

This was going to be a long dive. We were now off the normal decompression tables and on to the U.S. Navy's 'Exceptional Exposure Tables'. Apart from the actual dive time, I could expect to spend over three hours on decompression. We arrived on the beach early. It had been the rush that had been responsible for the previous day's calamity and this time I wanted to feel certain that everything was right - tried and checked.

Palmer and Tony entered first, each transporting a cylinder - to 2,000 feet and 1,700 feet respectively. The one at 1,700 feet was to take me on to 2,250 feet and the other was to get me out.



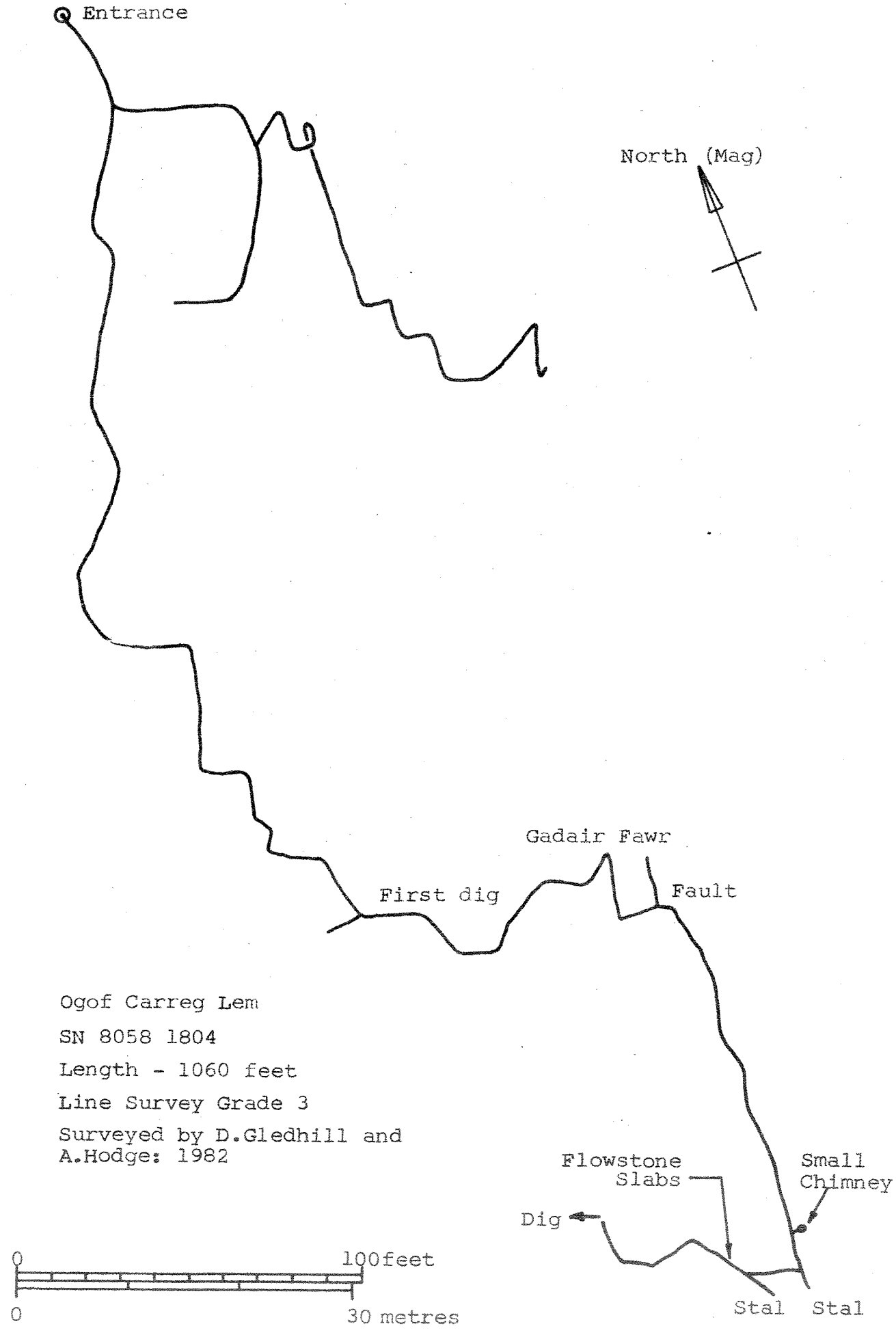
With a strong sucking current progress was good. The second stage bottle was tied off as planned at 2,250 feet and the third picked up. Then I dodged around the big blocks, wriggled through the squeeze, and in minutes was at 2,400 feet. Here the fourth stage unit was picked up to accompany the third, plus the reel. Clang, clang--- the underwater bell-ringer bumped clumsily forward. I was glad to be rid of the third unit at 2,650 feet and then moved on into the intimidating rift with the fourth. This last unit got me to 3,150 feet where it was tied off.

At long last I was free of hassles; 100 cu.ft on my back and two 80's on my sides. Just a few minutes later the end of the line was reached, everything having gone like clockwork. Ahead, passage proportions increased dramatically and by 3,500 feet I was into an absolutely vast chamber at a depth of over 80 feet. Huge blocks of breakdown littered the floor but perhaps the most striking feature was the absence of marine life - just rock and water. As per normal, the occasional belay was made to stals on the floor but the incredible thing about these formations was the fact that here, so far from the entrance, they exhibited no layer of encrustation as was typical of every inch of rock surface up to the 1,600 feet mark. It was as though they had been flooded but a short time before. Waving a hand next to them was as good as a quick dust-off and for a few moments they glistened like any other stal in the caves back home. Then the clouds came rolling in - the scene was lost and it was time to move on. At 3,750 feet I had the feeling that I had completed a loop. The line was tied off. Another foray was to be made in another direction but the same thing occurred. It transpired later, from the survey, that I had circumnavigated the chamber - which gave no obvious indication of a route on and which measured about 140 feet x 120 feet.

The journey out also went smoothly and I arrived back at 2,250 feet to find Julian patiently waiting for my arrival. He'd been there wondering and watching his gauge for 20 minutes. We set off out together, finding Rob Parker waiting at 1,600 feet. He'd been on station for 38 minutes! An uneventful return was made to the entrance after a dive of two hours and 46 minutes. Cameras whirred and the most enjoyable piece of team-work that I have ever been involved with drew to a conclusion.

This, in fact, proved to be the last push at Conch Blue Hole but a brief mention must be made of other significant explorations. A 700 feet penetration was made at a depth of 160 feet in a blue hole off Mastic Point to reach a boulder choke, and a couple of other sites, visited the previous year, were pushed to more of a conclusion. Rob and Julian also made a bold descent in Forfar Blue Hole passing the previous year's limit, a further series of tight squeezes, to reach a large trunk passage at a depth of 200 feet. Much, much more remains to be done on Andros, especially at the deep sites in the south and inland. Despite the continual upwellings of discontent, the two trips must ultimately be viewed as a success - judge for yourself on 'World About Us'.

Martyn Farr



Ogof Carreg Lem

SN 8058 1804

Length - 1060 feet

Line Survey Grade 3

Surveyed by D.Gledhill and A.Hodge: 1982

THE GIEDD SYSTEM

Interest in this much postulated system has waxed and waned for as long as the South Wales Caving Club has existed. In 1947 Peter Harvey dug and entered Sinc-y-Giedd, finding about 500 feet of passage. This was later lost and, apart from a brief period in the 1950's, it remained so until Paddy and Sue O'Reilly and Pete Ogden re-opened it at Easter 1970. Though they keenly pushed the cave it was soon lost again when they moved to Ireland and Africa respectively.

A few half-hearted attempts have been made since but not until the last couple of years has any concerted work been put into the area. Nor was much known about the underground drainage except that 3lbs of Fluorescein put into the sink appeared 35 hours later and 'dyed the Tawe bright green from Dan yr Ogof to Abercraf'.

Martyn Farr's discovery of Mazeways II spurred on some people to re-examine the area, including one sodden group who looked at a sink half a mile due West of the Giedd sink. It looked promising, but a large boulder barred the way. Mike Ware produced some bang and an electrical det. He tried firing it from an Oldham cap lamp - it failed to go off. We walked dismally back to the valley in disgust.

In June 1977, Tony Davies, Liz Millett and Pete Francis, after a chat with Alan Coase about the area, went to look at the sink at Twyn Tal Ddraenen. Pete went to relieve himself in a convenient shakehole, gave its floor the traditional kick, and nearly fell down a shaft. Half an hour's work opened it up enough for easy penetration but a lack of gear stopped further progress. The following weekend saw the trio sneaking back up there. The shaft turned out to be twenty feet deep and free climbable; leading to a big, dark phreatic tube with a lot of breakdown in the floor and stretching South towards Sinc-y-Giedd.

Pete cursed loudly as the next weekend saw him off to Iran for three months but was relieved to find the passage blocked by a large earth slope under an aven after a hundred feet of passage. Any dig there would be a protracted affair needing timbering and, with the state of moral at the Club at the time, there was no one interested enough to undertake it. So the area lapsed into quiet solitude once more.

On May 1st '81, after an article in the Newsletter (No.93-Nov '80 - Club Meets), Gareth Davies led Pete Francis to an interesting sink west of Sinc-y-Giedd. It turned out to be the same one that Mike Ware failed to detonate. The boulder was removed manually and a small chamber entered. Digging in its floor revealed a further space with lots of hanging boulders and a shaft. After much thought and prayer, this was descended and, after one false try, a further 'space' opened. Due to the wet nature of the dig pushing was restricted to dry periods and it was not until the 27th March '82 that Kevin Davies removed another boulder from the floor of this 'space' and revealed more blackness. Pushing him quickly aside, Pete Francis squeezed through until stopped by thin projections in a vertical slot below. S.A.Moore offered to remove these with a lump hammer and then proceeded to easily push his body into the resulting space - quickly followed by a religiously enraged Pete. This slot led into the first cave chamber which ran away for fifty feet; fifteen feet wide and six feet high. The surface stream sank here among boulders and, apart from one trickle in the left-hand series, was not seen again.

Galantry won and the two brave explorers waited for Kev and

Dick Gledhill before pushing onwards. The left-hand series was examined first but after a few hundred feet it closed down. Subsequent digging in Toad Hall gave more passage of a restricted nature and a twenty foot pot down to a few feet of streamway but attention was then concentrated on the right-hand passage. After squeezing over a drop, a walkable passage was entered passing two pots in the floor. The further of these was later dug by Dick Gledhill and Pete Francis to reveal that the passage was, in fact, a twenty foot deep rift although now mainly buried under infill material. Further down the passage, after digging through two tight squeezes, the passage finished in coarse, dry earth. Until then, the cave had been following the dip downhill; occasionally going along the strike and, each time it did so, becoming very restricted and showing marked signs of sumping.

The next few trips were spent digging the end of this passage until, on April 18th, the continuation was revealed by digging upwards. The character of the passageway now changed, becoming a bedding-plane crawl over water-washed cobbles. Passing a large, mud-filled chamber on the left, the Gadair Fawr, the team thought that they were into the big time but, around one more corner, mud blocked the way on although an enticing draught flowed out of a five-inch air space.

Work has since gone on digging out this fill which seems to be another infilled, strike-orientated passage, but bad weather has slowed progress.

The cave, now called Ogof Carreg Lem (Sharp Rock) is, to date, one thousand feet long and one hundred and fifty feet deep. Of interest is the fact that it would seem to start at the top of the upper limestone beds as large outcrops of honeycomb sandstone occur on the sides of the sink, and Productus fossils abound below it and in the choke. It now seems to be following the beds downwards, gradually cutting through them and it is hoped that, on reaching more speleogenic beds, it will increase in size. The prospects are good as, judging by the surface topography and the amount of water sinking in the area, a large system must await those keen and dedicated enough to persevere; and which could, when finally entered, well rival Top Entrance in size and complexity.

WARNING The cave shows marked signs of severe flooding throughout its length in wet weather and it is judged that there would be NO safe area in it. Any party caught underground in those circumstances would be in extreme danger. There is an emergency First Aid container at the far end of the Right-hand Series but it does not include diving apparatus!

The list of diggers includes:- Pete Francis, Gareth Jones, Dick Gledhill, Bob Hall, Kevin Davies, Ian Todd, M.Rose, Wiggins Apprentices (Hereford), Barbara, Pete Hall, Ray and Margaret Craven, Derek, Little Richard, Bob Hill, Jim Heskith, S.A.Moore, Alan Bell, Steve West, Annie Peskett, Haydn Rees, Pete Cardy, Fiona Thomson, Bill Clarke, Denise Samuel, Pete Townsend, Nig Rogers, Brian Clipstone, Roddy McLaughlan, Martyn Farr, Doggit, Phil Rust, Claire, Alan Hodge.

Many thanks to all those people for their help - sorry if I missed out your name but do come again.

Pete Francis

SINC-Y-GIEDD 1982

Feelings about Sinc-y-Giedd are often mixed. It is a large sink, there is known cave and it must 'go' to Dan yr Ogof. Yet it is in the 'wrong' beds (1), is constantly being blocked with sand and river cobbles and is often flooded to the roof. Attempts to maintain an entrance from one year to the next have all failed in the past.

In September 1981, Members built a megalithic dam across the flood course of the Giedd between the upper and lower sinks. This was intended to effect a reduction in silting at the lower sink. This was achieved, but at the cost of an increasing inflow of stream debris at the upper sink and, incidentally, the formation of a subsidiary upper sink beneath one end of the dam.

During the Spring of last year, a good many trips were made to dig the old downstream sink which was finally reopened in mid-summer. It is hoped that this will prove to be the basis of a long-lasting entrance. No doubt an annual Spring clear-out will be needed but the job should not be too daunting.

The situation below ground is not so encouraging. Comparing Peter Harvey's sketch made in 1947 (2), P.M.O'Reilly's survey of 1970 (3) and the accounts of Pete Francis and others in recent years, the impression is of ground lost rather than gained. This loss is entirely the result of silting in the lowest parts of the cave. Nevertheless, a clear route on exists: a narrow rift, carrying a good draught and patently the route taken by much of the water in flood conditions. The start of this rift would seem to be at a level some three metres above the bedding plane referred to by O'Reilly and could well be the '7" crack' of his survey (3).

In the July of last year the weather conditions were ideal and we were able to maintain a sustained assault on the narrow rift. This was done by blasting away one wall to produce a square section passage of comfortable size. The blasting was facilitated by the use of shot-holes, 25mm in diameter and about 500mm long. One hole was usually sufficient for each blast. The holes were charged with varying amounts of I.C.I. plaster gelignite, hand rolled into suitable cartridges. Electric detonators fired from the surface were judged to be the safest method of firing. We hired a Kango 950 rotary percussion drill and this proved very satisfactory in driving spiral-fluted drills into limestone. Power was obtained from a 240 volt petrol generator, borrowed from UBSS, and a step-down transformer for the 110 volts required by the drill. Mucking out was by hand power. Skips were made from 25 litre plastic drums and proved very durable. We hauled the skips to and fro on a rope system which was rather tedious and expensive in man power. The small spoil was tipped behind a crude dam in the main passage; some of the larger blocks were built into an impressive pile of 'stacked deads' - Derbyshire fashion. In all, a week's slogging produced 5 or 6m advance. The rift continues and I hope to resume the push this Easter, weather permitting. In the event of rain there is always Cwm Dwr: any volunteers?

A number of improvements in technique are in hand for this year. The use of plaster gelignite caused excessive fragmentation and tedious shovel work. I hope to have stocks of 80% gelignite (Gelamex) available this year in the hope of obtaining larger size spoil. A power skip-hauling system is also planned and should further ease the mucking out bottleneck.

STOP PRESS The shaft has, as hoped, more or less stayed open over the Winter. The stream has undercut the bank

near the upstream entrance washing a lot more silt into the cave.

Bob Hall

References: (1) Coase and Judson - Dan yr Ogof - BCRA:1977
(also Coase PhD Thesis)

(2) Peter Harvey - 1947 Survey in Club Records.

(3) O'Reilly - Sinc-y-Giedd - SWCC N/L No.66:1970.

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CAVING AND THE DISABLED

At first sight this might appear a strange article for the Newsletter and I must admit that I thought twice about writing it; however, it occurred to me that this situation might arise for other Members so I decided to commit my experience to print in the hope that it may benefit somebody.

As a brief background to this story, my involvement with the disabled came about through another club to which I belong. The club, known as 'Scabendon', was formed several years ago following a successful attempt to get a team of Venture Scouts to run the three peaks of Scafell, Ben Nevis and Snowdon in record time. As a club, its activities are mainly devoted to enjoyment of outdoor sport including caving, canoeing, climbing, parascending, gliding, in fact, anything that we can organise. There is a minor penalty for belonging to this club but that need not concern us here. To celebrate the Club's 10th Anniversary, it was decided to lay on a special project for the disabled (especially as it fell on the year after the 'Year of the Disabled'), such that the disabled would be able to take part as realistically as possible in most of the club's normal recreational activities. Once committed to this course of action, the real work began.

It was decided that the project should cover two weekends: the first - a camp by the River Thames at Dorney with canoeing, archery, shooting, barbeque and bar/disco (and that's another story!) and the second - a caving weekend in Wales.

The planning and build-up to the project took very nearly a year and was left in the hands of a sub-committee. Various disabled groups were contacted very early in the programme and leaders of these groups were co-opted onto the sub-committee for advice and guidance. Just about every concievable angle was covered and early visits to the disabled groups enabled us to make an assessment of the various disabilities and the methods required to cope with them. Once we had a list of people interested in caving, we visited them regularly so that we could get to know them and their reaction to various situations (the first weekend at Dorney was invaluable here). We designed a form which was filled in for each disabled caver and which covered things like name, age, next-of-kin, blood group, disability, reaction to drugs, weak points, strong points, reaction to alchohol (!), in fact, anything that we thought might be necessary in the event that anything went wrong. We fitted them with sit and chest harnesses, boiler suits and helmets prior to the weekend and noted the sizes. We showed them photographs of the proposed cave and were honest about the difficulties involved. We wrote letters to everyone who might be involved and counted the money that we had raised to see if it had reached the £1,000 that we reckoned we needed for the two weekends.

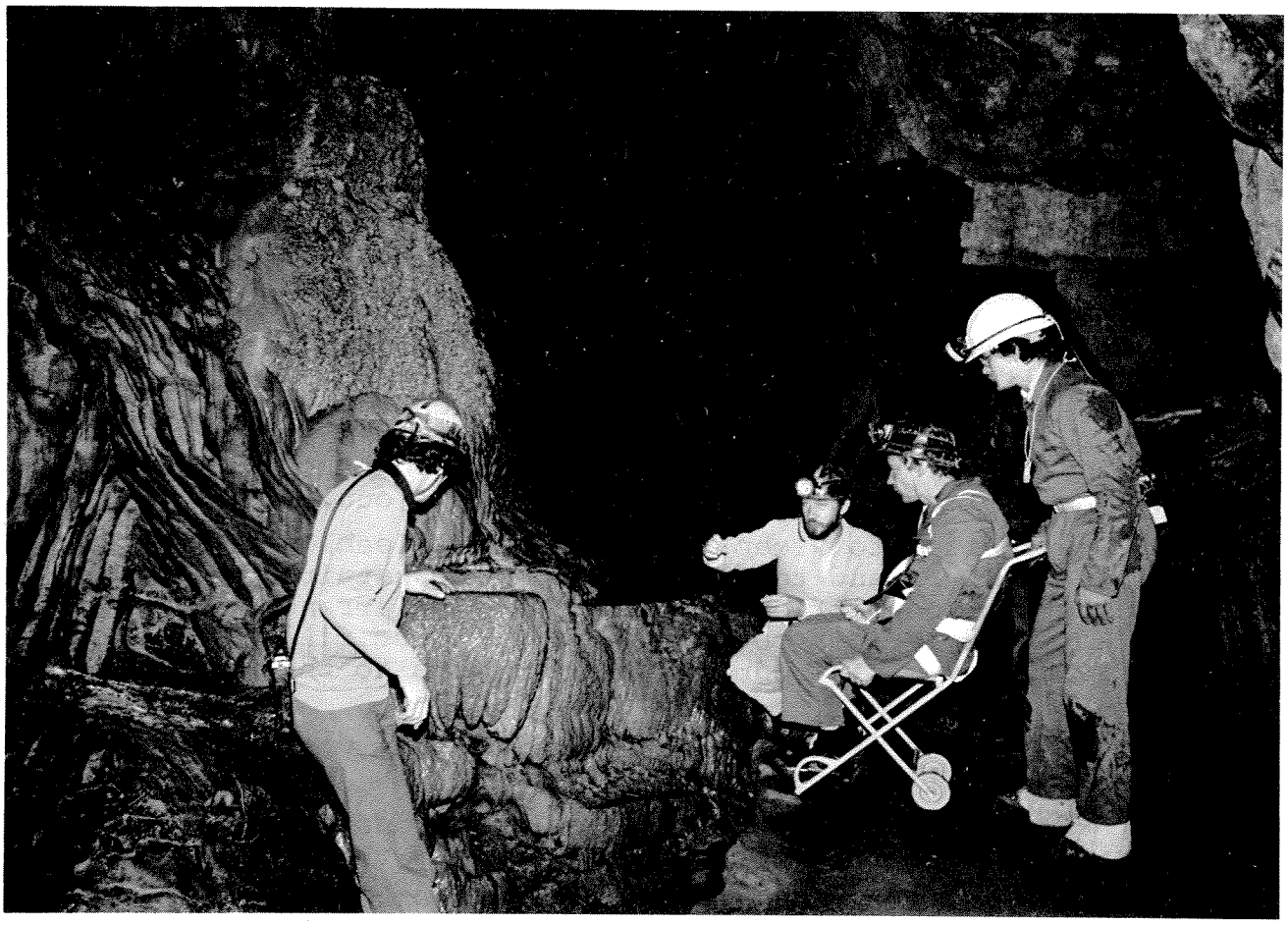
My involvement with SWCC made me the obvious choice to organise the caving end of the project and I gave the exercise a lot of thought. I first approached the Committee and gained approval for the project in principle and tentative approval for the use of Family Quarters for the weekend. I then considered which bit of cave to use. My first thought was the area around Top Entrance but I eventually rejected this on the grounds that (a) it was a long drag from the HQ with wheelchairs and (b) it was difficult to do a reasonable underground distance without encountering boulders. I then went and looked at the entrance series to OFD 1. If I ignored the entrance itself, the passages as far as Pluto's Bath looked ideal; interesting and not technically difficult. The entrance itself posed a problem in that (a) it is vertical and (b) a wheelchair would not go through the hatch. However, we decided that these problems were not insurmountable and agreed on OFD 1. John Barrows agreed to this and offered tea for all when we came out.

We decided to sleep the less agile disabled downstairs in Family Quarters and to provide Elsans downstairs to avoid negotiating the difficult stairs. We also arranged to drop off a barrel at the Prices on the way down, to be filled and used as a convivial way of introducing the visitors to the Members on Friday night.

I will now cronicle the events of that weekend: anything to be learned will be painfully apparent.

We had arranged two mini-buses as transport from Harrow leaving a central point at 1.30pm. One of the disabled passengers was held up by a hospital visit - he arrived at 2.00pm. The loading of equipment, and the most comfortable seating of the various disabilities all took time and the driver of the second bus had forgotten a vital piece of gear and had to go home for it. It was nearer 3.30pm before we got away. We stopped at the 'Little Chef' at Symonds Yat and fed everybody - that took over an hour. We had arranged to drop the barrel off at 6.30pm - it was 9.30 when we did. On arrival at the HQ, we decided to change the sleeping arrangements. The Family Quarters lounge was out of the question for sleeping; it was obvious that nobody had any intention of getting an early night - so, with assistance from Laurie, everyone was accomodated upstairs. We successfully negotiated the stairs with people sitting apprehensively in their wheelchairs - for the first time! At 10.45pm, a party of three left to collect the barrel. 'Time' was being called as we entered so I only managed to get three pints in! Back at the HQ, by the time we got everybody to bed it was 2.30am: a pity, we had intended to put the scaffold frame on OFD 1 entrance on Friday night. 7.00am on Saturday saw me breakfasted and frantically Rawl-drilling a bolt-hole for a rope guide just above the entrance hatch. By 9.00am we had the scaffolding up but it was 10.30am before we had tested the system and got it running to our satisfaction.

We had decided to bring the disabled from the HQ two at a time, kitting out one whilst the other was lowered. We figured that it would be less demoralising if the lowering exercise was not watched by those yet to go. We intended to contact the HQ by means of C.B. or Rescue radios to get the pairs sent down. In the event, neither type of radio would make contact due to the steep angle of the hill and the amount of rock between entrance and HQ. It became necessary to send transport up the hill each time we were ready for two more and so, as the long-wheelbase Transit was a bit much to keep taking down the lane to Y Grithig and was parked in the lay-by, frequent walks up and down the lane became tiringly essential.



We had rigged the scaffolding as a tall frame over the entrance ladder and fitted a pulley to the top. This made it easy to lift a person from a wheelchair to a sitting position on the wall. Troll Sit and Chest Harnesses had already been fitted, padded where necessary, and it was a simple matter to krab the lifting rope onto the harness and lift the person slightly to ensure that they were comfortable and to give them confidence (?) in the system. To negotiate the hatch and the angle of the lower ladder, we had fitted a guide rope from a bolt fitted about $1\frac{1}{2}$ metres above the hatch, through the hatch and hard across to the floor of the opposite wall, thus running approximately parallel to the lower ladder. Once the person was lowered to the bottom of the first ladder, with a supporting caver moving with them, they were supported whilst the chest harness was krabbed onto the guide rope. Up until this point the hatch was kept closed as it was felt that the strong draught blowing out might be a bit disconcerting. The hatch was then opened and the lowering continued, the guide rope ensuring that the person descended parallel to the lower ladder, with cavers on the ladder to steady and support. Safety during the lower was ensured initially using a Jumar as a safety brake. In practise it proved difficult to release the cam to pull up if necessary and the Jumar was later changed for a Figure of Eight.

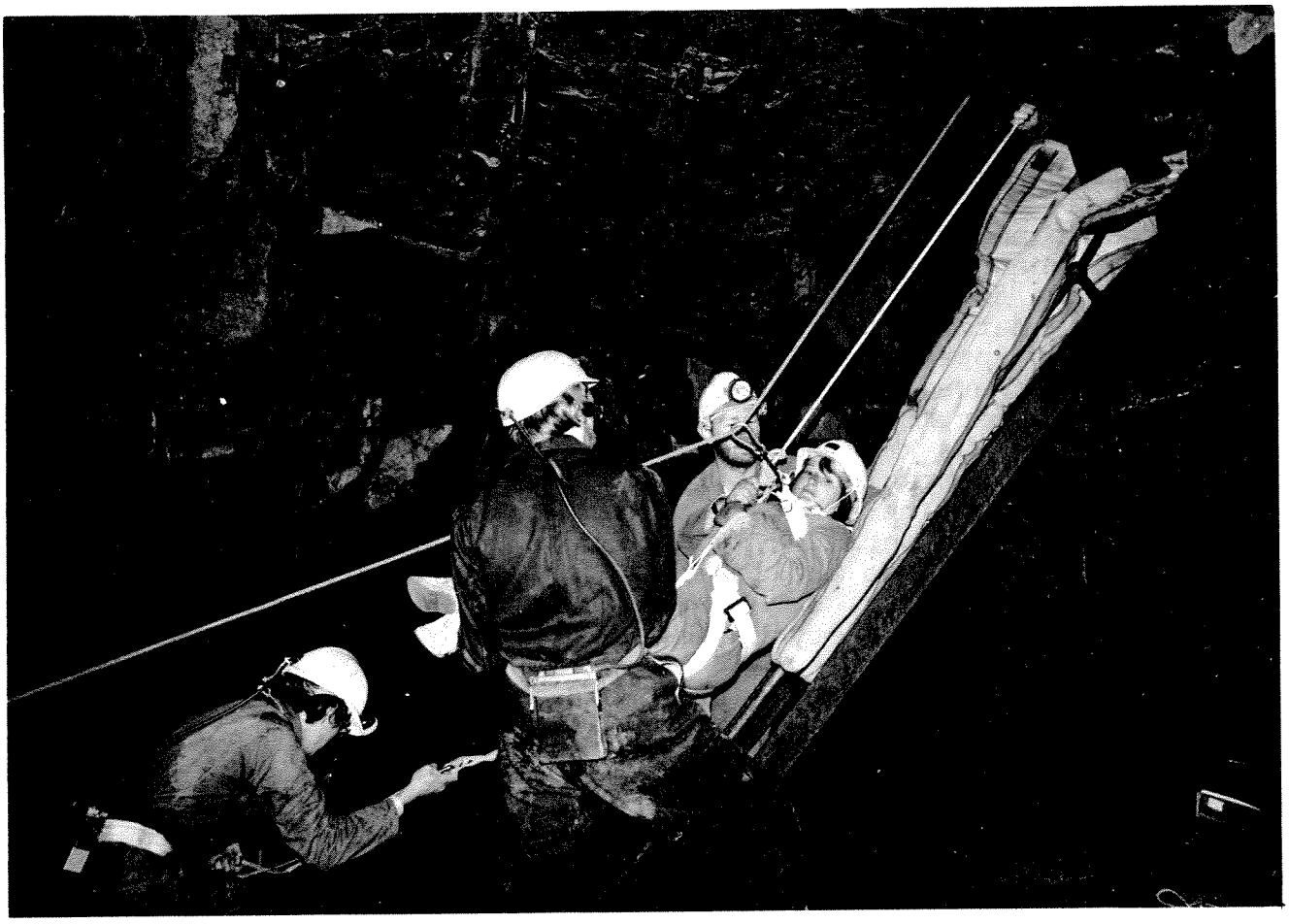
Once at the bottom the person was immediately seated in a First Aid chair (borrowed from my firm's First Aid Room) and transported around the Entrance Series. Luckily, only two of the disabled needed this treatment; one a paraplegic and the other a Spina Bifida sufferer. The rest of the disabled party consisted of one amputee with an aluminium leg, one polio sufferer on crutches, one blind lady, one E.S.N. and one who suffered from stress-related epilepsy.

Around the route we had placed spare hand-lamps and written descriptions at strategic points. This was to assist the Members of Scabendon who were not familiar with the details and history of the cave. We also set up a 'Tea Room' with flasks of coffee and tea just before Cathedral Chamber.

To say that the underground trip was a success is an under-statement. Having got them in - they didn't want to come out! This, and a slight underestimate of the total number of carriers and guides needed, meant that time slipped by at an alarming rate. It was about 6.00pm when the last person was ready to be extracted. By this time people were busy clearing the cave and there seemed to be a shortage of manpower. Extricating the unfortunate Spina Bifida victim seemed to become a very protracted affair. At one point she was left suspended on the guide rope for five minutes while some-body went to organise the haul a bit better. The hatch seemed to cause problems as well and it was not until we finally got her to the top that those below discovered that the problem was that the hauling party had been reduced to two exceedingly knackered young ladies who had found the heavy weight very hard lifting!

By the time that the gear was cleared and everybody fed and watered (and wheelchairs humped up and down stairs a dozen times) it was 10.30pm before we reached the Prices. My rush to alchoholic oblivion was slowed at 11.00pm when John informed me that he had an extension! By midnight, getting everybody and their sticks and chairs into one Transit became something of a surrealistic exercise. One young lady with a taste for Tequila decided that she could not negotiate the two steps down to the road on her crutches - and promptly fell asleep standing up!

Back at the HQ, and six wheelchair trips up and down the stairs



(for obvious reasons) we finally got them bedded down and concentrated on finishing the barrel.

On Sunday, we had arranged with Ashford for a trip around Dan yr Ogof starting at 9.30am. This went well although we now had five wheelchairs. Have you ever counted the stairs in the Show Cave? There are 27 down to the lakes alone! And the push up to Cathedral - to say nothing of coming down! Say no more.....

After a gratis cuppa in the Restaurant and a quick session in the shop, we just had time to get to the 'Three Horseshoes' in Trecastle where we had booked a meal. Duncan's interpretation of licencing laws related to booked meals were a delight to behold and the programme timing slipped a bit further.

Back at the HQ and the, by now, inevitable trips up and down the stairs with the wheelchairs, we found that trying to get packed to leave was a mammoth task due to the lovely weather and convivial atmosphere. Nobody wanted to leave!

As a project for Scabendon, there is no doubt that the exercise was an outstanding success and on their behalf I would like to thank SWCC for the use of their facilities and for their assistance. For the disabled, it was the most exciting thing that they have ever done and their subsequent gratitude borders on the embarrasing. For me, it was extremely knackering but still a gratifying exercise: not something that I would like to make a habit of though. Still, it might make a good Club project one day.

Dave Edwards